CONTEXTS OF SCIENCE
TEACHING AND LEARNING IN
FIJI PRIMARY SCHOOLS:
A COMPARATIVE STUDY OF ETHNIC
FIJIAN AND INDO-FIJIAN
COMMUNITIES

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Abstract

As an experienced science educator in Fiji, it is my observation that Ethnic Fijian students evince, on average, significant under-achievement in science subjects as compared to their Indo-Fijian counterparts at all school levels. In my doctoral study, I seek to identify the reasons for this differential achievement of the two ethnic groups.

My study explores both macro level and micro level contexts of science teaching and learning in Fiji Primary schools. For instance, at macro level, my focus is on the relevance of political/colonial history and the socio-cultural and geographical background of the two ethnic groups in Fiji. At micro level, my study has involved observing classroom interactions and investigating the beliefs and practices of the various participants in children’s early education.

Over a six month duration from May to November 2001, I spent extended periods of time in four villages/communities, two from each ethnic group, in order to gather data for my study. I have employed multiple observations, semi-structured interviews with teachers, students and parents or community members, and analyses of prescribed syllabi and selected policy documents. In addition, I have used my own experiences of being a student, a parent, and a teacher in the Fijian Education system to reflect on the analysed data.

My data evidences very little difference between the teaching approaches of teachers from the two ethnic groups. The most significant exception to my generalisation that the teaching practices are similar is that there are some marginal differences in practices relating to examination preparation.

By far, the most remarkable differences seem to lie outside the classroom — be it in the community life, the cultural differences, or the demographics or the ambient thoughtforms of the two groups. My study presents a multi-layered analysis of these complex contexts based on ecological considerations and the socio-cultural theory of development and learning.
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Chapter 1
Introduction to the Study

1.0. My Reason for Undertaking this Study

During the 18 years of my teaching science and mathematics at various secondary schools in Fiji, and Foundation level at the University of the South Pacific, I have experienced the general trend for Ethnic Fijian students to underachieve in science and science-related subjects as compared to Indo-Fijian students at these levels. It always touches me emotionally to think about it because I am also an Ethnic Fijian.

The trend creates feelings and thoughts amongst people that Ethnic Fijians are not academically as able as other races in Fiji. The more I think about this, the more I ask myself the following questions: Why are Ethnic Fijians not doing so well in science when compared to other races? Do they tend to find the subject difficult or do they tend simply not to find it pertinent or interesting? Either way, what are the reasons? Is their under-achievement related to the teaching of the subject at school? Is it related to their cultural upbringing? Could it be that what Ethnic Fijian students learn at school is not viable within the context of their cultural and traditional upbringing, or that what the students learn at school does not form a meaningful part of their life especially in their homes and villages? Do they have negative or positive perceptions of the value of schooling, and why do they have the perceptions they do? What are the ways in which the situation can be improved? Can the situation be improved by changing the way in which the subject is taught in schools? Could changes in other curricula help improve these students' receptivity to science?

The above thoughts in fact persuaded me to change my field of study in order that I could concentrate on Science Education in my higher degrees (Masters and Ph.D.) rather than on Pure Science (Chemistry and Mathematics) which were my major fields at undergraduate level. The present thesis is my second on science education in Fiji. In 1995, I undertook Master's thesis research which aimed to find
out some of the factors contributing to academic under-achievement of first year Ethnic Fijian students in Science courses at the University of the South Pacific. The major issues I examined (by questionnaires completed by the first-year university students themselves together with in-depth interviews) were school background; the socio-economic and cultural factors; students’ entry marks to the university; and the adaptability of students from the two ethnic groups to the University environment. Since that particular research (Dakuidreketi, 1995) considered only tertiary level education, it left me with many puzzles about how the problem originates. For this reason I thought that I should concentrate during this Ph.D. research on Primary level science in Fiji. I hypothesise that the problem at both tertiary level (Dakuidreketi 1995; Narsey 1994; Taylor 1990) and secondary level (Nabuka 1984; Taylor 1991) actually originates at the lower or Primary school level, partly at school and partly within the wider cultural experience surrounding young children. My assumption was that this hypothesis alone could explain the depth of the difference between the experiences of science of the respective ethnic groups. Primary school education is likely to be at the root of the problem not only because this is where science is first taught, but also because this is the first point of contact between children from the respective cultural backgrounds with formal education per se.

As yet there is relatively little information about school performance in science at primary level in Fiji. While the first two national examinations at Primary levels are the Fiji Intermediate Examination (F. I. E.) at Class 6, and the Fiji Eighth-Year Examination (F. E. Y. E.), at Class 8, systematic studies of differential educational attainment between the two ethnic groups at these early levels of primary school education in Fiji have not been done. It could happen that, by Class 6 at primary school, the die may already be cast.

However, on average a deep difference separates the experience of school performance by Ethnic Fijian students on the one hand from that of Indo-Fijian students on the other hand. This is evidenced by national examination performance at higher school levels such as Forms 4, 6 and 7 where students sit for their Fiji Junior Certificate (F. J. C.), Fiji School Leaving Certificate (F. S. L. C.) and Fiji Seventh Form (F. S. F.) examinations respectively. (Refer to Table 25 in Appendix A). Unfortunately, results of these national examinations are aggregated results. These do indicate that on average, Ethnic Fijian students lag well behind Indo-Fijian students in
their performance on examinations but careful disaggregation would be needed in the lower national examinations in order to indicate the extent of differences that there may be at primary level in terms of examination success specifically in science.

Results of national examinations on Form 6 Fiji School Leaving Certificate, First Year Study at University level (refer to Tables 26, & 28 in Appendix A) and Seventh Form Examination (Table 1) clearly illustrate that the Ethnic Fijian population on the whole struggles to achieve well in science examinations as compared to the Indo-Fijian population. Indeed, the difference is sufficiently profound that it seems safe to hypothesise as I have done, that the problem originates earlier, and should be explored at the primary level. Ethnic Fijian students might find it hard to learn science either because of the way it is taught at primary level and/or because of the mismatch between their cultural norms and those imposed by the school in defining what the school takes to be success.

Thus in the research for the present thesis I have endeavoured to investigate answers to my questions about differential performance in science at school by Ethnic Fijians compared to Indo-Fijians by looking at the original sources of the problem. Looking for a perspective on how the difficulties facing Ethnic Fijians may originate, I have here investigated the area of teaching and learning in Primary level science. This is the area where the foundation for science learning is established and the level where teachers are least likely to have specialist science knowledge. To understand what differentiates the experience of Ethnic Fijian and Indo-Fijian students at this level, I needed also to find out how parents and others in the two communities view or perceive the practice of schooling, especially the learning of science in light of their traditional village or community practices. This includes the cultural upbringing of the two ethnic groups of students in their home environment and whether or not it has any relationship with school learning which may also contribute to their differential achievement at school. I thought that in studying both the micro-setting of the child at school and at home, I should be able to answer in the most telling and helpful ways the questions raised above.

1.1. Dimensions of the Problem

The present Fiji population of about 856,346 (July 2002 estimate: CIA World Fact book 2002) comprises people of two main ethnicities: Ethnic Fijians, and Indo-
Fijians (the descendants of Indian migrants who were brought to Fiji as indentured labourers more than a century ago). Ethnic Fijians total slightly more than half (51%) of the population, and Indo-Fijians about 44% (CIA World Fact book 2002). Despite the fact that Ethnic Fijians are in the majority and therefore as a group enjoy greater political influence, their academic performance does not compare favourably to other races in Fiji including Indo-Fijians.

The realisation that Ethnic Fijians are not achieving well academically is not new since there have been many reports on this lag (Baba, 1979, 1985; Hopkin, 1978; Kishore 1981; Sherlock, et al. 1969; Whitehead, 1986) and specifically in science related subjects (Dakuidreketi, 1995; Kenchington, 1988; Nabuka, 1984; Narsey 1994; Taylor 1990). No aspect of education in Fiji has been so consistently written and talked about as that of the ‘Fijian Education Problem’ or the failure to get enough Ethnic Fijians to the top.

The Indo-Fijians have consistently done better than the Ethnic Fijians in standardised external school examinations (refer to Figure 1 below and Table 29 in Appendix A) and particularly in science and science related subjects as shown in Tables 26 and Table 28 (Appendix A).

**Figure 1**

% Pass Rate of Ethnic Fijian and Indo-Fijian Students in Fiji Junior, Fiji School Leaving Certificate and Seventh Form Examination from 1996 to 2000.

*Note.* From “Ministry of Education Annual Reports”, 1997, 1998, 1999; and statistics of the Ministry of Education. Figure 1 is derived from Table 25 in Appendix A. For Fiji Seventh Form Examination,
numbers passed are those that score 200 and above for English (at least 35%) and best 3 subjects. The figure does not represent the quality of subject passed. Figures for Fiji Seventh Form result in 2000 for both Ethnic groups were not available.

From Figure 1, it can be seen clearly that in all the National Examinations namely the Fiji Junior Examination (Form 4); the Fiji School Leaving Certificate (Form 6) and the Fiji Seventh Form examination, Indo-Fijian students tend to do better than their Ethnic Fijian counterparts. The trend tends to be more pronounced at higher school level but the fact that it also appears at the lower school examination level, signifies that it begins at an earlier school stage.

In considering the National Examination at Form 6 level where students begin to concentrate on learning pure science, it is clearly seen that the percentage of Ethnic Fijian students’ who sat the subject and their percentage pass rate in those subjects are below that of Indo-Fijian students. The bar graphs on Figure 2 clearly illustrate this.

![Form 6 Fiji School Leaving Certificate % Sat and Pass Rate per Science subject by Race in 1999](chart)

**Note.** From “The Report of the Fiji Islands Education Commission”, 2000. The bar graph is derived from Table 26 in Appendix A. Recent figures were not available.
The trend seen from this figure is that in 1999 Indo-Fijian students both sat science subject examinations in the form 6 Fiji School Leaving Certificate examination in greater numbers than Ethnic Fijians (the exception being Agricultural Science) and were (without exception) more likely to pass those examinations than Ethnic Fijians.

The data shown in Table 1 clarify a further dimension of difference, namely that the exam passes by Ethnic Fijians are more heavily weighted into the C category (with very few A and B grade passes) as compared to Indo-Fijian students in science subjects, in the Seventh Form Examination results for the years 1998, 1999 and 2001.

Table 1. *Seventh Form Grades of Pass per Science Subject by Race from 1998, 1999 and 2001*

<table>
<thead>
<tr>
<th></th>
<th>Pass Grades</th>
<th>Mathematics</th>
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<th>Biology</th>
<th>Physics</th>
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<td></td>
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<td></td>
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</tr>
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<td>17</td>
<td>15</td>
<td>10</td>
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</tr>
<tr>
<td>C</td>
<td>322</td>
<td>132</td>
<td>164</td>
<td>97</td>
<td></td>
</tr>
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<td>305</td>
<td>241</td>
<td>253</td>
<td></td>
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<tr>
<td>C</td>
<td>924</td>
<td>432</td>
<td>329</td>
<td>318</td>
<td></td>
</tr>
<tr>
<td>Fijian</td>
<td>2001</td>
<td></td>
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<td>A</td>
<td>3</td>
<td>1</td>
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<tr>
<td>B</td>
<td>121</td>
<td>34</td>
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<td>C</td>
<td>427</td>
<td>159</td>
<td>158</td>
<td>134</td>
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<tr>
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<td>138</td>
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<tr>
<td>B</td>
<td>650</td>
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<td>C</td>
<td>904</td>
<td>437</td>
<td>367</td>
<td>324</td>
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</tr>
</tbody>
</table>

*Note.* From “Ministry of Education Annual Report for the Year 1998, 1999, & 2001". The year 2000 figures and the more recent ones were not available.
Table 27 (Appendix A) further illustrates this problem by considering the overall grades of Form Seven passes from 1996 to 2000.

Ethnic Fijians’ underachievement in science is not only seen at secondary level but also carries on to the University level. The trend can be clearly seen by looking at the line graphs when the Foundation Year Programme was running from 1983 to 1993 (Figure 3).

*Figure 3*

% Pass Rate and Enrolment of Ethnic Fijian and Indo-Fijian Foundation Science Students at the University of the South Pacific From 1983-1993

*Note.* Figure 3 is derived from Table 28 in Appendix A. Data from Table 28 is derived from the ones compiled by the late Dr. Bill Kenchington and Dr. Bill Albersberg, of the School of Pure and Applied Science, from 1983 to 1993, University of the South Pacific and from the Fiji Centre from 1997 to 2002. A similar trend where Indo-Fijian students tend to do better than Ethnic Fijian students in science at Foundational level is also shown when the Foundation Programme was reintroduced in 1997 up to 2002 (Table 28 Appendix A).
This first year University Foundation Programme was phased out by the University at the request of the government in 1994. The programme was continued at the Fiji Centre of the University of the South Pacific from 1997 onwards at the request of the Ministry of Fijian Affairs which sponsored Ethnic Fijian students entering the programme. That is why there is no data available between 1994 and 1996 in Table 28 of Appendix A.

The two clear trends shown in Figure 3 are the decline in Ethnic Fijian science students enrolments coupled with decreasing pass rates in relation to Indo-Fijian students.

It should also be noted that during the period 1986 – 1988 not only were there larger numbers of Ethnic Fijian students doing science but also their performance was better than formerly during that period. The period was marked by higher enrolments of Ethnic Fijian students in Foundation Science billeted at Nasinu (a Residential College catering for Foundation year students at the University of the South Pacific). With residential supervision at Nasinu and support meetings by the Ethnic Fijian staff at the University, there was a higher level of motivation and guidance. This resulted in larger numbers of Ethnic Fijian students qualifying for entry into degree programmes in science at the University of the South Pacific. However as seen from Figure 3, the Ethnic Fijian enrolment rate and pass rate in science turned significantly downward after 1988. Moreover, even at their highest point these rates did not match those of Indo-Fijians. The decline after that interval seems largely to have been due to the fact that support meetings and supervision by Ethnic Fijian staff at the University were discontinued when, in order to cut costs, the government abolished the Foundation Year course at the University of the South Pacific for Fiji students. The Government calculated that it was more economical to have Form 7 students in schools rather than students attending the Foundation year programme at the University of the South Pacific. The Government costed its plan for schools to establish a Form 7 level on the assumption that schools would simply deploy the same teachers who taught Form 6 to teach the further material for Form 7. This political decision was made without proper assessment of the effect it was liable to have on the academic performance of Ethnic Fijian students. For it has apparently differentially disadvantaged Ethnic Fijian students, whose teachers for the most part had no prior experience with Form 7 level instruction. By contrast, in most Indo-Fijian schools Form 7 classes had already long been taught. Moreover in the Ethnic Fijian schools the policy change added new burdens for the school committees: to build extra
classrooms and laboratories necessary for this level. The teachers who were pressed into service as Form 7 instructors in general did not have higher qualifications as had lecturers at the University of the South Pacific who had formerly taught the Foundation Year Programme (Dakuidreketi, 1995). Consequently, the teachers of many Ethnic Fijian students were being asked to teach beyond their level of competence. The performance of Ethnic Fijian students in the three favoured years prior to the policy change shows that Ethnic Fijians can succeed in science just like any other racial group if they are guided and motivated all along as was done by Ethnic Fijian staff at the University during those years. It also shows that in the absence of special forms of support at upper secondary and tertiary levels to encourage Ethnic Fijians into science, solutions to the flight of Ethnic Fijians from science must be found at lower educational levels. The effect of the added support for those years was in any case not large enough to represent a complete solution to the problem of differentially low achievement by Ethnic Fijian students in science, and this also points to the need to look for solutions at lower educational levels.

The fact that Ethnic Fijian students can succeed in science if they are guided and motivated all along in fact initiated the Ministry of Fijian Affairs to re-introduce and sponsor the Foundation Programme for Ethnic Fijian students again as a trial at the University of the South Pacific’s Fiji Centre from 1997 onwards. The pattern of having Ethnic Fijian tutors to boost Ethnic Fijian performance has continued to be used. This has had notably good effects. However, in relation to this exercise it is important to reflect on the following. For an improvement of the situation facing Ethnic Fijians, I have set the following goals which bear consideration:

Goal 1: Improve average performance in science by Ethnic Fijians.


Goal 3: Improve absolute number of top-performing Ethnic Fijians, and thus the number of Ethnic Fijians in a position to become scientists.

Notably, the measures just considered are narrowly focused on Goal 3. They are quite without any possible effect so far as Goals 1 and 2 are concerned.

On the other hand, it is possible that what happens at primary school is very significant in respect to all the above three goals. At the primary level, it is more possible to seek meaningful progress with respect to these goals in concert. Many practical issues facing Fiji focus attention on goal 3. Much existing wisdom about
science teaching and learning especially at the primary level relates to goals 1 and 2. What we must keep in mind is that particularly in primary level science these goals may interconnect, and the best way to achieve progress relatively to Goal 3 may be to seek it relatively to Goals 1 or 2 or both. My present point is that this sort of interconnection doesn’t even enter the picture at the tertiary level, since by that level the vast majority of Ethnic Fijians have dropped away from any involvement in science.

The findings that I have presented in this section are mostly just from three National Examinations (Form 6, Form 7 and Foundation Science Examination). These illustrate the magnitude of the problem. Many reports regarding school achievement of the two ethnic groups (Hopkin, 1978; Kishore, 1981; Nabuka, 1984; Narsey, 1994) have shown that under-achievement of Ethnic Fijian students exists in these National Examinations and at lower Secondary level.

What I conclude from these studies and the data here presented is that there is no sufficient remedy for problem that consists in changes wholly at the tertiary level. Indeed I would go further and say that (setting aside the performance of the many students who do not come to tertiary level to study science) there is no remedy for the differential performance even at tertiary level itself that is wholly at the tertiary level. To achieve the progress that is required for Ethnic Fijians in terms of their performance in science at all levels (relatively to all three goals above-mentioned) we clearly need to look to remedies at lower levels starting from the primary level.

1.2. Significance of the Problem

Since school and academic qualifications in science are necessary for professional careers in science and technology, the present trend has far-reaching consequences for Ethnic Fijian society and in particular has helped exacerbate divisions within the society along ethnic lines. Differences in educational attainment in other fields such as languages and law can also exacerbate these divisions. But there are special reasons why it is important to redress the problem in science. In this sub-section I discuss some of these reasons.

Most developed and developing countries in the world today rely on Science and Technology to improve their economy. They depend on scientific and technological expertise not only to facilitate technological advancement but also to
understand and evaluate the pressure to implement new technologies. If a nation is not to be held back from fruitful advancement, it needs good human resources in science and technology. In any ethnically diverse nation, it is important that every ethnic group significantly contributes to the pool of scientists and technologists and thus to key processes of national self-determination.

In Fiji, this is a problem. There is a lack of well trained and highly skilled Ethnic Fijians in the fields of science and technology as compared to Indo-Fijians and other races (Dakuidreketi, 1995). This is a problem because it is not promoting the cultural, social, political and economic development and self-determination of several races as a single nation in Fiji. To promote development and self-determination requires a fair and collective contribution and participation of all the ethnic groups. The building of a nation is a collective responsibility of different races living in it and it involves both young and old, rich and poor, and leaders and followers. This provides the foundation upon which is built the sovereignty and economic development of a country.

The lack of well-trained and highly skilled Ethnic Fijians in science and technology seems to originate from their under-achievement in science and science-related subjects at school. As illustrated above, Ethnic Fijian students are found to do poorly in science and science-related subjects as compared to their Indo-Fijian counterparts to an extent that is quite desperate by tertiary level (Dakuidreketi 1995; Kenchington 1988; Meek 1988; Narsey 1994; Taylor 1990), but the same trend is also observed at lower education levels (Elley 1982; Hopkin 1978; Kishore 1981; Nabuka 1984; Stewart 1983; Whitehead 1986).

The disparity in educational achievement in science between the two major ethnic groups in Fiji has caused a widespread absence of Ethnic Fijian participation at the national level in occupations requiring advanced knowledge of science, technology, mathematics, computing, commerce, accounting, and economics.

In order for Fiji's economy to be competitive in the World’s free market economies, it must have adequate numbers of its work force trained in science and science-related subject areas such as the ones mentioned above. Failure of the education system to produce adequate numbers of Ethnic Fijian graduates in these areas must also significantly handicap the future Ethnic Fijian participation in the advanced sectors of Fiji’s economy and administration.
Small nations like Fiji need intellectual leaders who can assess the pressures for globalisation and as necessary give voice to concerns about the potential for exploitation. It is therefore important that the problem of Ethnic Fijian education is addressed within a unified national framework. Their problem in education should be a concern for everyone in the education field and not just Ethnic Fijians. As suggested by Baba (1979), the academic underachievement problem of Ethnic Fijians should not be looked at specifically as their own problem but rather as a national problem, the resolution of which must play a major role in determining how Ethnic Fijians and Indo-Fijians are to live together in the future. This is necessary because academic failure by Ethnic Fijians must create a number of wider social, political and economic problems which affect all other ethnic groups in Fiji.

Beyond the leaders themselves among whom it is important that there be experts in science, there are all the other people who, in a democracy, should also be able to evaluate in an informed way the decisions the government takes concerning matters of science and technology. Indeed their votes might strongly influence or even determine those decisions. Thus Fiji will be the better off the higher the average level of attainment is in science. It will be the better off the more that can be done for people who do least well in science, to increase the amount of science that these least scientifically oriented students learn. It is not only important that the number in Fiji who does well in science should increase. However, this issue too, is very important.

It is time that something be done to address the problems about Ethnic Fijian achievement in science at school. The predilection for talk in preference to action is reflected in much of the research on Ethnic Fijian education which has focused more on counting, describing and classifying the problem than on seeking the causes and solutions to the problem. I hope that this study will point out the direction in which for Fiji to seek meaningful improvement.

1.3. How Governments since Independence Have Viewed the Problem

The Governments of Fiji since Fiji Independence in 1970 have defined the Ethnic Fijian educational achievement problem as getting more Ethnic Fijians to pass successfully through the school system (particularly up to the tertiary level) so that the number of Ethnic Fijians occupying top or key positions in the government and
private sectors would compare favourably with that of other ethnic groups. Thus
were initiated deliberate Government efforts to reduce the imbalance in educational
attainment between Ethnic Fijians and Indo-Fijians. For example, the Alliance
Government that ruled immediately after Independence implemented five main
affirmative action policies in the period 1970-1976 in its deliberate attempt to close
the "educational gap" that existed between Ethnic Fijians and non-ethnic Fijians.
These policies included:

- the reservation of 50% of Government Tertiary scholarship funding for
  Ethnic Fijians;
- the award of scholarships to all deserving Ethnic Fijians;
- the expansion of teacher-education facilities and improvement in the
  quality of teacher education;
- the provision of better staff quarters to enable schools to attract and
  retain the services of better qualified teachers; and,
- the establishment of Junior Secondary Schools in rural areas to cater for
  the rural population which is mainly Ethnic Fijians.

[Note. More detailed information on these policies can be found in the DP6 (Fiji’s Sixth
Development Plan, 1971-1975), and the DP7 (Fiji’s Seventh Development Plan, 1976-1980)].

During the early part of 1980, the Government adopted a few more affirmative
action policies for Ethnic Fijians:

- the creation of special funds for supporting Ethnic Fijian education;
- the conversion of the former Nasinu Teachers’ College as an
  intermediate college between secondary and university level
  predominantly for Ethnic Fijians enrolled in the Foundation
  Programme at the University of the South Pacific in 1984;
- the building of new science laboratories and supplying of chemicals and
  science apparatus in rural Ethnic Fijian secondary schools to enhance
  science teaching and learning; and,
- the amalgamation of schools in the rural areas to allow for sharing of
  facilities (Whitehead, 1986).

It has been suggested by Narsey (1994) that for Ethnic Fijian students to do well
at school, there is a need to encourage them to attend multiracial schools because they
are better equipped with school resources such as library facilities (Elley, 1979) and
science laboratories and equipment (Nabuka, 1984) as compared to Ethnic Fijian schools.

The government envisaged that the above measures would somehow reduce, if not, close the educational gap between the two ethnic groups. In my view, these special measures directly implemented by the government were ineffective because there was no clear perception of what constituted the Ethnic Fijian educational achievement problem and thus what actions would be needed to address the problem effectively. The government should have first conducted some in-depth research to find out the nature and possible causes of the problem.

In an examination of the Post-colonial government policy in Ethnic Fijian education Puamau (1991) pointed out two shortcomings on the part of the Alliance Government in implementing these special measures to solve the Ethnic Fijian education problem. First, the government did not set any specific objectives or targets in its implementation of the policy. Second, the government seemed to have based the policies on assumptions and impressions rather than on in-depth research.

Other initiatives presently planned by the government (through the Ministry of Education) are:

- the introduction of free education up to Form 4 (year 10) level;
- the training of primary and secondary school leaders and managers in Ethnic Fijian schools;
- a staff development programme for the teaching staff of Ethnic Fijian schools where examination results in Fiji Junior and/or Fiji School Leaving Certificate are below the national average;
- a community awareness programme for Ethnic Fijian parents promoting the value and benefit of education and the need for family support;
- monitoring of the staffing needs of Ethnic Fijian schools and considering of the staffing requirements during the transfer process;
- the improvement of resources and infrastructure in Ethnic Fijian schools;
- the analysis of the training requirements of teachers in Ethnic Fijian schools; and,
• continued allocation of funds to the Fijian Affairs Board to particularly cater for Ethnic Fijian education especially in areas which need urgent improvements.


Fiji is now in its 34th year of independence and yet, as the statistics and reports indicates, the achievement gap between Ethnic Fijian students and their Indo-Fijian counterparts remains. The government may be seen to have considered already a number of pieces of the puzzle as to how the problem arises, and to have attempted in good faith to solve the problem on that basis. That its efforts have so far failed seems to me sufficient indication that there are still further pieces of the puzzle to consider. Hence the rationale for my study — examining another piece, one as yet not brought into view at all in the government’s actions.

1.4. Why the Government’s Attempt to Solve the Problem Fails

A brief look at all the policies made by various governments in previous years reveals one very important point. That is, the government did not particularly pay more attention to improving education at the grassroots level. There is no mention in these policies and future plans of how teaching and learning can be enhanced at the primary level. In addition, the government seemed to base all these policies on assumptions and impressions rather than on detailed in-depth research (Puamau, 1991).

In my view, these government initiatives to narrow the educational gap generally failed because they did not tackle the grassroots of the problem. Instead they were either aimed at helping those who are already at a higher level of education (Tertiary) or were aimed at only one aspect of school development such as facilities and school structures (Puamau, 1999). Moreover, few attempts have been made by the government to look at what is really happening inside the primary school classrooms in terms of the teaching and learning of science.

Since the problem still exists, I personally consider that a more appropriate way to tackle the problem is to look at the lower education level in Fiji (Primary Level). If my analyses prove at all correct, then the differences that most matter will be found to
begin earlier, and may have to do in part with the nature and quality of discussion and thinking in the school and home environment of the two ethnic groups. There are many issues about teaching and learning of the subject at primary school, but none of these issues are separable from a wider cultural context that I intend to study in detail.

1.5. Focus Area of Study

As noted earlier, researchers in areas of Ethnic Fijian and Indo-Fijian education have found various factors contributing to the disparity in performance between the two ethnic groups. This include the: socio-economic and socio-cultural background of the students (Dakuidreketi 1995; Kishore 1981); the unavailability of school resources in most rural schools together with teachers’ qualifications being inadequate (Fiji Islands Education Commission Report, 2000; Hopkin 1978; Nabuka 1984); institutional, psychological and socio-cultural factors (Puamau, 1998, 1999); and, low quality of subject passes (Narsey 1995).

All the mentioned factors have been the subject of investigation yet I would say that in particular, none has had the focus of the present study on what I consider to be the grass-root of the problem.

Because of the fact that teachers of both ethnicities mostly teach in their respective schools, I hypothesised that the causes of the differences in science performance of the two ethnic groups of students lie partly at school in terms of how the two ethnic teachers teach the subject together with the way they assessed the subject for their students. Since the two ethnic groups are culturally very different from one another, I also hypothesised that the causes of the differences in science performance of the two ethnic groups of students partly lie in the cultural upbringing of the two ethnic groups in their home environment.

I believe that without this wider search for answers, the problem will remain a matter of academic interest — without ever being practically solved. No research on its own can solve a practical problem, of course, and I would not want to claim that the present study on its own will even get the ball rolling. But I am motivated by the desire that something should be done, and would not be happy with the present research unless it seemed to me to be giving some new and potentially useful ideas. My very understanding of the comparative observations that I have made is doubtless conditioned by wider understandings that I have of Ethnic Fijian cultural history and
the anthropological significance of the very different experience of the two main ethnic groups in Fiji. I shall begin to detail in Chapter 2 some of these cultural-historical considerations and anthropological reflections.

1.5.1. Aims

The proposed research study has the following aims:

• To find out why Ethnic Fijian students are not doing well in science at school as compared to Indo-Fijian students.

• To suggest ways in which Ethnic Fijian students’ performance in science at school can be improved in light of these findings.

1.5.2. Research Questions

I have set out some general questions related to the above aims which I will try to address in this particular research. These questions are:

1. Why are Ethnic Fijian students not doing as well in science at school when compared to Indo-Fijian students?

2. What is their under-achievement at school related to? Is it related to the teaching of the subject at school or to their cultural upbringing or both? Are there other factors? If so, what other factors?

3. Is what they learn at school viable within the context of their cultural and traditional up-bringing?

4. What sort of changes can be made to improve the performance of Ethnic Fijian students in science at school?

In Chapter 3, I develop theoretical reasons for addressing a range of more specific questions relevant to these research questions.

1.6. Scope and Limitation

The purpose of this study is to examine in detail another piece of the puzzle concerning why Ethnic Fijian students perform less well in science than Indo-Fijians. I believe that this piece may be crucial, in the sense that neglect of it both prevents an adequate understanding of the problem from being formed, and ensures that attempts to solve the problem will not wholly succeed. But of course I do not pretend that this
piece represents the whole puzzle, or in other words that what I study here represents all the factors that are at work. The study will therefore be restricted to two main settings: the school setting in terms of the relationship between the child, peers and teacher in the teaching, learning and assessment of the subject (science) at Primary level; and the home setting, in terms of the direct relationship between the child, the parent and other members of the social group of which the child is a part especially by considering some indirect influences such as the effect of the child’s cultural upbringing in the village or community life situation. The study focuses mainly on two types of Primary Schools, namely: Ethnic Fijian Schools taught by Ethnic Fijian teachers and Indo-Fijian Schools taught by Indo-Fijian teachers. This pattern of ethnic teachers teaching in their respective ethnic schools is commonly found in Fiji today. In looking at these two areas, the study does not intend to be involved in a debate about whether the teaching and learning issues or the cultural issues are more important. Instead, it attempts to examine these issues as interconnected, and in that way better define what school-based factors and out-of-school characteristics of the two ethnic groups are the most important co-relates of academic achievement in science at school. In addition, the study does not consider gender discrepancy and it does not investigate the teaching of science at secondary level.

The sort of insights that I mean to achieve can come only from intensive, qualitative investigation on a continuing basis in carefully selected school and community settings. Thus I have not sought overmuch to extend the breadth of my investigations in terms of the number or range of schools studied, only their depth, in terms of the quality of my understanding of the dynamics of the classrooms, homes, communities, and lived experience of the children. For reasons that will be indicated, I see the small number of rural and urban ethnic Primary schools chosen for this study to be sufficiently representative, and the in-depth understandings I developed in the course of my work within them to be sufficient basis for genuine insights into the general problem in Fiji that my thesis addresses.

Chapter 2 will present some background information on the Geographical, Cultural-Historical and Political-Historical Background of Fiji.

Chapter 3 details some theoretical conceptions that I take to be most pertinent for my study, selectively examines other studies that are in their various ways
pertinent to my research, and introduces the research questions that informed my data collection and that in later chapters I intend to put to my data and assess empirically.

Chapter 4 outlines the method that I have used in the study.

Chapter 5 describes the village and school settings of the areas under study.

In Chapter 6, the results of the study are analysed, interpreted and discussed.

Finally, Chapter 7 summarises the discussion and implications of the main research findings, together with some conclusions and recommendations.

1.7. Addendum

As a result of the formal examination of this thesis, some relevant literature related to what I have written was pointed out to me that I had not myself used, although I was aware of some of it due to the theory courses offered at the University which I was unable to attend. Critical approaches to the study of teaching and learning, post-colonial research by indigenous peoples as well as research related to curriculum theory have not informed my present thesis and in this addendum I have briefly listed some of these references. They are important studies for anyone who wishes to explore further the causes of the differential achievement between Ethnic Fijian and Indo-Fijian students at school, and I intend to make full use of them in any publication that may ensue from this thesis. These relevant studies are not included in the References section of this dissertation. These are as follows:


Chapter 2

Geographical, Cultural-Historical, and Political-Historical Background

2.0. Introduction

Here I will attempt to provide a summary of some facts concerning Fiji’s geography, cultural history, and political history. This is relevant because I intend to discuss settings outside the Microsystems of the home and the school as noted in Figure 4 of the next chapter. The ecological model of Bronfenbrenner (1979) that I will adopt to frame my study encourages me to consider these Microsystems not only in interaction with one another but also as embedded in further and larger systems, all able directly or indirectly to influence the development and performance of the two ethnic groups in science at school. This ecological model is described in the next chapter together with my reasons for using it as theoretical bases to my study.

I first draw a time line in order to present selected key historical and political events. The purpose is to establish a chronological background for considering some of the facts concerning ethnic differences in educational achievement in science that form the focus of my study. It is especially important to consider this background when assessing whether, for comparative purposes, seemingly related studies in countries other than Fiji are more or less relevant.

I shall discuss the pertinent aspects of geographical and socio- and politico-historical background of Fiji by describing its location, area, and physical features and by including a brief history of events: from when Ethnic Fijians first settled and adapted to the Fijian landscape and environment; early impact on their oral culture by Western civilisation and influence; some Colonial policies concerning and affecting Ethnic Fijians and Indo-Fijians; the Establishment of Mission schools and the first provision for formal education for Ethnic Fijians; Fiji after the Colonial days in terms of the first taste of being independent by Ethnic Fijians; the changing political situation
from 1972 until 2000; and, Ethnic Fijians’ insecurity over leadership and their land. Finally I will discuss Fiji’s situation today in terms of its people, the present school structure and the organisation of the science curriculum.

**Timeline of Events**

<table>
<thead>
<tr>
<th>TIME</th>
<th>EVENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1600 B.C.</td>
<td>Ethnic Fijian first settlement of Fiji; Adaptation of their oral culture to the Fijian landscape and environment begins</td>
</tr>
<tr>
<td></td>
<td>• The original inhabitants</td>
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<tr>
<td>1643</td>
<td><strong>Early impact on oral culture by western civilisation</strong></td>
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<td></td>
<td>• The arrival of European discoverers</td>
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<tr>
<td></td>
<td>▶ Abel Tasman</td>
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<td></td>
<td>▶ Captain Cook</td>
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<tr>
<td>1774</td>
<td>▶ Captain William Bligh</td>
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<tr>
<td>1789</td>
<td>• The arrival of sandal wood and beche-demer traders: introduction of trade</td>
</tr>
<tr>
<td>1801</td>
<td>• The arrival of missionaries: introduction of Christianity &amp; western medicine; end of tribal war.</td>
</tr>
<tr>
<td>1835</td>
<td>• Introduction of western administration – e.g. establishment of first confederacy of chiefs.</td>
</tr>
<tr>
<td>1865</td>
<td>• Fiji becomes a British colony</td>
</tr>
<tr>
<td>1874</td>
<td><strong>Colonial policies concerning and affecting Ethnic Fijians and Indo-Fijians</strong></td>
</tr>
<tr>
<td>1875</td>
<td>• Protection of Ethnic Fijian land and culture</td>
</tr>
<tr>
<td>1879</td>
<td>• First importation of Indian indentured labourers</td>
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<tr>
<td>1888</td>
<td>• First mission schools established; Marist Brothers establish school in Suva</td>
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<tr>
<td>1906</td>
<td><strong>First formal education for Ethnic Fijians</strong></td>
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<tr>
<td></td>
<td>• Elite school for chiefs’ children established (Queen Victoria School) – for boys, later (Adi Cakobau School) for girls.</td>
</tr>
<tr>
<td>1916</td>
<td>• End of Indian immigration. Education Ordinance is established — First time the Colonial Government’s control over education is increased.</td>
</tr>
</tbody>
</table>
Fiji: After the Colonial Days

- Ethnic Fijians’ first taste of independent living
  - Fiji becomes an independent nation. First constitution adopted

- Changing political situation
  - Alliance Party (Ethnic Fijian dominated party) rules under the Westminster Administration led by a prominent chief (Ratu Sir Kamisese Mara).
  - Labour Party (Indo-Fijian dominated) forms a coalition with the another main Indo-Fijian led party (National Federation Party)
  - First time the Indo-Fijian dominated political party (Labour-National Federation Coalition) defeats the Ethnic Fijian dominated Alliance Party.
  - Military coup led by Major Sitiveni Rabuka. Rabuka becomes the Prime Minister and declares Fiji a Republic. Fiji is expelled from British Commonwealth.

- New constitution is drawn
  - General election under the 1990 constitution is held. SVT (Soqosoqo ni vakavulewa ni Taukei), an Ethnic Fijian political party, takes control. Major Sitiveni Rabuka is re-elected as Prime Minister
  - Ratu Mara is sworn in as the President.

- Fiji is readmitted to the Commonwealth
  - The Fiji Labour Party (an Indo-Fijian dominated political party) gains victory in the national elections. Mahendra Chaudary was sworn in as the first ever Indo-Fijian Prime Minister.

- A civilian parliamentary takeover is led by George Speight. An Interim Government is appointed with the approval of the Great Council of Chiefs.

- The general election is won by the Soqosoqo ni Duavata ni Leweni Vanua Party (SDL). Laisenia Qarase (an Ethnic Fijian) is elected as the new Prime Minister of Fiji. Mahendra Chaudary’s Labour Party becomes the Opposition. At the time of the present writing, this is how the things remain.
2.1. Location

According to Chandra and Mason’s Atlas of Fiji (1998), Fiji is located between latitude 15 degrees and 22 degrees South of the Equator and between 177 degrees West and 175 degrees East longitude. It is an Oceania group of islands in the South Pacific Ocean about two thirds of the way from Hawaii to New Zealand and consisting of about 332 islands of which approximately 110 are inhabited (CIA World Factbook, 2002).

On the boundary between Melanesia and Polynesia, (Refer to Maps 1 and 2) Fiji has an indigenous ethnicity illustrating the ineluctable connection between these cultural and racial types and spanning many millennia.
MAP 1.
POSITION IN THE SOUTH PACIFIC

MAP 2
FIJI ISLANDS

Source: http://www.janeresture.com/melhome/
Source: http://www.janeresture.com/fiji/fiji_map.htm
2.2. Area

Fiji has a total land area of about 18,272 square kilometres, of which much is rugged mountains (Chandra & Mason, 1998). The two main islands are Viti Levu (Great Fiji) with an area of about 10,388 square kilometres and Vanua Levu (Great Land) having an area of about 5,532 square kilometres. The other three principal islands are Taveuni (440 square kilometres), Kadavu (411 square kilometres) and Ovalau (108 square kilometres). The two main islands together with these three principal islands thus comprise 93% of Fiji’s total landmass. The rest of the other inhabited islands vary in size from about 100 square kilometres to very tiny islets a few square kilometres in area. Most of these tiny islets are prohibitively isolated and lack fresh water.

2.3. Physical Features

Fiji’s main islands are of volcanic origin with their interiors being mountainous. Its highest mountain (Mt. Victoria or Mt. Tomaniiivi) is about 1,324 metres high (CIA World factbook, 2002) and is located in Viti Levu. The coastal areas are typically less than 30 metres above sea level. Fiji’s climate is moderately tropical with the main islands being divided into windward (Southeast) and leeward (Northern and Western) sides. The windward side is usually wet throughout the year whereas the leeward side is usually very dry. The average yearly temperature is about 25 degrees centigrade while its relative humidity is usually high, ranging from about 75 to 80% (Chandra & Mason, 1998).

2.4. Ethnic Fijian First Settlement and Adaptation of their Oral Culture to the Fijian Landscape and Environment

2.4.1. The Original Inhabitants

The early Ethnic Fijians kept no written records, so history before European contact must depend upon legend and archaeological evidence. According to Ethnic Fijian legends, the great chiefs ‘Lutunasobasoba’ and ‘Degei’ led their people across the seas in one canoe and one voyage to the new land of Fiji. Their canoe was called the ‘Kaunitoni’. According to this legend, the people were said to have come from Thebes and travelled up the Nile to Tanganyika, eventually migrating from Africa to Fiji. Their canoe landed at a place near Nadi called “Vuda” meaning “ancestor” but
they abandoned it, and moved inland of Rakiraki in the Ra coast called Nakauvadra. (Source: Aqua Trek Fiji). ‘Lutunasobasoba’ had numerous sons and a daughter who founded families that grew into the present chiefly “yavusa” and migrated to various parts of Fiji from Nakauvadra following down various rivers with their sources in the Nakauvadra range. (For more information on this, refer to http://www.aquatrek.com/history.html.) The “yavusa” is the largest social unit of Ethnic Fijians and its members are direct descendants of a single “Kalou-vu” or defined ancestor.

Despite the fact that Ethnic Fijian schools teach that Ethnic Fijians originated in Africa, there is no evidence that indicates the Ethnic Fijians came from anywhere else other than S.E. Asia. Pottery, tools and artefacts unearthed in archaeological excavations tell us that Fiji was first settled about three and a half thousand years ago (Source: Fiji Government Online). According to this source, the earliest ancestors of Ethnic Fijians came into the Pacific from Southeast Asia via Indonesia and New Guinea. The original inhabitants are now called “Lapita people” after a distinctive type of fine pottery they produced, remnants of which have been found in practically all the islands of the Pacific, east of New Guinea, though not in eastern Polynesia. In fact, the name ‘Lapita’ is after an area in New Caledonia where large deposits of their distinctive form of pottery were found.

Evidence suggests that the Lapita people may have been the first to arrive — from Southeast Asia via New Guinea and New Caledonia, settling along the shorelines of the major islands of Fiji. It is believed that at some stage after these Polynesians (Lapita people) settled in Fiji, the Melanesians who stayed in Vanuatu, New Caledonia and the eastern Solomon Islands followed. Since the Lapita people already inhabited the coastal areas, the Melanesian people were forced to settle inland where their population eventually built up and spilled over into coastal territories causing both peaceful and hostile interaction between the two groups. These two groups intermixed but still remained distinct. The Melanesian people are dark skinned with many of the physical characteristics of the Negro race whereas the Polynesian people are taller, lighter skinned, and with straighter hair. The Lapita people are said to have been good sailors, craftsmen and excellent potters. These people were to become ancestors of the later Polynesian peoples. (Source: Aqua Trek Fiji, 2003.)
Over the centuries the population of the Melanesian people increased and probably tensions arose between the two races, finally causing the descendants of the Lapita people to move out, first into the eastern part of Fiji and then to Tonga, Samoa and eventually the other islands which today comprise the area known as Polynesia. The departure of these people from the main islands of Fiji left the dominant Melanesian people almost solely in possession of Fiji. It was during a period of isolation in Tonga and Samoa from roughly 3000 years ago that the cultural and physical characteristics of Polynesians were incubated. Polynesian migrations then occurred again touching Fiji on many occasions. The Melanesian people who had remained in Fiji became the dominant race of the islands.

The fact that fully three and a half thousand years connect the indigenous people of Fiji with the Fijian landscape and environment is potentially pertinent in the following ways. An oral culture developed over such a long period is liable to have become both sophisticated and resilient. The sophistication and resiliency was only liable to be strengthened by the frequent further infusions of people, customs and technologies from other parts of both Melanesia and Polynesia. Warfare was highly developed in ways that testify to the resolve of the various groups to maintain their ways and their sovereignty over their lands even in the face of belligerent incursions by others.

Like all non-literate peoples, the indigenous peoples of Fiji employed arts of memory to adapt and propagate all that must be remembered in order to promote survival and flourishing. In three and a half thousand years the indigenous peoples had brought their overall oral culture into a sophisticated form finely tuned both to facilitate successful living in the physical environment of Fiji and to orchestrate social cohesion and human satisfaction. That oral culture had become very rich in the meaning it can bring into life in Fiji. Of course the constant arrivals in Fiji of new people and new cultures have challenged traditions, with the most significant challenges of all beginning with the first arrival of Europeans. But a traditional culture developed in one place for fully three and a half thousand years will most probably be resilient to some degree against these challenges. While this very resilience of the traditional culture of the Ethnic Fijians might help explain the relatively poor uptake by Ethnic Fijian children of science at school, to suggest as much is certainly not to advance any kind of “deficit model” in explanation of that fact. Ethnic Fijians are clearly capable of
developing and using sophisticated knowledge structures: just consider those that aided their survival and flourishing for three and a half thousand years before the first Europeans arrived. Ethnic Fijians are not inherently less ‘intelligent’ than Europeans or Indo-Fijians nor is their culture lacking in some quality that cultures intrinsically ought to have. However, it may be that Ethnic Fijians’ cultural values and traditional lifestyles do not accommodate easily to European practices and ideals. A similar mismatch would presumably affect Europeans, given their culture, if they needed to acquire the Ethnic Fijian practices and ideals. For example, they would probably find that they just don’t have a mind for memory arts, and they would probably struggle to see much point in the practices which sustain those arts.

Ethnic Fijians are Melanesians but because of migration and interaction with neighbouring islands of Tonga and Samoa, the Ethnic Fijian people also evince a strong Polynesian influence, particularly in the eastern-most islands. Here the Melanesians and the Polynesians mixed to create a highly developed society, long before the arrival of the Europeans.

2.5. Early Impact on Oral Culture by Western Civilisation and Influence.

The European discoveries of the Fiji group were accidental. According to Stanley, (1999) the first sighting of Fiji that would put islands in its location on the maps of Europeans was made in 1643 by the Dutch explorer, Abel Tasman. Later, 18th century English navigators, including Captain James Cook (who sailed through in 1774) made further explorations. In 1789, Captain William Bligh sailed through Fiji after the mutiny on the Bounty. He discovered and recorded most of the islands in the Fiji group.

According to Derrick, (1950), the islands were not visited by Europeans until the beginning of the 19th century, when the first regular contact with the Europeans was made through traders in sandalwood and beche-de-mer in 1801. The sandalwood and beche-de-mer traders were followed by Wesleyan missionaries, coming from Tonga to the Lau group of islands from 1835, and gradually converting the Eastern chiefdoms to Christianity.

After many ships and many lives were lost, European settlers finally established a town at the site of Levuka in the 1820s. At that time, the chief of Bau (Ratu Seru
Cakobau) controlled much of Fiji from his outpost in the Rewa River delta. Cakobau was considered the most wilful, intelligent and energetic chiefs of his time. When Cakobau accepted Christianity in 1854, the rest of the country soon followed and tribal warfare and cannibalism came to an end. In fact, the conversion of Cakobau and his conquest of Rewa, with the help of the Tongan Chief Ma’afu, produced mass conversions of Ethnic Fijians to Christianity later on in the 1860s.

It is important to remember that cannibalism in Fiji during those early days was not practised due to shortage of food resources but rather mainly as an indication of the strength and power of a tribe. A tribe which practised such a custom would be the most feared by the surrounding people. Strong chiefs in those early days practised this in order for their people to obey their orders. In circumstances where the only forms of communication were word-of-mouth, only emphatic deeds would ensure that people far and wide would acquire a sense of the power and reputation of a chief or his tribe. However, today, people respect and obey orders from their chief partly because of the Ethnic Fijian custom of respect, and partly because chiefs are well known and recognised in other areas. Thus they can use their authority to provide help and assistance for the need of their people. Communication is now rapid and by many means. There is no need for anyone to establish a reputation partly by means of terror.

It has been alleged with various written evidence (for example Henderson, 1931 and Williams, 1870) that many Ethnic Fijians were converted by missionaries to Christianity with the use of various means like the threat of hell-fire; the possession and sale of British goods; the use of foreign medicines to cure diseases; the use of the printing press which amazed natives with how marks made on books could allow people to talk to others far away; the use of guns which to the natives seemed to carry a spirit that could soar into the air and burst into flames, killing birds and animals, and then, as is the wont of spirits, disappear.

From the early Ethnic Fijian point of view, the God who gave all these things to the white man must be a powerful God (Henderson, 1931: 100). As technological people in their own right, they were obviously very impressed with the superior technology of the industrial world of the white man. At Lakeba, as stated by Henderson (1931), “Fijian ‘converts’ had been attracted in the first instance by extraneous aids; not one so far... by the preaching of the Gospel of Christ” (p107-8). At Bau, there are instances in which the missionaries used medicine as the opportunity
to expose the “falsehood and foolishness of heathenism”, and dispensed the “blessings of the Gospel” (Williams, 1870: p. 287, cited in Ravuvu, 1988, p 25). The missionaries first converted chiefs in various areas around Fiji mainly because they believed that it was only through them that a rapid conversion of the people could be effected. Although the missionaries begin converting Ethnic Fijians in the coastal areas when they first arrived in 1835, other parts of Fiji like the interior of Viti Levu were until 1882, still “butobuto” (heathen) (Brewster, 1922).

The first European settlers brought with them the two deadliest things ever to arrive in Fiji: guns and diseases. Together, guns and newly imported diseases threatened the very existence of Ethnic Fijian people. Guns together with diseases such as influenza and measles significantly reduced the Ethnic Fijian population during that time. For example, in 1875, measles killed over 40,000 Ethnic Fijians (Source: Fiji Government Online).

Ethnic Fijians were much feared as warriors, and before the arrival of the missionaries, the practice of cannibalism was widespread. Wars, which had previously resulted in few deaths, caused widespread loss of life because of the use of guns. According to Stanley, (1999) years of tribal warfare ended temporarily in 1865, when a confederacy of native kingdoms was established and a constitution was drawn up and signed by seven independent chiefs of Fiji. Cakobau was elected president for two years in a row, but the confederacy collapsed when his main chief rival, a Tongan chief named Ma’afu, sought the presidency in 1867. Political unrest and instability ensued, as western influence continued to grow stronger. In 1871, with support of the approximately 2000 Europeans in Fiji, Cakobau was proclaimed king and a national government was formed in Levuka. His government, however, faced many problems and was not well received. There was some unrest and some European settlements were burned down by Ethnic Fijians. This included the home of an American Commercial Agent – John Brown William on Nukulau Island near the present day Suva. For this loss William blamed Cakobau - the reigning “Tui Viti” or King of Fiji that time. William sent Cakobau a $5,001.38 bill even though he bought the island for only $30.00 (Stanley, 1999). The American claims for the damage according to Stanley (1999) eventually rose to $45,000 which they forced Cakobau to pay. Deeply in debt and with the islands in a virtual state of anarchy, Ratu Cakobau and other
Ethnic Fijian chiefs ceded Fiji to Great Britain on October 10, 1874. From then onwards, Fiji remained a British Crown Colony.

2.6. Colonial Policies Concerning and Affecting Ethnic Fijians

Three very important policies were emphasised by the Colonial government for Ethnic Fijians during the colonial administration. These included the protection of their culture, their land and the colonial government policy of non-intervention in the education of Ethnic Fijians. It is very important to mention this because some of these policies tend to affect not only present-day Ethnic Fijian education but also in various ways the present-day situation for the Indo-Fijians, for example their greater urbanisation, the way that they are debarred from owning land, and the greater number of successive generations during which they have received formal education in Fiji.

2.6.1. Protection of Ethnic Fijian Land

Sir Arthur Gordon was deeply concerned with the welfare and the very survival of Ethnic Fijian people. He was advised by Queen Victoria to assure Ethnic Fijians that their land would not be taken away from them (Roth, 1953). Through his influence, Native Lands Claims Commissions were set up at different times to investigate claims to land titles and to record land ownership, confirming the Ethnic Fijian owners in possession under customary law, and the further sale of Native Land was outlawed. In addition, through his influence, the power of the chiefs was maintained. The Native Lands Trust Board was later set up in 1940 to look after the welfare of Ethnic Fijians through the better management of their land.

Today, about 90% of the land in Fiji is owned by Ethnic Fijians (after the recent return of schedule A and B land from the State to the Native land) and the remaining 10% is either privately owned (freehold land) or held by the government (Crown Land), Source: www.nltd.com.fj. Indo-Fijians own very little land. Indo-Fijians who are farmers, mainly lease out land from Ethnic Fijians since present law forbids any sale of Native Lands. Since much of the land in Fiji is mountainous and inaccessible, its overgrowing population is beginning to press quite severely against the limits upon the supply of arable land.
2.6.2. Protection of Ethnic Fijian Culture

In 1875, Fiji's first Governor, Sir Arthur Gordon arrived from Australia. He foresaw the destruction of Ethnic Fijian culture if Ethnic Fijians were taken away from their villages to work on the sugarcane plantations. From the time of cession, it had been the policy of the colonial government to 'protect' the Ethnic Fijian culture. This was accomplished by leaving the Ethnic Fijians in villages and to their traditional ways. Not wishing to disturb native society, Gordon ruled that Ethnic Fijians could not be required to work on European plantations. During that time, sugar had taken the place of cotton and there was a tremendous labour shortage on the plantations.

2.6.2.1. Importation of Indian indentured labourers

Gordon who had previously served in Trinidad and Mauritius saw indentured Indian workers as a solution. This led to the importation of about 60,000 Indians between 1879 and 1916 to work the sugar-cane which had become the backbone of the colonial economy. According to Gillion (1962), to come to Fiji, the Indians had to sign a labour contract (girmit) in which they agreed to cut sugarcane for their masters for five years after which the labourers could choose to return to India at their own expense or after waiting for another 5 years be repatriated at the expense of the government; or take to a craft or trade; or settle on a plot of land. Most of them chose to settle on the land as tenants. After the end of their contracts, about 60% of the migrants never returned to India (Gillion, 1962).

Regarding the origins of the indentured Indians, Coulter (1943), mentioned that the greater part of the Indian population of Fiji originated in the Ganges Plain and had as their home states United and Central Provinces, Bengal, Bihar, and Orissa. Madrassi or Southern Indians included Tamil, Telegu, Malayali, Kanarese and Moplah. Punjabis and Gujeratis came as free immigrants later. These latter groups were attracted to the islands by rumours of high wages and favourable economic conditions. Actually, Indians who came during the indenture system comprised various castes: high castes (including Brahmins), middle castes and low castes. As stated by Mayer (1973: pp. 2-3):

The people who enlisted were mainly Hindus belonging to castes — endogamous bodies ranked in a hierarchy of status, membership of which could only be acquired by birth. Of the people leaving from the Calcutta depot 16.1% were classed as of high castes, 31.3% as of middle agricultural castes, 6.7% as of
artisan castes and 31.2% of low and untouchable castes; there were also 14.6% Muslims and 0.1% Christians.

In the immediate cultural background of the arriving Indian population, one of the strong forces of social organisation had been the caste system. However, since indenture, the caste system has largely disintegrated in Fiji (see Jayawardena 1971, pp. 89-120). When the Indian immigrants arrived in Fiji, they were assigned to plantations that needed labour. They went mainly to the sugar companies’ estates, some of which were operated directly by the companies and others by planters to whom the companies leased them. In some plantation settlements that they were allocated to, all the different castes lived together rather than separately as was the case in India. As stated by Chandra (1980: pp 35-36): “There was no spatial segregation based on caste as found in India. People settled according to the blocks of land they could get and not according to any ethnic or caste grouping”. As a result, their pattern of authority was very much different from that with which the immigrants had been familiar. Initially, caste influenced social behaviour. For example, Brahmans or people of the highest caste might occupy the best positions and act as leaders of the settlement, partly because of their status resulting from their superior caste and partly from their education. They were most respected. The main areas of sugar production during those indentured days were the Suva - Nausori area and later the western and dry side of the two main islands. These areas are still found to be mostly occupied by the Indo-Fijians.

Today, in my experience, the caste system has almost completely broken down. Leaders are chosen for their competence, and caste rarely plays any part at all. Any Indo-Fijian can go and eat and drink freely at other Indo-Fijian’s residences without regard to the caste affiliation of that person. This type of practice was uncommon or forbidden in the caste-determined society their forefathers had left behind in India (Chandra, 1980). This implies that the arriving people had altered their culture in a fundamental respect quite dramatically in the space of a few generations. Given that the caste system remains influential to this day in a large part of rural India, an aspect of the cultural change by the arriving Indo-Fijians seems clearly to have been that they were displaced, and thus more liable to adjust their culture in significant ways.

So while Ethnic Fijians were left in their own villages, the immigrants provided labour in the cane fields. Commerce and International trade were left to the European populace, and as time went on, to an increasing number of Indo-Fijian communities.
Until the 1960s, Ethnic Fijians were restricted by law from living away from their villages. If a person wanted 'galala' status ('galala' – at liberty), the person had to go to a Fijian Magistrate and give cause for living away from his or her ancestral land. Even if they were permitted to do so, they were still under obligation to contribute to their village by means of taxes and levies.

When the Colonial Government was criticised for its actions in confining the Ethnic Fijian people, defenders of colonial policy pointed to places like Hawaii, where the traditional culture was destroyed with the onslaught of 'Westernisation'.

2.6.3. *Non-Intervention in Ethnic Fijian Education*

During the first decades of colonial rule, the British administration's approach to education for the Ethnic Fijian people was one of non-intervention, although they did establish and support schools for European children in the main urban centres.

The sugarcane areas to which Indian indentured labourers were allocated were by and large close to most urban areas. As a result, Indian religious organisations and missionaries in their effort to educate their children began to establish their own schools alongside these urban sugarcane areas. This is one reason why the majority of Indo-Fijian schools today are located in urban areas as compared to Ethnic Fijian schools which are predominantly in rural areas. Because of the colonial government policy of non-intervention towards the education of Ethnic Fijians, there was no drive for Ethnic Fijians towards the establishment of their own schools with the exception of the few schools established by missionaries. The schools established by missionaries were located in only a few centres and therefore did not cater for all Ethnic Fijians especially those located in rural areas. While missionaries elsewhere in the world often brought formal education to the masses as an aspect of their attempt to win mass conversions to Christianity, it seems that in Fiji this was either too difficult for them or found to be unnecessary. By converting the chiefs and attending foremost to the schooling of the chiefs' children, the missionaries were able to bring about mass conversion of the Ethnic Fijian populace to Christianity. Perhaps this fact reflects the very strong lines of authority in traditional Ethnic Fijian culture (not untypical of oral cultures generally). The fact that Ethnic Fijians were converted in mass numbers to Christianity did not mean that they immediately sought to establish schools to educate their children. Schooling remained something completely new to them and largely
unknown. The establishment of schools for Ethnic Fijian children in rural areas was for this reason an especially long process, and thus in many Ethnic Fijian families today only the most recent two or thee generations have experienced formal education at all.

Indo-Fijian communities on the other hand were keen from the outset to establish schools, and at the same time were resistant to the split in educational focus that the Colonial government initially established between European and non-European schools. The Indo-Fijians preferred from the outset that their children should have access to the more "academic" curriculum available to European children. This was probably due to the fact that many had already experienced the system of schooling in India, and virtually all of them needed no encouragement to think that formal education is a good thing. Thus when they arrived, they were quick to move along and establish their own schools alongside European schools. The fact that arriving Indo-Fijians were bonded only for 5 years in their labour and that they arrived all between 1879 until 1916 means that their population has had fully four generations or more of relative freedom in Fiji to get on with establishing schools and with promoting formal education. By contrast, Ethnic Fijians were until the late 1960s in most cases not allowed to live either independently or away from their rural village contexts. Their schools were not quickly established. So on average Ethnic Fijian families have had far fewer generations to become oriented to formal education or thus disposed to value it.

Within the schools that were established for them, Ethnic Fijians were, unlike Indo-Fijians, largely fully accepting of the Colonial government policy of maintaining differences in the curriculum available to European children and that available to others. Because Indo-Fijian schools were mostly in urban areas, where the Colonial administrators had also established the schools for European children, it was easier for the Indo-Fijian populace to recognise this difference and thence agitate for curriculum change in their own schools.

It can be seen that the concerns about and associated perspectives on education of the two main immigrant groups, Europeans and Indians, helped to lead the Indo-Fijian community toward the earlier establishment of educational emphases such as would ultimately provide different life chances for their children.
While Europeans and Indians went far ahead in establishing their own schools, Ethnic Fijians on the other hand were kept away in their own villages. Here, the traditional culture continued with its own style of enculturation of children.

2.7. Establishment of Mission Schools and the First Formal Education for Ethnic Fijians

During the late 19th century, Methodist and Roman Catholic missionaries from Britain introduced literacy to Ethnic Fijian villages where they spread Christianity (Henderson, 1931). The Wesleyan missionaries were able to translate the bible to the Fijian language in which Ethnic Fijians were taught to read in the “Bauan” language which was adopted as the ‘Fijian’ language. This language became the medium of instruction as it still is in primary school, although it is not by any means the first language of all Ethnic Fijians.

It is true that the missionaries converted and taught basic literacy and numeracy to Ethnic Fijians. However, it should be noted that the conversion was not uniform throughout the whole of Fiji. Relatedly, one certainly could not say that all Ethnic Fijians were literate since the arrival of Missionaries in 1835. Brewster (1922:25) for example contends that the coastal and maritime people of mainly the Eastern side of Fiji (which are mainly small islands with relatively small numbers of people) were the first to adopt Christianity. Henderson (1931:109) mentioned that the people in Somosomo were not converted by the preaching of the Gospel until 1840. Even the people of Colo in the interior of the main island of Viti Levu were until 1882 still ‘butobuto’ (heathen) (Brewster 1922:25). So the spread of literacy among Ethnic Fijians was not uniform throughout Fiji for it depended very much on the people’s conversion to Christianity.

The first mission school was opened by the first two Methodist missionaries shortly after their arrival in 1835. Teaching was mainly based on reading and writing in the main Ethnic Fijian “Bauan” dialect (Derrick, 1946).

The Marist Brothers provided schooling in Suva from 1888, and they continue to this day to play a prominent role in both primary and secondary education. Other churches such as the Seventh Day Adventists Church and the Anglican Church opened schools and colleges so that by the mid 1930s, most adults were literate in the “Bau” language, adopted as the official Ethnic Fijian vernacular. These Mission schools
introduced formal education for Ethnic Fijians in Fiji without any help or assistance from the Colonial Government.

Elite schools for children of chiefs began in the early 20th century, for example Queen Victoria School in 1906 for boys and Adi Cakobau School in 1948 for girls. It was not until 1916 that the Education Ordinance was established in which the Colonial Government's control over education was increased.

By this time, there was a fairly well-established network of small village schools, most of them under the control of the Methodist church, or the village committee, in which Ethnic Fijian teachers taught basic numeracy and literacy using materials printed in the dominant Bauan dialect.

This historical overview of the early years of schooling in Fiji makes it very clear how the migrant Indo-Fijian community upheld its children's need for, and right to, basic education for a very long period, and that the development of a system of formal education was very much the consequence of that community's vision and awareness of the importance of education in their life. In the indigenous community the history is different. Left to preserve as far as possible their traditional culture the Ethnic Fijians were left for a longer time entirely without schools. When the first mission schools were established, this did develop an understanding of the importance of formal education. From that time the Ethnic Fijian communities have shown considerable vision in facilitating the establishment of schools. But not all Ethnic Fijians during those early days were touched by formal education and Ethnic Fijian influence over the curriculum naturally did not begin at all until very recently.

It must be remembered that both formal education and the whole culture of the written word were only recently introduced to Ethnic Fijians. The initial introduction was by the Missionaries, who first arrived in Fiji in 1835. One may argue that formal education for the Indians in Fiji began later after their arrival in 1879. However, one should remember that by comparison the ancestors of both Europeans and Indians had been much taken up with the culture of the written word and (at least to some extent) in formal education long before their arrival in Fiji. For example, the institution of the law had long had significance among the ancestors of both Europeans and Indians. Both were long used to religions based in part on scriptures. Both had long used writing in relation to trade and commerce. Both had recourse to the discipline of history which uses the resource of writing to investigate the literal truth about the past.
Both had associations with mathematical inquiry spanning millennia, and familiarity with aspirations for natural science spanning a similar time. It's true that neither all Europeans nor all Indians could read and write. But even those who could not had been exposed in many ways to the importance of writing, and of the high value of the ability to read. Thus Indo-Fijians were liable immediately to value formal education to a pitch and intensity that we would not have expected for a minute to see among Ethnic Fijians.

The issues here are two. First, people require many generations to be assimilated to the culture of the written word. In fact, for no people anywhere is this assimilation ever as complete as it might be. But for a people just three or four generations on from its first contact with writing, such assimilation will be conspicuously less than in other people. This can make many aspects of formal education on average alienating and unhelpful.

Second, the value that is placed on formal education is not immediately high. It can take time for the sense of the high importance of education to spread within a people that have not long been exposed to it. European and Indian culture have been used to the system of education long before they arrived in Fiji so that is why they are fast to establish and promote education for their children as compared to Ethnic Fijians whom their awareness of the importance of education only eventuated two to three generations ago.

2.8. Fiji after Colonial Days

2.8.1. Ethnic Fijians' First Taste of Independent Living

From the time when Fiji was ceded to Great Britain in 1874, Fiji remained a British Crown Colony for over 95 years, until it gained independence in October 1970. Until independence, Ethnic Fijians were restricted by law from living away from their villages. As mentioned earlier if a person wanted to go or move out of the village to another area, the person had to ask the Fijian Magistrate.

On the other hand for Indo-Fijians, by the 1920s, the majority of them have already completed their 5 year bond as labourers and have already tasted independent living whereas for Ethnic Fijians, during the same time, they were still required by law
to remain in their own village until the 1960s or close to 1970 when Fiji became independent.

After independence, this law of keeping Ethnic Fijians in their own villages was relaxed thus giving them the opportunity to freely move out from their own villages and live independently or away in towns and other areas or looking for better employment and education opportunities for their children. Today, some fractions of Ethnic Fijians live in urban centres while the majority still stay in their own villages occupying their communal land.

It is my opinion that this Colonial protection was probably a significant contributor to the disparity in performance between the two ethnic groups. The Colonial government in trying to “protect” Ethnic Fijians did not foresee the effect such policies would have especially in delaying the advancement in education of Ethnic Fijians. Since they were forced to live in their villages they were deprived of attending better schools in urban areas. The result is that most of them attended rural schools which were usually not well equipped with school materials or qualified teachers. In addition their staying together in villages further encouraged their children not to be well adapted to the independent and competitive system mainly emphasised in the Western inspired school system today.

2.8.2. Political Situation

In 1972, the first general election was conducted under the 1970 constitution which introduced a bi-cameral Parliament composed of an Upper House (Senate) and a Lower House (House of Representatives) (Chandra and Mason, 1998). In the general election of 1972, the Alliance Party (an Ethnic Fijian dominated political party) won 33 of the 52 seats in the Lower House and elected its first Ethnic Fijian Prime Minister (Ratu Sir Kamisese Mara) and Governor General (Ratu Sir George Cakobau) — both are high chiefs.

From then on, the Alliance Party remained the government until 1977 when the general election was won by the National Federation Party (an Indian dominated political party). However, due to internal quarrels amongst the National Federation Party members the party could not get started and as a result, there was another general election in the same year which once again saw the Alliance party ruling.
Fiji’s Prime Minister during that time (Ratu Sir Kamisese Mara) and his Alliance Party continued to rule the nation until 1982 when it again won another general election. One year later another highly regarded chief, Ratu Sir Penaia Ganilau, was sworn in as the Governor General. As an attempt by this Ethnic Fijian dominated party (Alliance) to bridge the gap in academic achievement between the two ethnic races it continued to help Ethnic Fijians in education by introducing the 1980s affirmative action policies mentioned in chapter 1.

In the 1987 General Election, the Coalition National Federation Party – Fiji Labour Party, both Indian dominated political parties, won, resulting in the relegation to the opposition of former Ethnic Fijian Prime Minister Ratu Sir Kamisese Mara together with his fellow Alliance MPs, while Dr Timoci Bavadra (an Ethnic Fijian member of the Indo-Fijian dominated Fiji Labour Party) was sworn in as new Prime Minister.

This government was unacceptable to a great majority of Ethnic Fijians and a coup d’etat led by Lieutenant Colonel Sitiveni Rabuka on May 14th 1987 brought government back into Ethnic Fijian hands. After this coup, those in charge in Fiji declared Fiji a Republic and severed its ties with the British Monarchy. In 1990, a new constitution was promulgated by the first President of the Republic of Fiji, Ratu Sir Penaia Ganilau, giving Ethnic Fijians 37 seats, Indo-Fijians 27, General voters 5 and Rotumans 1.

In 1992, the first general election under this new 1990 constitution was conducted and the Soqosoqo ni Vakavulewa ni Taukei (SVT) – an Ethnic Fijian Political Party took control of the polls. Later on in 1994, Ratu Sir Kamisese Mara (the former Ethnic Fijian Prime Minister) was sworn in as the President. There was some disagreement between the churches and ethnic groups about the new 1990 constitution and this led the President (Ratu Sir Kamisese Mara) in 1995 to appoint a Constitution Review Commission to review the 1990 Constitution.

In 1999, the Fiji Labour Party (Indian dominated political party) gained victory in the national elections. It formed the People’s Coalition Party with three other political parties, the Veitokani ni Lewenivanua Vakarisito (VLV), Party of National Unity (PANU) and the Fijian Association Party (FAP). Mahendra Chaudary was then sworn in as Prime Minister, and became the first ever Indo-Fijian Prime Minister of Fiji.
The Coalition government rule was disrupted when an attempted coup led by civilian George Speight took over the government on May 19th 2000. An Interim Government was appointed on July 28th with the approval of the Great Council of Chiefs and the new President -- Ratu Josefa Iloilo (a highly regarded chief of the Western Viti Levu). This Interim Government took control of the government until a new general election was conducted in 2001 in which a new Ethnic Fijian Party -- the Soqosoqo ni Duavata ni Leweni Vanua (SDL) won the majority seats in parliament. The leader of this party -- Laisenia Qarase (an Ethnic Fijian) -- was appointed as the new Prime Minister of Fiji, while Mahendra Chaudary's Labour Party became the opposition. This is the situation at the time of this writing.

2.8.3. Ethnic Fijians' Insecurity over Leadership and their Land

Ethnic Fijians were comfortable and feeling secure when their Ethnic Fijian dominated Political Party (Alliance) was running the government after Fiji gained its Independence in 1970. They accepted the leadership of Ratu Mara as the Prime Minister because of his position as an Ethnic Fijian and more importantly because of his status as a high chief in Fiji. They respected and trusted him in the same way as he had been respected and trusted by the people of his own tribe. However, the sudden change in 1987 and then again in 2000 in leadership of the country from the Ethnic Fijian led Alliance Government to the Indo-Fijian dominated Labour Government greatly unsettled Ethnic Fijians with the concern that they might no longer be going to lead their own country.

When the Indo-Fijian political parties assumed control, Ethnic Fijian people lost confidence in whether they would be listened to and have their views seriously taken into account. They thought that such a change in government would also mean a change in land policies which is perceived by them to be a shaking of the very foundation of Ethnic Fijian societies.

The land has been a continuing source of friction between the Indo-Fijians and the Ethnic Fijians. The 1987 and 2000 coups resulted from Ethnic Fijian insecurity over their land when the Indo-Fijian dominated Labour party won elections in those years.

The recent amendments in some of the land policies by the Indo-Fijian dominated Labour Government in 2000 tended to create a feeling of insecurity
amongst Ethnic Fijians. Ethnic Fijians’ deepest anxieties involve their land, because of the increasing numbers of Indo-Fijians demanding more land. Despite Ethnic Fijians owning the majority of the land, they do not have control over education and businesses, nor have they the numbers in important professions such as law, science, technology, commerce and accounting. They realised that land, the only commodity over which they have control, was central to Prime Minister Mahendra Chaudary’s agenda. Most Ethnic Fijian’s have the perception that Indo-Fijian community has grown in number and economic power to an extent that Ethnic Fijians feel a threat to their political and economic position in their own country. In fact the above perception by most Ethnic Fijians was wrong since the population of Indo-Fijians is decreasing instead of increasing. This wrong perception in fact created a feeling of insecurity and the only way to guarantee their control over their land and country seemed to them to have total control of leadership in government.

The land as I see it could also be the cause of underachievement in education for ethnic Fijians as compared to Indo-Fijians today. The availability of land for Ethnic Fijians would create the feeling amongst them that they do not have to work hard at school since they always have the land to rely on if they are not successful at school.

2.9. Fiji Today

2.9.1. The People

As mentioned in chapter 1, Fiji’s total population is about 856,346 (CIA World Factbook July, 2002 estimate). Of this, the two major ethnic groups are the Ethnic Fijians (51%) and Indo-Fijians (44%). The remaining 5% of the population consists of other ethnic groups like the Europeans, Part Europeans, Chinese, and other Pacific Islanders.

Most of the Country’s population live on the two main large islands especially on Viti Levu which is the most important island in the group. Not only does it hold the bulk of the population, it is the commercial and political centre as well. Suva, Fiji’s capital city and main port of trade, is also located here, with a population estimated to be 141,273 (1994 Bureau of Statistic figure). The only other urban centre of importance is Lautoka which is located on the opposite and leeward side of Viti Levu and is the main centre for Fiji’s sugar industry. It has been declared the second city
recently because of its growing population of about 39,057 (1994 Bureau of Statistic figure). There are about ten more small towns scattered throughout Viti Levu, Vanua Levu and a few other islands and these serve as administrative and trade centres for their respective areas.

The Ethnic Fijian people are identified as the ‘Indigenous Melanesian population’ who are the ‘original inhabitants’ of the islands (Bureau of Statistics, 1989, p. 3). On the other hand, the Indo-Fijians are identified as ‘the population who are of Indian descent’ and are the ‘descendants of the indentured labourers and free settlers of the early part of the twentieth century’ (Bureau of Statistics, 1989, p. 3).

Since most of the sugarcane belts where the indentured labourers work are located near urban areas on the dry side of the two main islands, Indians are also found primarily on these parts of the main islands on scattered settlements in the cane growing areas.

The Ethnic Fijians on the other hand being the largest number compared to other races in Fiji are spread out on all the inhabited islands of the group, living mostly in rural areas of their social group – the Vanua. To briefly describe this, the Vanua is regarded as a communal group identified with a particular territorial area in which the people’s roots are established. As stated by Ravuvu (1988), the Vanua “is an extension of the concept of the individual self, the group self” (p 6). It is where people’s ancestors were born and brought up. The Vanua does not mean only the land areas with which the people are identified but also the social and cultural systems including the people, their traditions, customs, beliefs and values.

People of the Vanua live in a Koro or village. Several Koro or villages make up the group called Yavusa or tribes. Several social or political groups called Mataqali or clan make up the Yavusa or tribe. The Mataqali consists of several extended families or Tokatoka who share work and food as well as a designated part of the village. Each village has its own Turaga or chief who is respected by the whole community. This hierarchal arrangement still holds true today in Ethnic Fijian rural villages and outlying islands.

A majority of Ethnic Fijians are subsistence farmers, selling surplus produce in order to buy things like cloth, knives, canned food as well as to pay for school fees and other communal obligations. Ethnic Fijians have entered government services but mainly as soldiers, policeman, clerks, labourers and teachers with very few of them as
lawyers, doctors, lecturers, and engineers. Very small numbers of Ethnic Fijians are businessmen, accountants or shopkeepers. The reason often given for this situation is the Ethnic Fijian custom of communal sharing, called ‘kerekere’. To briefly explain this, the custom of ‘kerekere’ means that if a person needs something and another person has that thing, the person may ‘borrow’ it with no strings attached. However, when this custom meets such situations as credit or investment, something must give; and so far it has not been ‘kerekere’.

On the other hand, the Indo-Fijians have practically monopolised the country’s retail trade as well as manufacturing and transportation industries today. During their ethnic group’s 125 years of existence in Fiji, many Indo-Fijians have done very well for themselves economically and politically. When the early Europeans left, the early indentured labourers took over from them and they now comprise overwhelmingly the majority of cane growers on leased land. Since Fiji’s economy is based mainly on agriculture, sugar is its backbone, with other related services such as tourism, fisheries, forestry and mining playing an increasingly important role. Sugar is Fiji’s leading export commodity and accounts for more than 85% of the total annual value of domestic exports.

2.9.2. The Present School Structure

Today the majority of schools in Fiji are administered by private organisations which are either religious organisations or local committees (98%) and only a small number are administered by the government (only 2%). Essentially, these committees are composed of people living in a particular village or area who have organised themselves to establish a school with the permission of the Ministry of Education. The committee has to convince the Ministry of the need for a school in order to receive such permission. While they can operate independently of government assistance, this is usually not the case. As teacher salaries represent a high administrative cost, nearly all committees seek to employ either government teachers or government subsidised teachers. Thus there is a state-community partnership where the community or school committees own and manage the school while the government or state focuses on the provision of teachers, curriculum development, maintenance of standards, and provision of recurrent and capital grants.
For many years, Fiji’s education system was closely related to that of New Zealand with students taking examinations administered by the New Zealand Examination Board. It was only in 1988 that the last New Zealand Examination was taken for form six (year 12). In 1989 this was replaced by the local examination known as the Fiji School Leaving Certificate.

Education is offered at Pre-school (to children at the ages of 3 to 5) followed by primary (Years 1 to 6), lower secondary (Years 7 to 10) and higher secondary (Years 11 to 13) levels. At primary level, there are two examinations offered: The Fiji Intermediate Examination (FIE) at class 6 (year 6) and the Fiji Eighth Year Examination (FEYE) at the end of class 8 (year 8) level. The FIE qualifies students to enter Form 1 (year 7) and the FEYE qualifies students to enter Form 3 (year 9) at lower secondary level.

Fiji had a system of eight years primary education (Years 1-8) and four years of secondary education (Years 9-12). As discussed in Chapter 1, Year 13 was just recently introduced into the upper secondary system after the University Foundation Level (a level which used to absorb students passing form 6 examination – year 12) was phased out by the government in 1992. With the establishment of Junior Secondary Schools in rural areas in the 1970s, some primary schools had to give away their classes 7 and 8 so they could be feeder schools to their local Junior Secondary. This arrangement meant that FIE was not required for these primary schools. This was a strategy used to improve access for students to lower secondary level whereby final Year 6 students were automatically promoted to Form 1 at local Junior Secondary Schools. Since this strategy was never made compulsory by the Ministry of Education, some primary schools in Fiji, especially in urban areas, still offer Year 7 and 8 classes.

The continued co-existence of six-year and eight-year primary schools is one reason why the two Primary examinations (FIE and FEYE) remained in the structure of Fiji Education system even though most teachers think that they should be scrapped. They are still deemed necessary as a mechanism for selection to secondary level.

At the secondary level, there are three examinations offered: the Fiji Junior Certificate at Form 4 (Year 10) which qualifies students for entry to the upper secondary level; the Fiji School Leaving Certificate (FSLC) at Form 6 (Year 12) qualifying students to enter Form 7 and the Fiji Seventh Form Examination for schools
offering higher education to Form 7 (Year 13) students. The Seventh Form Examination qualifies students to enter University and other Tertiary level Institutions.

Table 2 shows the summary of the present school structure in Fiji which includes the four school levels from Pre-school up to Upper Secondary School and the respective Age, Year, Class and Examinations at Primary and Secondary school levels.

Table 2. *Present School Structure*

<table>
<thead>
<tr>
<th>Age</th>
<th>Year</th>
<th>Form/Class</th>
<th>Examination</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>13</td>
<td>Form 7</td>
<td>Fiji Seventh Form</td>
<td>Upper School</td>
</tr>
<tr>
<td>17</td>
<td>12</td>
<td>Form 6</td>
<td>Fiji School Living Certificate</td>
<td>Secondary</td>
</tr>
<tr>
<td>16</td>
<td>11</td>
<td>Form 5</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>10</td>
<td>Form 4</td>
<td>Fiji Junior Certificate</td>
<td>Lower School</td>
</tr>
<tr>
<td>14</td>
<td>9</td>
<td>Form 3</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>8</td>
<td>Form 2/Class 8</td>
<td>Fiji Eighth Year</td>
<td>Secondary</td>
</tr>
<tr>
<td>12</td>
<td>7</td>
<td>Form 1/Class 7</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>6</td>
<td>Class 6</td>
<td>Fiji Intermediate</td>
<td>Primary School</td>
</tr>
<tr>
<td>10</td>
<td>5</td>
<td>5</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>4</td>
<td>4</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>3</td>
<td>3</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>2</td>
<td>2</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2.9.3. *Organisation of Science Curricula*

The teaching of science in Fiji begins at Class 1 (equivalent to Year 1 in New Zealand). From Class 1 to 4, Elementary Science is introduced to all students. Health Science is first introduced at Class 5 level. So at Classes 5 and 6 levels, both Health Science and Elementary Science are taken by all students. At the lower secondary level from Form 1 (Class 7) up to Form 4 level, all students take Basic Science. When students reach the upper secondary level from Forms 5 up to 7, students have their
choice of the subjects. They can choose to follow either the academic school or the vocational school. The academic schools have science and social science streams whereas the vocational school have broad vocational streams covering specifically designed science courses for each stream. For the academic school science stream, the subjects covered are: English, Physics, Chemistry, Biology, Mathematics and Technology. The arts stream takes English, History, Geography, Accounting and Economics. Table 3 illustrates the science structure and curriculum from Primary level up to Upper Secondary Level.
Table 3. *Organisation of Science Curricula from Primary to Secondary level*

<table>
<thead>
<tr>
<th>Level</th>
<th>Form or Class</th>
<th>Year</th>
<th>Science Stream</th>
<th>Social Science Stream</th>
<th>Broad Vocational Streams</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper</td>
<td>Form 7</td>
<td>13</td>
<td>English</td>
<td>English</td>
<td>Specifically designed</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Physics</td>
<td>History</td>
<td></td>
</tr>
<tr>
<td>Secondary</td>
<td>Form 6</td>
<td>12</td>
<td>Chemistry</td>
<td>Geography</td>
<td>science courses E.g.</td>
</tr>
<tr>
<td>School</td>
<td>Form 5</td>
<td>11</td>
<td>Biology</td>
<td>Accounting</td>
<td>Agriculture, Metal Work,</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Maths</td>
<td>Economics</td>
<td>Engineering etc.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Technology</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lower</td>
<td>Form 4</td>
<td>10</td>
<td></td>
<td>All Pupils</td>
<td></td>
</tr>
<tr>
<td>Secondary</td>
<td>Form 3</td>
<td>9</td>
<td></td>
<td>Basic Science</td>
<td></td>
</tr>
<tr>
<td>School</td>
<td>Form 2/ Class 8</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Form 1/ Class 7</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary</td>
<td>Class 6</td>
<td>6</td>
<td>All Pupils</td>
<td>Health Science, Elementary Science</td>
<td></td>
</tr>
<tr>
<td>School</td>
<td>Class 5</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Class 4</td>
<td>4</td>
<td>All Pupils</td>
<td>Elementary Science – Life experience</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Class 3</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Class 2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Class 1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2.9.4. *Present Primary School Grading System*

All primary schools in Fiji have been categorised to 6 different grading or level. The level of the school will depend on the number of Pupils, which determines the
number of teachers at each level. The 6 different grades or levels from the top to the bottom are: ED1B, ED2C, ED3C, ED4C, ED5E and ED6D. Table 4 shows the summary of this 6 different grading set up by the Ministry of Education.

Table 4. Number of Pupils, Teachers, and Total Primary Schools at each Grade

<table>
<thead>
<tr>
<th>Number</th>
<th>Grade</th>
<th>No. of Pupils</th>
<th>No. of Teachers</th>
<th>Total Primary Schools in each Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ED1B</td>
<td>836+</td>
<td>26</td>
<td>9</td>
</tr>
<tr>
<td>2</td>
<td>ED2C</td>
<td>661-835</td>
<td>21</td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td>ED3C</td>
<td>486-660</td>
<td>16</td>
<td>38</td>
</tr>
<tr>
<td>4</td>
<td>ED4C</td>
<td>311-485</td>
<td>11</td>
<td>123</td>
</tr>
<tr>
<td>5</td>
<td>ED5E</td>
<td>136-310</td>
<td>6-8</td>
<td>232</td>
</tr>
<tr>
<td>6</td>
<td>ED6D</td>
<td>10-135</td>
<td>5 or less</td>
<td>291</td>
</tr>
</tbody>
</table>

Total Primary Schools in Fiji 713

Note. From the "Ministry of Education Annual Report", 1999. The number of Primary Schools at each level may have change since this data was taken. The lowest Primary grade is the ED6D and the highest is the ED1B level. This grading system is currently the one used in the Primary school level in Fiji.

In attempting to form a preliminary view of what should be considered in relation to school science learning, I will in the next chapter consider the theoretical perspectives and studies in the literature that I consider to be most pertinent for my study.
Chapter 3

Theoretical Perspectives & Literature Review

3.0. Introduction

In Section 3.1 of this Chapter, I will begin with a brief discussion of salient features of Bronfenbrenner’s ecological theory of development from which I will form the main framework for my study. In this connection I will also briefly discuss, in Section 3.2, some selected ideas of Piaget and Vygotsky on children’s thinking. In Section 3.3, I will introduce and discuss some selected ideas from a few philosophers of science about the nature of science, as well as some thinking from historians, anthropologists, and cross-cultural psychologists on the differences between on the one hand cultures that are wholly oral, and on the other hand cultures that have thoroughly assimilated the technology of writing. At the end of this section, I use what I have detailed earlier about the ecological and the socio-cultural theory of development to construct a nexus of issues surrounding science achievement at school. In fact, students’ learning of science at school is affected by various issues in the Home and School settings which I will further refer to again in chapter 6. In Section 3.4., I will turn to the empirical literature as related to specific questions that I want to put to my data.

3.1. The Ecological Theory of Development

I will use the ecological theory of Bronfenbrenner, (1979) to understand the role of home-school linkages and ecological transition in this study. His theory, as well as the socio-cultural theory, pushes me towards implementing a context-based approach for understanding human development.

I chose to utilise as a theoretical base Bronfenbrenner’s ecological theory mainly in order to understand the role of home-school linkages and ecological transition. In addition, this theory like the socio-historical school, promotes a context-based approach for understanding human development. The theory visualises the developing child as situated in an ecological environment conceived as a set of nested
structures with one placed within the next and ranging from micro to macro settings. The development of the child according to Bronfenbrenner is influenced by the interconnection between these settings and the immediate settings of which the child is a part. As Bronfenbrenner (1979) stated: "...The capacity of a setting... to function effectively as a context for development is seen to depend on the existence and nature of social interconnection between settings about the other" (p. 5, 6). In fact, one of the integral parts of the study is to look at what happens inside the classroom and also outside the classroom situation and try to understand the inter-linkages between home and the school setting which can have some influence on the development of the child. So using the ecological theory of development in this study helps to understand the role of ecological transition from what children learn at home to what they learn at school. Ecological transition is not just an outcome, but also an initiator of development processes where biological and situational factors work together.

In this section, I will very briefly touch what Bronfenbrenner refers to as the 'ecological environment' which he thinks can affect the development of a child. The four main ecological environment or settings include: the microsystem, the mesosystem, the exosystem, and the macrosystem.

These sets of nested settings interact with each other and according to him, in order for a setting to function effectively as a context for development; it must connect appropriately with other settings. He stated (1979),

"...The capacity of a setting...to function effectively as a context for development is seen to depend on the existence and nature of social interconnection between settings, including participation, communication, and the existence of information in each setting about the other (pp. 5, 6).

The ecological theory emphasises that development is affected by contexts. The theory emphasises the fact that children's development is affected by the immediate contexts of their home, their school, and the contexts beyond them which are influenced by how their parents or caregivers and teachers act towards them. In Bronfenbrenner's words (1979), "...Development never takes place in a vacuum; it is always embedded and expressed through behaviour in a particular environmental context" (p. 27).

I shall begin by looking briefly at the first layer within which the child is directly embedded, called the 'microsystem'. I shall briefly comment upon how in
Bronfenbrenner's view these microsystem elements help in the development of a child.

He defines the microsystem as: "...a pattern of activities, roles, and interpersonal relations experienced by the developing person in a given setting with particular physical and material characteristics" (p. 9).

So the three main elements of the settings or microsystem he mentioned are the activities, roles and relations with other people. In terms of the activities, the simplest which Bronfenbrenner refers to is the 'molar activity', which he defines as "an ongoing behaviour possessing a momentum of its own and perceived as having meaning or intent by the participants in the setting" (p. 45). Bronfenbrenner (1979, p. 48) argues that:

"...the development of a child is a function of the scope and complexity of the molar activities engaged in by others that become part of the child's psychological field either by involving her in joint participation or by attracting her attention.

Relations between the child and other people are very important in a child's development. As for molar activity, a child will not learn as much by doing things alone as the child will if his or her activities involve interaction with others. This interaction with others is what Bronfenbrenner terms the 'dyad' or a two-person system. He points out two ways in which the dyad is important in enabling the development of a child: one is that it is a critical context of development on its own and the other is that it enables the formation of other interpersonal structures such as the triads, tetrads etc. Dyadic relationship is something which is mutual and can affect the development of both individuals involved. It is important because it provides the pair the opportunity to learn from each other which thus can contribute to both cognitive and social development. As Bronfenbrenner points out (p. 57):

In any dyadic relation, and especially in the course of joint activity, what A does influences B and vice versa. As a result, one member has to coordinate his activities with those of the other. For a young child, the necessity of such coordination not only fosters the acquisition of interactive skills, but also stimulates the evolution of a concept of interdependence, an important step in cognitive development.

Bronfenbrenner also thinks that in order for the two-person system to function effectively as the context for human development, the participation of the third parties
(who in the settings I study would be relatives, friends and neighbours) is crucial. As he (p. 5) stated:

...If such third parties are absent, or if they play a disruptive rather than a supportive role, the development process, considered as a system, breaks down; like a three-legged stool, it is more easily upset if one leg is broken or shorter than the others.

This principle could apply to the relationship between settings such as the home and the school. The third important component of the microsystem which Bronfenbrenner refers to is the role. He defined this as “a set of activities and relations expected of a person occupying a particular position in society, and of others in relation to that person” (p. 85).

Every person in society has roles to play. For example a teacher has a role to play with the child at school. Parents too have a role to play at home but one important feature which Bronfenbrenner stresses is the role expectation, i.e. the association between how the holder of the position acts and how others are to act towards the position holder. These role expectations according to Bronfenbrenner tend to relate not only to the amount of activities but also to the relations between the two parties such as the dyads. Considering as an example the two roles of parents and of teachers, both of them are expected to provide guidance for the child and in the same way, the child is expected to accept such guidance. However, with parents, the degree of mutual affection and authority is expected to be higher than with the teacher. This is what is expected by the society which may be part of the culture of the parents. Looking at this direction, it can be seen that the role which is one of the main elements of the microsystem is also seen as being affected by the outside setting (macrosystem) which in this case is the culture of the society. As Bronfenbrenner explains it:

It is the embeddedness of roles in this larger context that gives them their special power to influence and even to compel how a person behaves in a given situation, the activities she engages in, and the relations that become established between that person and others present in the setting (p. 86).

Thus, it is through the interactions with persons occupying a variety of roles that facilitate child development. Bronfenbrenner further reiterated on this and stated:

Roles have magic-like power to alter how a person is treated, how she acts, what she does, and thereby even what she thinks and feels. The principle applies not only to the developing person but to the others in her world (p. 6).
As already mentioned, according to the ecological theory, a child's development is affected by the microsystem and also the settings beyond that. Bronfenbrenner argues that in order to understand human development, one must consider the entire ecological system in which growth is taking place. He thinks that human development takes place through progressive interaction between the human organism and the persons, objects and symbols in its immediate environment. Thus, that would suggest that the performance of students may not be all that strongly related only to what the children or teachers do at school. It may be equally or even more strongly related to the children's home background and the relationship with other settings within which the child acts. This set of interrelations between two or more settings in which the developing person actively participates is called the 'Mesosystem'. In considering the school and the home microsystem this may include the relationships between the two influences of one or the other.

The third layer of type of settings which has influence on the development of the child is the 'Exosystem' which according to Bronfenbrenner (1979) consists of: "one or more settings that do not involve the developing person as an active participant but in which events occur that affect, or are affected by, what happens in that setting" (p 237). At school, this may include aspects such as the curriculum used, teachers' qualifications and teaching experiences, teachers' interests in the subject and the school resources.

The outermost layer of ecological environment in Bronfenbrenner's view is the 'Macrosystem', which is the:

....consistencies observed within a given culture or subculture in the form and content of its constituent micro-, meso-, and exosystems, as well as any belief systems or ideology underlying such consistencies (p. 258).

In the home setting of the child, this may include the socio-cultural, geographical and political factors and also the belief system.

3.2. Selected Theoretical Ideas on the Development of Children's Thinking

Both Piaget and Vygotsky, two of the most significant thinkers on children's thinking consider learning and development to be different and important psychological processes. However, how they viewed the relationship between these
processes and the role that each process plays in organising and guiding development are different.

Piaget’s idea of intellectual development came into prominence in the 1960s when the influence in science education of behaviourist theories of learning was waning. Piaget is well known with his theory of the child passing through various stages of development. He proposes that the development of a child occurs mainly in four stages: “sensory-motor”, “pre-operational”, “concrete operations” and “formal operations”. Moreover he proposes that there are endogenous as well as exogenous factors which can explain the development from one stage to another. These factors include maturation, experience, social transmission and equilibration. Of these four factors, he thinks of equilibration to be the most fundamental factor. As he reasoned out:

....I come now to the fourth factor which is added to the three preceding ones but which seems to me to be the fundamental one. This is what I called the factor of equilibrium. Since there are already three factors, they must somehow be equilibrated among themselves. That is one reason of bringing in the factor of equilibration. There is a second reason.... It is that in the act of knowing, the subject is active, and consequently, faced with an external disturbance he will react in order to compensate and consequently he will tend towards equilibrium. Equilibrium, defined by active compensation, leads to reversibility. ....Equilibration, as I understand it, is thus an active process. It’s a process of self-regulation. I think that this self-regulation is a fundamental factor in development. (Piaget, 1964, cited in Cole and Gauvain, 1997, p. 24.)

He contends that for development of an individual to take place, both biological and environmental factors contribute equally. He thinks that development is a spontaneous process which is tied to the development of the body and nervous system whereas learning is stimulated by external situations. To support his point, he argues that mental growth is not separate from physical growth.

Mental growth is inseparable from physical growth; maturation of the nervous and endocrine systems, in particular, continues until the age of sixteen. (Piaget & Inhelder, 1969, p. viii, cited in Cole, 1992).

His idea of children passing through stages of development with the assertion that children can function at a higher level only if they have first learnt ways of thinking at the lower level has been applied to the education system by some psychologists and educators. For example, Schwebel and Ralph (1974, cited in Wood, 1988), use Piaget’s stages of development to structure curricula and approaches to teaching. Piaget’s idea gave rise to the notion of ‘readiness’ where
students may not be ready for some learning at a certain stage of development. That is, Piaget describes the development of operational thinking as occurring in all people in a sequence of stages beginning with sensorimotor stage, preoperational stage, concrete operational stage and finally stage of formal operations. The implication of this view is that some things cannot be learnt by students if they are not at the right stage of intellectual development. In other words, something might be just too difficult for a student of a particular age or stage of development to learn.

He viewed learning as subordinated to development and not the other way round. In the stimulus response schema, the relation between the response and the schema is understood to be one that involves association, however, he thinks that it does not involve association but instead involves assimilation. As he stated:

....The fundamental relation involved in all development and all learning is not the relation of association. ....I think, the fundamental relation is one of assimilation. Assimilation is not the same as association. I shall define assimilation as the integration of any sort of reality into a structure, and it is this assimilation which seems to me fundamental in learning. ....My remarks represent the child and the learning subject as active. ....Learning is possible only when there is active assimilation. (Piaget, 1964, cited in Cole & Gauvain 1997, p. 26.)

Vygotsky on the other hand view development in a different perspective to that of Piaget. He thinks that to understand any development outcome, it is important that we should first of all understand the socio-cultural context. Vygotsky (1978) thinks that the social or cultural environment is very important in the development of an individual. He argues that in order for a concept to be formed or understood, it has to depend on the socio-historical context and further adds that:

Any function in a child’s cultural development appears twice, or on two planes. First, it appears on the social plane, and later on the psychological plane. First it appears between people as an interpersonal category, and then within the child as an intrapsychological category (p. 163.)

He thinks that development cannot be separated from human social and cultural activities for social interaction provides an essential context for development itself. Children for example learn about culturally relevant tools and practices through their interaction with the more experienced members of their society during development. Thus joint problem solving will give children more opportunity to use their individual skills. What the children can do with the assistance of others better indicates their mental development than does what they can do alone. Thus by following others,
children are capable of doing much more in collective activity or under the guidance of adults. As he stated:

...learning awakens a variety of internal developmental processes that are able to operate only when the child is interacting with people in his environment and in cooperation with his peers. Once these processes are internalised, they become part of the child’s independent developmental achievement. ...Thus, learning is a necessary and universal aspect of the process of developing culturally organised, specifically human, psychological functions. (Vygotsky, 1978, cited in Cole & Gauvain 1997, p. 35.)

Piaget to some extent also emphasises, the significance of social conditions in the development of learning of an individual. Piaget (1973) thinks that the environmental learning also helps illuminate how individuals develop. He argues (p.56) that the society or social environment in which the individual is brought up is no less significant than the physical environment for determining how an individual develops:

The human being is immersed right from birth in a social environment, which affects him just as much as his physical environment. Society, even more, in a sense, than the physical environment, changes the very structure of the individual.

Piaget tends to divide the environmental factors into two — the social environment and the physical environment.

Whereas Piaget mainly based his idea on stages of intellectual development and thought that development determines learning, Vygotsky on the other hand emphasised the importance of social interaction in aiding development and thought that development trails behind learning. As Vygotsky stated:

...Learning awakens a variety of internal developmental processes that are able to operate only when the child is interacting with people in his environment and in cooperation with his peers. Once these processes are internalised, they become part of the child’s independent developmental achievement. .... Development processes do not coincide with learning processes. Rather, the developmental process lags behind the learning process; this sequence then results in zones of proximal development. (Vygotsky, 1978, cited in Cole & Gauvain 1997, p. 35.)

In looking at the Ethnic Fijian situation, I think Vygotsky’s ideas regarding the importance of the relationship or interaction between the social environment and the child are very important, especially in relation to the traditional oral culture of Ethnic Fijians, where most of the ideas learned by the child are derived from their relationships with their elders or the community. Although Vygotsky’s studies may
be derived from Soviet schools where the culture was not oral like that of Ethnic Fijians, what he brought out in terms of the importance of the social environment in the development of the child’s conceptual mind is in my view relevant to consider in the classroom situation in Fiji today — especially if one has to consider how to go about improving the academic performance of Ethnic Fijian students in science at school.

So far, I have briefly addressed the development theories and its relation to learning. Since my study is embedded to science teaching and learning, I will in the next section briefly add the views of Vygotsky and Piaget on how children develop scientific concepts, for the problems uncounted in the psychological analysis of teaching and learning cannot be correctly resolved or formulated without addressing the relation between learning and development in school aged children.

Some broad questions which many research still want to know the answer to are: How do children come to hold the ideas they have? Why is it difficult to modify such ideas as they already have? What happens to their minds when a new scientific concept is taught to them at school?

Unless we know what children think and why they think that way, we cannot ensure that our teaching will have any effect, no matter how skilful we are as teachers. Some people think that when teachers teach scientific concepts or new ideas to children, these new ideas are absorbed into children’s minds as complete abstract ideas without the children altering or augmenting them in any way. In other words, whatever new ideas or scientific concepts are taught by teachers go inside the children’s minds as wholes, quite without gradual development of the ideas or concepts taking place in the children’s mind. That is, the new scientific ideas or concepts tend to completely replace the pre-existing concepts and the old concepts are completely thrown out. It is as if individuals have empty minds and when teaching takes place, the empty minds are filled with the new concepts which are being taught.

On the other hand, some also think that when children enter the classroom, they already have some pre-existing ideas or views about the world. So when science teaching takes place, children will only assimilate some of the new scientific ideas they think make sense to them and may put away or reject some of the new ideas or scientific concepts introduced which do not make sense to them. In assimilating the new scientific ideas, children do not completely throw away all the old concepts or
pre-existing ideas they already have with them. These old ideas or thoughts may be kept in mind for such time that the individual is completely convinced after learning some further facts that these do not make sense anymore. Not all new ideas or scientific concepts that are given to them will be assimilated or will thus replace their prior world view or pre-existing ideas, since in some cases children may return to their former thinking style if they see that the new concept does not make sense to them. In this case, their absorption of the new ideas or concepts undergoes a development process. Vygotsky (1986) upholds this second conception and says (p. 203):

...The child advancing towards higher levels of generalisation does not restructure all of his earlier concepts separately. ...Once a new structure has been incorporated into his thinking — usually through concepts recently acquired in school — it gradually spreads to the older concepts as they are drawn into the intellectual operation of the higher type. The work of the child’s thought embodied in earlier generalisations is not wasted; it is superseded, i.e., saved as a necessary premise for the higher intellectual activity.

Both Vygotsky and Piaget dismiss the first conception of abstract assimilation of ideas or concepts by children and agree with the second conception that the child’s development of scientific ideas involves their pre-existing ideas.

However, Piaget thinks that a child’s development of new ideas or scientific concepts involves the pre-existing ideas of the child alone and does not involve the ones that the child may learn by systematic instruction from the teacher. He thinks that spontaneous concepts alone characterise a child’s thought so that spontaneous concepts and non-spontaneous concepts are completely separate and do not readily interact with one another.

Vygotsky (1986) on the other hand does not agree with Piaget and says (p. 154) that Piaget: “fails to see the interaction between these two types of concepts and the bonds uniting them into a total system”. He contends (p. 155) that Piaget’s idea here tends to go against Piaget’s own theory, that a child’s mental development or thought “...had no relation to socialisation while socialisation had no relevance for the development of the child’s concepts”. Vygotsky believes that the development of spontaneous and the acquisition of non-spontaneous concepts are interrelated processes. The mediation between the spontaneous and non-spontaneous concept is the instruction given by the teacher or adult which gives rise to the evolution and the development of the child’s mental concept. He sees a parallel between how a child
acquires scientific concepts from spontaneous concepts with how a child learns a foreign language by using his or her own native language. That is, in order for the child to learn a foreign language, he or she must first of all know his or her own language in order to be able to do the translation. So without knowing the native language in the first place, it will be impossible to understand the foreign language. Thus Vygotsky (1986) contends (p. 197) that:

"...There is a meditative role played by the native language and by spontaneous concepts. A foreign word is not related to its object immediately, but through the meanings already established in the native language; similarly a scientific concept relates to its object only in a mediated way, through previously established concepts. Moreover, the meditative role prompts semantic development of native speech and cognitive development of spontaneous concepts.

The discussion to this point of some ideas of the great theorists Piaget and Vygotsky is meant simply to pull into view a few of their ideas, namely those that I believe are especially pertinent to my study. Before I conclude this section I will mention some studies in New Zealand by a pair of far lesser investigators, whose findings seem to me also pertinent, and to bear on the issues discussed above. To mention these studies is of course not even to scratch the surface of the voluminous literature receiving Piaget or Vygotsky and critically or sympathetically elaborating their views.

Osborne and Freyberg's (1993) research on children's science from a range of studies including their own work on the 'Learning in Science Project in New Zealand' shows that children acquire many of their ideas prior to their formal teaching in science. Osborne and Freyberg found that children in a way are just like scientists for they are always curious to know more about the world around them. They always want to know how and why things behave as they do. In their words "Children naturally attempt to make sense of the world in which they live in terms of their experiences, their current knowledge and their use of language" (p 13).

Before children come to school, they have already developed some ideas about the world around them from their experiences. These pre-existing ideas are what Bell (1993) refers to as “students' prior knowledge” or Cobern (1993) calls “world view” or Osborne and Freyberg (1993) call “children’s science” because of the fact that the views and meanings are often considered by children to be more sensible and more useful ideas than the ones presented to them by teachers.
In Osborne and Freyberg’s (1993) research about children’s ideas in science, they found three very important things. One is that before any formal teaching of science is done, children develop meanings for many words used in science teaching and views of the world related to the ideas taught in science. Secondly, they found that the ideas or views of children are usually strongly held by them and are often significantly different from the views held by scientists. Thirdly that the ideas held by children are sensible in their point of view and they can either be influenced by science teaching or remain as they are.

This view that children enter school equipped already with many concepts, skills and beliefs previously acquired, is clearly pertinent to creating effective learning environments at school. The implication for this to teaching science is to first try to know what prior knowledge a child has of the new things he or she learns at school. Without knowing the children’s world view or pre-existing ideas, it will be difficult for the teacher to try and change or influence the children’s spontaneous concepts in favour of the new scientific concepts. This is called conceptual change, and teachers who conceive of themselves as chiefly needing to help orchestrate such conceptual change in the child can be said to follow a “constructivist’s” way of teaching.

With respect to my study, I am interested in finding out whether or not the two ethnic groups of teachers use the constructivists’ method of conceptual change to teach science and whether this has any influence on the differential performance of the two ethnic groups of students in science at school. It may rather be that both sets of teachers scarcely employ the conceptual change approach, but rather stick to the authoritative and directive approach of teaching. Teachers may just attempt to force students to learn what they want them to learn or what is supposed to be covered for the syllabus; like trying to fill up their empty minds. If students are not used to asking questions openly in class, then it is quite likely that the teachers will find out where a child is at, either before instruction or after. When they are not engaged by any actual discussion but simply spoon-fed concepts of some new type, students are unlikely to move all that far away from their pre-existing concepts so that their shift towards scientific concepts might be at a minimal or might take a very long time.

Independently of such questions about teaching practice, I will employ conceptual change theory to evaluate what is happening in the two ethnic classrooms. Even if the approach in teaching science at school is largely the same for the two
ethnic groups of teachers, it might be that differences in the backgrounds of the two ethnic groups of students could explain their differential performance in science at school. The concepts with which children arrive in the classroom could be quite markedly different, given the differences in the cultural experiences at home. Perhaps explanations should be sought in this area for the differential achievement of the two ethnic groups of students in science at school.

3.3. Theories about What Science Is — Philosophy of Science

In discussing (both in this Section and in Appendix B) various philosophical theories and views, my attention will mostly be on the literature in contemporary philosophy of science. Parts of the philosophical discussions below stem from joint writing with my co-supervisor Dr Philip Catton of the Philosophy Department at the University of Canterbury. Parts stem (as will be indicated) from my attending a particularly clear and helpful series of lectures by the Australian philosopher of science and University of Canterbury Erskine Fellow Dr Alan Chalmers.

The philosophy of science might seem especially pertinent for analysing what might promote better teaching and learning of science in the schools of Fiji, since philosophy of science has endeavoured to explain what science is. But I will argue that the philosophers’ accounts of how science supposedly itself works offer less than we might have expected for understanding effective school science teaching and learning. Indeed when we consider the various philosophies of science all together with due regard for the tensions between them and the weaknesses as well as the strengths that the philosophers have been able to identify in them, we find that they offer us a less definitive understanding of what science is than the philosophers themselves initially sought. They also simply presuppose in all practitioners of science a cognitive orientation and an accompanying set of categories of thought that, arguably, children are themselves not liable to possess initially, and that, arguably, even adults possess only in some cultures, not in all. Thus my research questions for later chapters have been shaped more by the anthropology and sociology of science than the philosophy of science, for reasons that I believe I can forcefully defend.

The ideas from the anthropology and sociology of science that I present in Section 3.3.2 lead me to conclude that science is special to a particular kind of cultural setting, a setting that is really very remote from traditional Ethnic Fijian
culture and from oral cultures generally. Science is often conceived as though it is a cultural universal and thus knows no boundaries between cultures. On this view the state of scientific development has been lower or higher in different societies at different times, but we can expect the word ‘science’ to refer univocally to something at some level of development or sophistication in any society. I believe that this viewpoint is false, in ways that betray the unhelpfulness of the philosophers’ presuppositions. It is not that I can offer to define science, in some way that would exclude from that status the forms of inquiry in, say, traditional Ethnic Fijian culture. Not even in the 350-year tradition of western science that started in Europe can philosophers of science discern a single monolithic ahistorical methodological form for the whole of that enterprise. That this is so shows clearly that there is no easy definition of science. It seems that ‘science’ connotes a “family-resemblance” concept (in the sense due to Ludwig Wittgenstein). Despite the looseness of the word ‘science’, however, there seem to be many good reasons to withhold it altogether from cultures significantly different from that in which the so-called “Scientific Revolution” occurred. Indeed one does better justice to those other cultures by withholding the word ‘science’, than by seeking to apply it to the kinds of inquiry and knowledge that they sustain. Whether the way that, say, Ethnic Fijians in their traditional context garnered understandings of the world around them sufficiently resembles the inquiries we receive today as sciences itself to be thought of as science, I very much doubt. I believe that we do better justice to Ethnic Fijians’ traditional modes of inquiry and forms of understanding by considering them not as attempts at science but rather on their own terms.

That people in India have long aspired to do science seems to me much more difficult to doubt. It is true that oral culture is very strong in India and these traditional forms of culture were clearly brought to Fiji by the arriving Indo-Fijians. Yet at the same time India has a two-thousand year history of literacy and of the pursuit of systematic theoretical knowledge (e.g. logic, mathematics, physics, cosmology). There was to this extent a very great difference culturally between the arriving Indo-Fijians and the Ethnic Fijians with their traditional culture. These differences are liable to have been compounded by other related differences concerning attitudes to formal education, to literacy and book learning, and to the question of the separateness of epistemic from political authority. I intend to explore
the question as to whether the differences that there are liable to have been initially in these respects between the two Ethnic groups continue to express themselves today.

This section might have discussed what is meant by scientific thinking. It could have done so by considering some philosophical views on the nature of scientific enquiry due to Bacon, Popper, Lakatos, Kuhn, and Feyerabend. Actually, I relegate to an appendix (Appendix B) all this discussion. For in this section I will in fact argue that there is not nearly as much to take from these philosophies of science into an analysis of the situation in science education in Fiji as might have been hoped, or as some would expect.

The ecological and socio-cultural considerations introduced (chiefly in Section 3.1. and 3.2) seem to me much more suggestive and potentially fruitful for my study. I will explain why I believe that the standard conceptions in philosophy of science such as those by Bacon, Popper, Lakatos, Kuhn and Feyerabend prove to have relatively little to offer to me. Of course this is not to distance my study from philosophical considerations altogether; it is just to say that the stock conceptions and debates in recent academic philosophy of science are for interesting reasons well to one side of my main concerns.

Appendix B suffices to show that science is not that simple to define. That is partly why I resist the following reasoning. Many people reason that, if we want our children to relate to science, or if we want to enable a few of them eventually to become scientists themselves, it seems necessary to be clear about what science is. For (it is suggested) we will surely want to use that knowledge in order to figure out how to invite students into the practice of science, and thus shape them into scientists. The problem with this apparently laudable reasoning is that, try as they might, philosophers of science have not successfully distilled a clear simple understanding of what science is. And this is probably because science is not one simple thing (based, say, on some simple but monolithic and ahistorical method) of which a single clear understanding can be had. Over against the claims of some philosophers of science, it does not seem that what science is, is a simple matter of defining the 'method of

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1 The discussion in the Appendix reflects some benefits upon my own learning in philosophy of science from a welcome series of lectures by the Australian philosopher of science Alan Chalmers, and also from reading that I did in the context of his course. Chalmers made it his central purpose to show that the attempt to define science in terms of a theory about its method does not succeed.
science'. In particular, saying what science is, is not a simple matter of defining some sort of method that could be wielded by an individual, turning that individual into a scientist.

Given my overall interest in the question why Ethnic Fijians are underperforming in school science as compared to Indo-Fijians, I find that for my purposes the philosophers of science are looking in the wrong place. It might be that Ethnic Fijian students, as compared to their Indo-Fijian counterparts, are, on average, relatively ill prepared by their cultural experiences to assimilate themselves well into science at school. But the factors that are most likely to be significant seem to me not to lie within the (controversial) descriptions that philosophers of science provide of what it is to "do science". Notably, philosophers of science simply take for granted some aspects of their own general culture, for example literal mindedness, or more particularly the preoccupation (that is necessary for the practice of philosophy itself) with literal, objective, truth. What they say about science illuminates not at all how these aspects of culture are set in place. Yet in all likelihood the aspects of culture that the philosophers of science simply take for granted (rather than seeking to illuminate) are keys to my area of research. The differences that exist between Ethnic Fijian and Indo-Fijian children in their experience of science at school probably have more to do with the category of literal, objective, truth, and with how weakly or firmly in the possession of students that category is, than it has to do with some (controversial) characterisation of 'the method of science'. Or so, at least, I conclude, upon the basis of the kind of investigation of the various philosophies of science that I detail in Appendix B.

3.3.1. An Appraisal of the Philosophy of Science for its Pertinence to my Research

An ever-popular conception that people have about science is that science is what a scientist does, times the number of scientists that there are. According to this popular conception, what a scientist, as a scientist, does is follow the method of science. Thus on this popular conception the whole nature of science can be identified by describing the kind of method that individual scientists have and use.

When it comes to science education, people often betray the influence of the above popular conception. If we want our children to relate to science, and if we
want to enable at least a few of them eventually to become scientists themselves, it
might seem necessary to be clear about what science is. That might seem to require
saying what the method of science is, on the supposition that that method can be
wielded by each individual scientist, making them scientists. This way of thinking is
surely committed to the view that science is what a scientist does, times the number of
scientists that there are. Thus we might hope to foster in children certain behaviours
that are conformable to “the method of science”. In this way we would help those
children to become scientists. This at least is a view towards which one is led by the
popular conception discussed above.

It is true that some philosophers of science, such as Bacon and Popper, have
tacitly endorsed the popular conception. They have articulated a method for science
of a sort that an individual researcher could wield. They suppose that the wielding of
this method is key to whether the researcher counts or not as a scientist. They seem
committed to the view that science is what a scientist does, times the number of
scientists that there are. But notably, neither Bacon’s inductivist method nor Popper’s
falsificationist one stands as a philosophically successful reckoning of science. Both
Bacon and Popper are roundly criticised by other philosophers for the unworkableness
of their proposals. In both cases it is arguable that the proffered prescription for
science is not even fully coherent, let alone accurate to the way science is actually
done. (See the Appendix B for an elaboration of these criticisms.)

Some other philosophies of science do not suppose that science is what a
scientist does times the number of scientists that there are. For example, both Kuhn
and Lakatos adopt an understanding according to which there are significant social
aspects to the functioning of science. According to Lakatos the key question is not
always what is rational for an individual to do. A significant separate question
concerns what is rational for the community to do. According to Kuhn the key
question is not always what is rational. Science can work forward effectively by non-
 rational means, simply by means of the overall social form that science takes.

The popular conception discussed above is quite mistaken. If doing science
were simply a matter of implementing some method that it is relatively easy to
describe, then we would have to expect that just about every people would have
stumbled onto doing science. On the contrary almost all the peoples there have ever
been have not done science. So there must be more to what it is to do science than simply to stumble upon and implement an easily describable method.

Likewise if doing science were simply a matter of implementing some method that is relatively easy to describe, then getting children to see what science is all about and why it is worthwhile would be quite easy. But getting children to see what science is all about and why it is worthwhile is typically not at all easy. So the perspective according to which science is simply a matter of implementing some method that it is relatively easy to describe is therefore pernicious. Science is not monolithic, not unified in its form. This is a worthwhile discovery to make because it arms one against adopting an oversimplified conception of science. To learn this lesson is a salutary antidote to the widely received understanding of science, according to which science gains its distinction and authority from a single, monolithic, overarching, a historical, context-independent method which defines what it is and ensures that it is special.

There may be dispositions that interfere with a child’s engaging in science let alone becoming a scientist. In addition, there may also be dispositions that can help a child engage in science or even eventually to become a scientist. Yet my point remains: we have little reason to expect that philosophers’ accounts of science will help us to pinpoint which dispositions matter one way or the other and why. It may be that the best dispositions for young people to have if any are eventually to become scientists are quite different from the dispositions Bacon calls our attention to, or Popper, or for that matter Lakatos or Kuhn.

The best dispositions for young people to have if any are eventually to become scientists may indeed not be those that are needed in adult scientists themselves. For example, a willingness to have a vast amount of received knowledge packed into oneself through very dogmatic education may be a significantly helpful disposition for a young person to have in order eventually to become scientifically creative. (To say this is contrary to the wisdom of many educationalists, as discussed in section 3.2., but I will sketch an example shortly which supports my present point.) It is true that a creative, adult scientist would need to have very different dispositions from this. It may seem anathema for me to suggest that willingness to learn by doctrinaire education is consistent with eventually being creative. In fact I do not propose that this is a way forward for Fiji. But I think that what happened in Germany after its
educational reforms in the late nineteenth century in fact does show that in some contexts this is possible. New, science-intensive schools were created there, to cater to a technically able elite, and to teach mathematics and science with the same intensity that classical subjects had traditionally been taught in the Gymnasia. Students at these schools were forced to learn vast reaches of established science. Some who endured this education, such as Albert Einstein, confirm that it was very doctrinaire. (For a discussion, see Pyenson 1985). Yet the consequence was that a fleet of young geniuses emerged who worked a creative effect on the fields of mathematics, physics, chemistry, geology and life science.

The experience in German-speaking lands at the end of the nineteenth century seems to show that (perhaps under special conditions) creativity can arise precisely as a result of thoroughgoing indoctrination. One reason why, say, Einstein proved to be very creative after learning a vast amount of received knowledge is that he was able to detect that the sum total of what he had been taught was not fully coherent. Einstein shows us that a person into whom a lot of received knowledge has been packed may encounter difficulties with it. If that person is, say, charged with the task of teaching others, or of using received knowledge in novel applications, that person may be forced to face the incoherencies in received knowledge for what they are. If in this situation that person takes the steps necessary to transcend or eliminate the incoherencies, then that will be creative. Yet the condition for becoming creative in this way seems to be to be willing as a young person to sustain a style of learning that little allows creativity to breathe let alone grow.

Of course all those German-speaking children who went to the elite schools were probably there under a self-conception that they might one day be scientists. So even as children they might already have had an image of themselves as one day being scientifically creative. I am not suggesting that a doctrinaire style of science education is necessarily the best thing for all children, and I suspect that in many contexts it might be disastrous for everybody. Even in Germany at the end of the nineteenth century it is likely that many who were taught this way were put off or fell behind and found the experience roundly negative. My overall point from this is just that we can’t learn what dispositions will best help children to acquire an ability for science at school by considering the dispositions that adult, creative scientists ideally should have.
The implication of this for science education in Fiji is that the classroom behaviours that a science teacher can most beneficially nurture or elicit may not be the same as are to be found in practising scientists. In any case there is no set of behaviours in practising scientists that define what science is. To suppose otherwise is to adopt the popular conception discussed above, and that is an error.

I do not mean to suggest that science teachers can in no way beneficially nurture or elicit behavioural or cognitive dispositions in children. There may well be reason, for example, for teachers to encourage Ethnic Fijian children to think more for themselves, to come to appreciate the importance of evidence as opposed to personal authority, and in these ways to begin to acquire more firmly the category of literal, objective, truth. It may well be that Indo-Fijian children are less in need of such help at school, while perhaps there are other kinds of help that they ideally should have. My point is just that the philosophies of science seem to point away from rather than at the dispositions that it will be most important for a school science teacher to consider and aim to instil.

3.3.2. Orality, Literacy and Science

In his 1994 book *The World on Paper*, David Olson examines how writing has affected the development of our modern understanding of language, nature and ourselves. He reverses the traditional assumption about the relation between speech and writing, by arguing that writing provides an important model of the way we think about speech and that for those in literate cultures, their consciousness of language is very much structured by their writing system. He argues that writing provides our dominant models for thinking about nature and the mind and shows how our science (our understanding of the world) and our psychology (our understanding of ourselves) are by-products of our ways of creating and interpreting texts.

According to Olson, writing and literacy are necessary conditions for the rise of distinctively modern modes of thought as epitomised by philosophy, science, justice, and clinical medicine. The importance of writing to the advancement of philosophy and science has in recent times been examined and defended in a series of major works by such writers as McLuhan (1962), Goody and Watt (1968), Goody (1978), Ong (1976), works which trace a new orientation to language, the world and the mind, to changes in the technology of communication.
In a society that has thoroughly assimilated the technology of writing, knowledge tends to be identified with what is learned in school or from books. Literacy skills in fact provide the route of access to that knowledge. People who cannot read and write are thus cut off from knowledge. This reduced condition, the condition of the illiterate person in a modern society, is pathetic. For this reason 'illiterate' becomes a highly negatively charged word. Of course, the non-literate condition of people in oral societies is for this reason best distinguished sharply from the condition of illiterate people in any modern society.

According to Olson (1980), literacy imparts a degree of abstraction to thought which is absent from oral discourse. This is also supported by (Baker, Barzun, & Richards, 1971) who think that literacy is of the highest importance to abstract, theoretical thought. Havelock (1982) provides evidence that the Greeks evolved a philosophical disposition only as they gradually pressed the Greek language into uses it would not have had in an entirely oral culture.

Some cultural historians and anthropologists over the past two or three decades have a different viewpoint to this. For example, Harris (1989), over against Havelock, contends that the degree of literacy in classical Greece far from being universal was quite limited. He argues that probably no more than 10% of the Greeks in the era of Plato were literate. Others like Carruthers (1990) argue that writing something down cannot change in any significant way our mental representation of it. Thomas (1989) and Anderson (1989) insist that classical Greek culture was primarily an oral culture favouring dialectic (that is to say, discussion and argument) for the development of knowledge, and that writing played a small and relatively insignificant part. Consequently it is unlikely that we can simply attribute the intellectual achievements of the Greeks just to their literacy. Lloyd (1990, p. 37, cited in Olson, 1994) found that the discourse that gave rise to the distinctively Greek modes of thought “was mediated mainly in the spoken register”.

People who study oral cultures with a view to showing how much can be achieved in them remark for example how Polynesian navigators sailed many-thousand-mile voyages without the aid of a compass or chart (Gladwin, 1970; Hutchins, 1983; Oatley, 1977). How are such accomplishments possible? Anthropological studies of oral culture by Bloch (1980) and Fieldman (1991) have revealed both complex forms of conversation and memorisation as the answer.
Consequently, these authors claim, contrary to Olson, that no direct causal links have been established between literacy and the development of sophisticated systematic modes of cognition.

I personally think that the truth is somewhere between these opposing views. The counterarguments that I have just discussed do underline both that literacy is not a sufficient condition for the emergence of science and philosophy; nor is it a necessary condition for the advancement of technology and quite sophisticated systematic thinking. Yet they all fall short of undermining the picture that Olson presents, of literacy as an important enabling condition for mathematics, science and philosophy. To understand how literacy helps enable a people to undertake mathematics, science and philosophy, there is a need to look closely at how cognitive change (change related to the mind) is caused by social change. I will first endeavour to illustrate what some other writers think about this before I present my own view.

In a classical work (Durkheim, 1948) Emile Durkheim argues that cognitive structures are first social in nature and that social change had brought about a shift from religious to scientific concepts. Scientific concepts, he argues, are an effect of the progress of social relations and concomitant changes in modes of thinking. This theory could explain the rise of early modern science. Cognition according to him was born out of coping with and rationalising new social roles and relations.

Robert K. Merton (1970), in trying to explain the relationship between religious and scientific thought, offers a much narrower but still sociological conception. He focuses on why so many early modern scientists were also Puritans. He offers the view that Puritan communities are hard working people with each man being his own interpreter of scripture and nature. This, he contends, was conducive to the development of experimental science.

However, Thomas Kuhn (1977) criticises Merton’s standpoint for being far too narrow and insufficiently explanatory. Kuhn urges that the critical factor in the scientific revolution was the development of exemplars of successful scientific activity. What Kuhn calls “paradigmatic” or “normal” science is the social effect of the community of researchers receiving certain individuals’ work as exemplary, or thus as setting the standards for what a worthy further contribution to the field could be thought to be.
There is one thing that I think each of these sociological theories misses in trying to explain the connection between social change and cognitive development. That is, they all fail to recognise the significant role of literacy. Literacy encourages thinking of a sort that enables a person to acquire a quite different variety of skills and knowledge from those that people come by in an oral society.

Vygotsky (1978) adopts the view that the “higher mental processes” always involve the use of socially invented signs. Such signs are, of course, culturally diverse, and they also always have a history. Although Vygotsky does not himself draw much attention to the differences of oral from literate cultures, his theories nonetheless potentially help to explain how writing and literacy could influence cognitive operations and activities and thus also potentially help to explain the development from primitive to modern forms of thinking. Vygotsky contends that cognition and consciousness are the products of human activities rather than the cause. This tends to suggest, furthermore, that human memory takes alternative forms depending upon cultural resources.

My own belief coincides with what Olson contends about writing as our dominant models for thinking about nature and mind. Olson argues that our understanding of the world (our science) and our psychology are produced from our ways of creating and interpreting written texts. Olson believes that writing makes it possible for the first time to set two pieces of text side by side in order to check them for identity or to look for relationships between them. Writing preserves statements and thereby opens them up to critical inquiry. Thus while writing is used to preserve information much as oral memory arts also do, it introduces an altogether higher set of standards concerning the identity of items of information and for the critical question whether or not they should be retained and if so in what systematic relation to other items of information. In fact, writing tends to relax the constraints on memorability. That is, being equipped with a writing system, one is capable of preserving an unlimited number of statements or facts. The question how to order facts rationally (rather than merely preserving selected important facts mnemonically) becomes paramount. Thus thinking can take on an orientation to an all-things-considered, rationally best-systematised, ideal way of thinking. Another name for this ideal is ‘literal truth’. A statement is literally true if it is conformable with all-things-considered, rationally best-systematised thought. If it is not so conformable, it
is false, literally speaking. The very categories of literal truth and literal falsity arise for the first time in the cultural condition of literacy.

Naturally every society marks out in some way the distinction between having spoken or thought well and having spoken or thought ill. And the distinction will often map directly onto that between having spoken or thought what is literally true and having spoken or thought what is literally false. But it would be wrong to conclude from this that every people possess the categories of literal truth and literal falsity. On the contrary, in an oral culture having said or thought well often ties tightly with the memorability of what is said or thought, or the functioning of what is said or thought for the memorability of other, important, thoughts. Because memorability can be such a crucial concern, oral societies have no real truck with the ideal of an all-things-considered, rationally best-systematised way to think. For that way to think cannot really be approached by humans, let alone memorised. Memorability depends on playful associations of ideas often in the form of myths. It is aided by rhyme and metre, and by oral practices of recounting, retelling, embellishing, and selectively eliding and adapting. The ideal of an all-things-considered, rationally best-systematised way to think is a luxury that can be afforded in a literate society whereas in an oral society people not only do not need to be literal-minded but they actually need not to be; for what they need most is for their memories to be vast and powerful.

In considering these facts together with what Olson (1994) suggested about writing in providing our dominant models for thinking about nature and the mind, it can be said that the type of culture that is well used to literacy from many generations back will confer an advantage within school learning, as opposed to the type of culture that remains significantly oral, and has had very few generations to adjust to the possible uses of writing. In short, with particular reference to the subject of my study, Indo-Fijians could be significantly advantaged in school learning over Ethnic Fijians. Of course not all Indo-Fijians were literate during their time of arrival in Fiji. However, they had long lived in cultural circumstances powerfully different because some in their society could read and write. They were long used to thinking of those who read and write as the more elevated because they can do this. They were used to the institution of the law, money-based commerce, political institutions in many ways centred on the written word (e.g. the passing of laws), and religion based at least in
part in scripture. It is easy to imagine that the mind-set even of illiterate Indians was significantly different from that of non-literate Ethnic Fijians, because their overall culture depended deeply on uses of writing and reading. The echoes of such differences in the present generation could also contribute to the differences in academic performance in science and other theoretically oriented subjects such as mathematics, economics, social studies, and even history, at school.

I also want to comment on what Levy-Bruhl (1923) writes about the difference between traditional, oral cultures and modern ones. He contends that the difference between the two cultures was to be explained on the basis of differences in their mental functioning. According to him, the so-called primitive mind constructed an “enchanted” world, a world occupied by spirits and demons, influenced by incantations and omens, whereas the rational mind gave rise to a scientific conception of the world, a conception clearly based on evidence and on principles of causal and rationally systematic explanation.

Once again, I would like to reiterate here my stand against the deficit theory. I actually disagree with Levy-Bruhl because what he says seems to imply that in an oral culture people’s minds do not function rationally. I believe that on the contrary, oral cultures produce minds that are highly rational at the tasks that face people who are in an oral cultural condition. People have to be ingenious about developing their arts of memory, adapting them to carry the optimal amount and varieties of information and to carry that information in the most memorable ways. Because that is what needs to happen, the reasons for explaining in one or another way why certain things are happening or not happening will be different from one oral culture to the next. So the thinking of people whose cultures are oral will seem far from objective, when compared to the thinking of science. But it is for all of that an impressive rational accomplishment.

Without their rational mindedness people whose culture is entirely oral would not have survived. Survival depends on appropriate adaptation of three things: structural, behavioural and psychological characteristics. If a people have survived, you can be sure that its culture displays these three types of adaptedness. Nothing could be more rational than for the adaptation to be managed well. Yet in any oral culture that promotes the survival and flourishing of a people we inevitably see such well managed adaptation.
It is true that societies whose cultures are entirely oral do believe in spirits, demons, omens, etc., just as Levy-Bruhl contends, but that does not mean that they have no rational mind. The talk of these things is woven into well-adapted arts of memory. Such talk may be a key part of an overall cultural accomplishment. We do it no justice by dismissing it in the terms Levy-Bruhl insists upon, as "primitive" "enchanted" construction.

For all of this, the ways of thinking of peoples whose cultures are oral are clearly different from science. They have a different aim, since memorability is key, whereas in science that function is largely taken care of by writing. (Today, knowledge is stored not just in the form of books and journals in libraries, but also increasingly by the internet, CD-ROM storage, virtual libraries etc.) When we consider the thinking of peoples whose cultures are oral, we do better justice to those ways of thinking by holding them separate from science than by comparing them to it.

In his book: How natives think, Levy-Bruhl (1926) claims that traditional thought fails to distinguish appropriately between a thing and the representation of a thing — believing that the representation carried some of the properties of the thing represented. One example mentioned by Olson is the Zafimaniry claim that "the centre post (of the clan’s chief’s house) is an ancestor".

Olson asserts that Levy-Bruhl’s argument is correct but I disagree. In an oral society like the Ethnic Fijian, metaphors and analogies are sometimes used in order to represent something in a way that a person with a different culture would find meaningless or totally different in meaning. Older generations in oral or primitive culture sometimes use these types of expression while they talk. They normally use analogous words and metaphors in their speech which to a person of a younger generation of their own or of a different culture would have a different meaning. To give an example, the Fijian word “Vauua” to a young Ethnic Fijian person would just simply mean “land” whereas for the older Ethnic Fijians, it has a much more general meaning. The term “Vauua” to the older Ethnic Fijian generation has physical, social and cultural dimensions, all interrelated. It means not only the land areas with which the people are identified, but also the social and cultural systems — the people, their traditions, customs, beliefs and values, together with other institutions established to achieve harmony, solidarity and prosperity. The other thing that I want to stress is
that, both primitive (oral) and modern (literate) societies also use analogies and words or phrases like these in some of their figures of speech.

I personally believe that there is another way in which the cultural differences described by Levy-Bruhl and others could be accounted for. Specifically, Olson's way of describing these differences, in terms of contrasting specific technologies of communication, seems to me far more illuminating. The invention of an alphabet, and later, printing technology, and ultimately even the technology of word processing and electronic flow of information, alters what it is rational for people to say and to think. Thus despite my disagreement above with Levy-Bruhl I can actually agree with what is proposed by Goody and Watt (1968) relating literacy to the rise of a certain new style of reasoning. It is true that the work by Goody and Watt was later criticised by Scribner and Cole (1981) who, when they distinguished literacy from schooling, found little evidence for a general effect of writing on reasoning. However, Goody's most recent work (1987) strengthens his original claims regarding the distinctiveness of the alphabet and holds fast to the notion that a written record has decisive practical advantages for carrying out a variety of cognitive functions.

Other early formulations of that view have been criticised and rejected by others. Some of the arguments presented to support this criticism were that: writing did not always and everywhere lead to democracy, science and logic; some non-alphabetic cultures evolved abstract sciences and philosophies; and, the evolution of Greek classical culture evolved from particular forms of political debate rather than from examining written documents.

Although there are contradicting arguments on this, I follow Olson in thinking that the invention and use of writing systems was instrumental and indeed essential for the formation of modern bureaucratic societies, and that literacy contributes in particular ways to the development of distinctive modes of thought — that are best conveyed through systematic education.

Olson (1994) mentions that earlier attempts to make this general perspective stick failed because of a series of oversimplifications.

For one, literacy was tied to alphabetisation rather than to notations generally. For another, writing was seen as embodying grammar and logic rather than as providing a representation of the grammar and logic of ordinary speech. Correspondingly, meta-linguistic knowledge and awareness was seen as all or none, either as a product of writing or as independent of writing. For another,
literacy was seen as direct function of a written text rather than as a way of taking texts by a group of readers. Finally, writing was seen as either superior to or as inferior to speech (p. 17).

Olson suggests that these mistakes all stem from their assumption that literacy has its effects through advances in ways of writing — i.e. the form of the script. He himself argues by contrast that conceptual implication arises from the ways of reading, for it is the art of reading which allows a text to be taken as a model for verbal form, that is, for “what is said”. These models of what is said according to him whether as sound, words or sentences are always incomplete, giving rise to problems of interpretation. Whereas scripts provide reasonably adequate models for what is said, they provide less adequate models for how what is said is to be taken. He argued that the problem of reading/interpretation then arises not from what texts represent — sounds, words and sentences — so much as from what they fail to represent, the manner or attitude of the speaker or writer to what is said. He thinks that our understanding of the world (our sciences) and our understanding of ourselves (our psychology) are by-products of our ways of interpreting and creating written texts, of living in a world on paper.

By exploring in the above section the theoretical perspectives of my study, I determine my own overall conceptual framework for considering how the ecological and socio-cultural theories can affect the learning achievement of Ethnic Fijian and Indo-Fijian students in science at school. I present this conceptual framework in Figure 4.
Figure 4. Ecological Contexts of the Child's Science Achievement at School
3.4. Empirical Literature and Specific Questions for my Data

This section reviews selected studies that are relevant to my project. By discussing these studies I shall sketch how some questions arise that I will put to my data in later chapters.

I am interested in science learning, yet the immediate reason for my study is the rather different matter of achievement on assessment hurdles. While level of achievement on assessment hurdles in the school science curriculum in Fiji may link only weakly with the level of actual learning of science, the nearly universal poor achievement by Ethnic Fijians is clear in that Ethnic Fijian children are for the most part not receptive to science. By contrast, the significantly higher scores among Indo-Fijian children tell a different story. What factors are there, then, that shape the one people to be at least some what receptive to science, and the other to be markedly unreceptive?

3.4.1. Interactions between the Child and the Teacher at School – A Microsystem

3.4.1.1. Teaching practices.

Two areas will be briefly covered in discussing this topic. These are: the various teaching and learning approaches used by teachers and the assessment in terms of the importance attached to external examination results by teachers.

For the teaching and learning approach, I intend to say more about some contemporary literature surrounding the different teaching and learning approaches and discuss how these approaches can affect learning. My discussion will include: the passive learning approach; the constructivist approach which requires conceptual change and active learning; and some literature on composite and straight class teaching and its relation to academic performance of students at school since this is one of the areas thought to be the cause of the differential achievement of Ethnic Fijian and Indo-Fijian students in school subjects. I will also briefly touch the differential importance that teachers attach to the external examination. At the end of this section, I will use this survey to raise some specific questions for my research.
3.4.1.1. THE PASSIVE LEARNING APPROACH

Some people tend to conceptualise learning as the transfer of prefabricated knowledge that then is stored in memory. This conception leads to the idea that science can be primarily learned as the accumulation of facts (an idea criticised among other places in Sutton, 1998). As a result of their (implicitly) holding such an idea, teachers may use a directive approach in teaching the subject. This passive view of learning can influence the students’ conceptions of what counts as work in schools. Classroom discussions of alternative viewpoints and negotiated consensus are not considered a part of the “work” of the classroom and simply are viewed as wasted time that hinders efficient progress (Baird & Mitchell, 1986).

Passive learning is a type of learning where the students are not actively involved in the lesson. In other words, it is the teacher who does most of the talking and writing while the students are just listening and doing what the teacher expected them to do. The teacher is more like directing and telling students what to do all the time. Rote learning may also be involved in passive learning. That is, teachers may give all the information he or she wants to deliver to the students in notes and students are expected to know this information by memorising or studying their notes. There is no question that the old directive approach of rote learning has at least some value in training, but it is naïve to expect that it must also generate understanding. Analysis of the process of linguistic communication shows that knowledge cannot simply be transferred by means of verbally explaining a problem. That is to say that it does not lead to understanding, unless the concepts the listener has associated with the linguistic components of the explanation are compatible with those the explainer has in mind. Hence, it is essential that the teacher have an adequate model of the conceptual network within which the student assimilates what he or she is being told. Without such a model as basis, teaching will fail to bring about understanding.

Glasersfeld (1998) clarifies that ‘Telling’ is not enough, because understanding is not a matter of passively receiving but of actively building up. Yet many who are involved in educational activities continue to act as though it were reasonable to believe that the verbal parading of facts and principles must eventually generate the desired understanding on the part of the students.

From a Piagetian view, the social aspects of understanding and learning are increasingly important (Solomon 1987; Taylor 1993), because knowledge construction
requires an active process of interpretation within a social and cultural setting by a learner (Roth 1995). It is important to emphasise that the most frequent source of perturbations for the developing cognitive subject is the interaction with others.

Many developmental psychologists now believe that the young child does not think differently from the adult. Phenomena that were interpreted in terms of Piaget’s stage theory are better interpreted in terms of specific alternative conceptual frameworks — novice-expert shift and theory changes in particular domains. Because of this, there nowadays seems to be a shift away from neo-Piagetian constructivism towards a non-Piagetian constructivist’s view of science teaching and learning.

Such a constructivist approach will be the next area I will now turn to look at. It can happen that the different approach used by the two ethnic teachers such as the passive and the constructivist approach may help to explain the differential achievement of the two ethnic groups in science at school. Ultimately I will need to use my data to evaluate this as best I might.

3.4.1.1.2. CONSTRUCTIVIST APPROACH

To understand the teaching approach that contemporary educationalists call ‘constructivist’, it is worthwhile to look at the meaning of the word ‘construction’. According to the Oxford English Dictionary, the primary meaning of the verb ‘construct’ is to form by fitting the parts together, or to frame, build, or erect. ‘Construction’ as a verbal noun is the action of so doing, but it can also denote the product rather than the process. Combining these, it can be said that ‘construction’ involves the fact that there must be some pre-existing material available together with some principle of construction which helps in the fitting together of the parts.

According to Piaget (1954), learning can be viewed as conceptual development. He thinks that knowledge about the world outside can be viewed as human construction. That is, all we know about reality is our tentative construction. So learning is not viewed as transfer of knowledge but rather as the learner actively constructing, or even as his or her creating knowledge partly on the basis of knowledge already held and partly on the basis of new stimuli. Although individuals have to construct their own meaning of a new idea, the process of constructing meaning according to Piaget is always embedded in a particular social setting of which the individual is part.
In teaching science, there is a need to consider the notions of both personally constructed and socially constructed knowledge. Personally constructed knowledge refers to what the learners are doing actively in learning — that is, to what the learner actually constructs for him or herself to some extent independently of the teacher. On the other hand, the learner can also gain some socially constructed knowledge which is agreed upon by others. As Driver (cited in Bell, 1993, p 28) states:

Learning science is therefore, seen to involve more than the individual making sense of his or her personal experiences but also being initiated into the ‘ways of seeing’ which has been established and found to be fruitful by the scientific community. Such ‘ways of seeing’ cannot be ‘discovered’ by the learner — and if a learner happens upon the consensual viewpoints of the scientific community, he or she would be unaware of the status of the idea. (Driver 1989, p. 482.)

Learning, then, according to social constructivists such as Vygotsky and Bruner, is an active construction of mental models by the learner in relation to her or his society rather than the transfer of knowledge. This does not mean that there is nothing stored in the human brain, but it does mean that knowledge has significant social aspects. For example Gergen (1995) thinks that knowledge can be distributed among the members of a certain community or shared by the community. According to him, knowledge is something that is between the individual and the social.

This is why some researchers in science education for example, Driver, (1984); Bell & Barker, (1982); Osborne, Bell & Gilbert (1983) give increasing attention to what students already know (their pre-existing ideas), and in particular whether students understand the scientific ideas they had learnt. From these researches arose the notion of ‘children’s science’ which is described by Osborne, Bell & Gilbert (1983, p. 1) as:

....the views of the world and meanings for words that children tend to acquire before they are formally taught science. Children’s science develops as children attempt to make sense of the world in which they live in terms of their experiences, their current knowledge and their use of language.

Research findings on children’s science have enabled some educators to come up with their ideas about learning science. For example, Bell (1993) thinks that when students come to a science lesson, they already have their own ideas and explanations of how things are the way they are and why they happen the way they do. As regards the preferred explanations from science, some may be taken in or up by the children and yet some may clash with their own pre-existing ideas and so be taken neither in nor up by the children. So learning:
...is not about filling students’ empty heads or about students acquiring new ideas, but about students developing or changing their existing ideas. Learning is seen as conceptual change, the construction and acceptance of new ideas or the restructuring of existing ideas. (Bell, 1993, p 23.)

One main constructivists’ approach to the involvement of learning is the conceptual change approach. From this comes the idea of active learning which is also discussed briefly with some drawbacks of constructivist approach.

• Conceptual change.

Conceptual Change Theory (Osborne, 1982; Bell and Gilbert, 1983; Hewson & Hewson, 1988) implies that students’ conceptions need to be exchanged for the new science conceptions. The term conceptual change denotes that learning of science concepts and principles usually involves major restructuring of students’ already existing pre-instructional conceptions. In other words, students’ pre-instructional conceptions and science conceptions are usually embedded in different qualitative frameworks.

In the late 1970s and the early 1980s especially, a predominant focus was that students’ conceptions (often called ‘misconceptions’) have to be extinguished and replaced by the correct science view. Research has shown that this is not possible. Indeed, there appears to be no study which found that a particular students’ conception could be completely extinguished and then replaced by the correct science view.

Most people think that old ideas are not usually thrown out completely in particular contexts. Usually, the best that could be achieved was the conceptual change (Chinn & Brewer 1993) in which parts of the initial idea, merge with parts of the new idea to form some sort of hybrid idea (Jung, 1993).

Conceptual change approaches therefore hold that the aim of science instruction is not to replace everyday views but to make students aware that in certain contexts, science conceptions are much more fruitful than their own conceptions. The key assumption of conceptual change approaches is that students’ learning should be considered by looking at their pre-existing ideas about the subject and that learning pathways have to be designed so that they lead from these preconceptions towards the science conceptions to be learned.

According to Scott (1992) there are two types of learning pathways: continuous and discontinuous. In using continuous pathways, one can start from aspects of student’s pre-instructional conceptions or framework that are at least in part compatible with the science view to be achieved. From there, a basically continuous passage of learning is possible. The other continuous learning pathway is that of reinterpretation (Jung 1986). For this
pathway, the strategy is different in that the starting point is a set of students' conceptions that appear to be in contrast to science conceptions. The key facets of students' conceptions, are then, reinterpreted in such a way that they are basically in accordance with the science conceptions.

In contrast to the above teaching and learning approaches, discontinuous pathways deliberately draw on the conflicts between students' conceptions and science's conception. Cognitive conflict, therefore, is a significant tool in these pathways (Scott, Asoko & Driver, 1992). There are three types of cognitive conflicts according to Scott, Asoko and Driver: students are asked for predictions and are challenged by the conflicting results of an experiment; there then arises both conflict between the students' ideas and those of the teacher, and conflict between the ideas of different students. The crucial issue in cognitive strategies is that students need to see the conflict. What appears to be clearly discrepant from the perspective of the teacher can be viewed as only marginally different or might not be considered discrepant at all from the perspectives of the students.

However, studies of the learning process have clearly shown that real learning pathways are very complex and cannot adequately be described by just conceptual growth or conceptual change (Duit, Goldberg & Niedderer 1992). They are quite different for different students of the same groups. They do not offer much explanatory insight into the process of individual construction of understanding learning pathways. It is somewhat difficult to come to a clear-cut conclusion regarding the success of conceptual change approaches. A key difficulty is that these approaches often include fundamental restructuring of more traditionally oriented science instructions. Conceptual change strategies in other words, often are only one facet within approaches that aim at making science instruction understandable and fruitful for the student in a very comprehensive way.

- Interactive learning.

Interactive learning is in fact derived from the idea of constructivism. This involves students in being active as inquirers and in being thus involved in the process of learning.

A brief review of the literature on primary science supports a model which involves pupils actively in the learning process. In 1977, Esler noted that traditionally, school science was considered to be what I have described earlier - an accumulation of facts. This emphasis according to Taylor, (1992) seemed to be changing now and school science is now considered to include not only knowledge but also manipulative skills, social skills, intellectual skills, and investigative and objective attitudes. This change in emphasis
should not only help children acquire these skills and attitudes but give them a more lasting interests in science, and in later life help them appreciate the close relationship between the problems of society and those of science (Taylor, 1992).

In order for students to gain more experience in science, teachers should make an attempt to have a high level of student involvement by providing opportunities for individual investigation. This view is shared by Carin & Sund (1980) and (Gallas, 1995) who think that young children come to science lesson with inquisitive natures and if they are involved in investigative activities, they can learn not only science concepts and principles but higher thinking processes as well.

Garson (1988) in her book 'Science in the Primary School' states that primary aged pupil science must be an active and not passive process. She further points out that following passive instructions by students can allow very little opportunity for them to develop the intellectual skills of true problem solving.

Vallet (1978) believes that a good primary school education should promote students to develop critical thinking skills. As stated by Longbottom (2000) “One of the major goals of science education is to build in children the capability of critical, analytical, rational thinking” (p. 78). According to Ennis (1991), critical thinking is scientific thinking and the development of critical thinking forms part of the justification for teaching science. This of course requires well trained teachers and an appropriate curriculum.

Researchers such as Clement (1987); Cobb et al (1989); Confrey (1984); Duckworth (1987); and Treffers (1987) have tried out some of the constructivist teaching approaches and have found them to be successful. Kelly, (1955); and Claxton, (1984) for example think that a constructivist approach is valuable if it is used in the science classroom situation. To these people, the method of memorising facts and training in rote procedures cannot achieve the levels of science learning that students themselves are able to achieve under a constructivist approach. Constructivism therefore may provide teachers and educators an accessible way to improve their methods of instruction. This position is understandable but there are others like for example Solomon, (1994) who tend to think otherwise. The question they often ask is: How can we know that the constructivist pedagogy in teaching science will produce the desired result?

One prominent constructivist, Richard White, has said “although the research on alternative conceptions has sparked interest in content, it has not yielded clear advice about how to teach different topics” (Fensham, Gunstone & White 1994, p. 255). Given the
necessity for any science programme to teach the content of science, this is a serious failure.

Many science educators are interested in finding out how on constructivist principles one teaches a body of scientific knowledge that we can not experience or see like for example atomic structure, and cellular processes. How can teachers use the constructivists' approach to teach ideas of viruses, or the earth's molten core, or say electromagnetic radiation which seems to have no connection with prior conceptions and is alien to common sense? How all of this is to be taught, without teachers actually conveying something to pupils is a moot point. This problem is well articulated by a British science educator Joan Solomon below:

Constructivism has always skirted around the actual learning of an established body of knowledge. ...students will find that words are used in new and standardised ways: problems which were never even seen as being problems are solved in a sense which needs to be learned and rehearsed. For a time, all pupils may feel that they are on foreign ground and no amount of recollection of their own remembered territory with shut eyes will help them to acclimatise. (Solomon, 1994, p. 16.)

The challenge for teachers lies in helping learners to construct these models for themselves, to appreciate their domains of applicability and, within such domains to use them. Most science teachers today still find this a problem. They try their best to explain things clearly by using metaphors, demonstrations and practical work to flesh out abstractions, to utilise projects and discussions for involving students in the subject matter and so on. They realise that many, if not most, things in science are beyond the prior experience of students and even beyond the capabilities of school laboratories to demonstrate.

The theory about constructivism may be easy but it is the practical component of it which some teachers find it difficult to implement. The constructivists' way of teaching science has some difficulties because different students will have different ways of thinking, so that their construction of ideas will also be different. Yet the teacher must somehow facilitate their coming together with a common, scientifically correct understanding.

Many teachers who use a constructivist approach to teaching become frustrated from the very beginning especially in thinking about what their constructivist module will be and about where they are to begin. However, they can always solve this frustration by sharing it with their students in terms of asking them what should be studied, how they can be involved and how the subject can be applied to their daily lives.
A constructivist module requires dynamic or active teaching and learning. Effective science classrooms cannot be passive environments where students merely go over information that will be used for examinations and or activities to verify its accuracy. In traditional science classrooms, students are expected to remember to get ‘the answer’ on quizzes and to make ‘correct’ observations in the laboratory. Rarely is real life context provided.

In using a constructivist module or approach, teachers can focus on problems, questions and unknowns. It means searching for answers and explanations. The searching means that students encounter many new questions and problems as well. In fact, the best constructive module results with students ending up in investigating many questions, identifying problems, and proposing actions interminably.

Constructivist teachers may explore how students see the problem and why their path towards a solution seemed promising to them. Real science learning can not be the result of teachers presenting information directing students or announcing a new constructivist module. Students must have a hand in constructing the problem and determining their actions concerning it. They must be involved with the activities. Some teachers teach science by beginning with real world issues and concerns. Hopefully, these will become student issues and not simply information teachers wish to present to students. As Ceccato, the Italian pioneer of conceptual analysis says (1974, p. 137):

The important thing is to show the child the direction in which to go, to teach him to find his own path, to retrace it and to continue it. Only in this way will he be able to assume a scientific attitude with which he can approach also things of the mind.

It will be very interesting to find out the type of teaching approach used by teachers in the teaching of science at primary school levels in Fiji today because this is one area which some educators and teachers assumed to cause the difference in performance between Ethnic Fijian and Indo-Fijian students in science at school.

From these considerations I have been brought to entertain the following questions, which I intend in later chapters to put to my data and assess empirically:

• How do the two ethnic groups of teachers teach science in their various classrooms?

• Are their approaches in teaching science different or the same?

• Do the two sets of teachers use the constructivist approach or the passive approach in their teaching of science?
• What are their reasons for using the method they used?

Issues related to the number of teachers as to the number of classes taken can also affect student’s learning of the subject and thus their achievement in it. Schools in Fiji practise both composite and straight class teaching of science. It can happen that this could also cause the differential achievement in science of the two ethnic groups of students at school. Literature of the effect of composite and straight class teaching on learning is covered in the next section.

3.4.1.1.3. COMPOSITE AND STRAIGHT CLASS TEACHING APPROACH

Composite classes are classes which consist of students of more than one grade that are taught by the same teacher usually in the one room whereas a straight class is a class which consists of only one grade taught by one teacher. Composite class teaching is mainly used when there are many classes and only a few teachers available to take all the classes. On the other hand, straight class teaching is mainly used where there are many available teachers to take each individual class.

In Fiji, there has long been a concern among parents and the public about the use of composite class teaching in Primary schools. This concern was raised in the recent Education Commission Report (Refer to: Learning Together: Directions for Education in the Fiji Islands: Report of the Fiji Islands Education Commission/Panel 2000). In that particular report, it was recommended that the government should increase the number of trained teachers entering Teacher’s College in order to increase the number of teachers at each school to reduce composite teaching and thereby to increase straight class teaching in schools. This was in response to parents’ and teachers’ perception and belief that students in the multi-grade or composite classes are usually not taught well and therefore achieve significantly less well than students within straight or single classes. Parents and members of the public think that composite class teaching does not allow students to achieve well because teachers have to concentrate their teaching on two or more classes so that they have less time for individual help with students.

Mason and Burns (1995); and Mason and Doepner III (1998) conducted research in some schools in the United States in order to find out about teachers’ views concerning composite class teaching. They found that the majority of teachers have negative feelings about teaching combination classes. The majority of teachers Mason and Burns interviewed thought that multi-grade or composite class teaching has significant
disadvantages, such as that teachers have to spend so much time in planning and preparing two curricula that they therefore spend less time on individual help with students of the different grades. Teachers also reported more class disruptions as they moved from the students of one level to those at another. Their baseline worry is that they were giving students less individual attention.

To cover the curriculum of each grade level teachers may endeavour to teach to both; however, the disadvantage of doing so is that it tends to divide each group’s instructional time in half. Such juggling of course also requires considerable mental and physical energy from the teacher. Teachers may think that combining the classes together and teaching at any one time to just one of the two curricula may solve this problem. However, as Mason and Burns found with their interviews with teachers, such whole class teaching does not allow any practical way to complete the two curricula within the teaching year, especially if the topics covered are very different from each level.

Mason and Burns also found that teachers who spoke positively about combination classes are the ones who are fortunate to have small class sizes and high achieving students. They do not experience the hard work faced by other teachers. Mason and Burns’ later research (1997) has led them to conclude that there are net negative effects from multi-grade classes at least in the United States.

However, it should also be remembered that composite class teaching is widely used in other countries around the world today. Arguably, in many cases it has positive effects on learning achievements. For example, in New Zealand, three quarters of primary school classes are composite classes (Wagemaker, 1993) cited in Wilkinson and Hamilton (2003). Composite class teaching is used mainly because of its advantage of allowing lower grade students to learn upper grade materials while upper grade students get review. In addition, students can also learn from each other especially when they work in groups.

Veenman (1995), in his research on “Cognitive and Non-cognitive Effects of Multi-grade and Multi-age Class” reported in his review of the literature on studies concerning the effect of multi-grade teaching on performance did not agree with other researchers who found negative effects of composite class teaching on students’ achievement. His later research (Veenman, 1996), where he collected observational data in multi-grade classes and compared it to data from single-grade classes, tended to confirm his previous findings that there is no difference in achievement between multi-grade and single-grade classes.
No research has ever been done to find out about the effect of composite and straight class teaching on achievement of students at school in Fiji. In my own research I have not directly examined the relationship between composite and straight class teaching and the achievement of students except that I have observed both composite and straight class teaching in schools of both ethnic groups and have interviewed teachers of both ethnic groups to find out how they feel about composite and straight class teaching.

From these considerations I have been brought to entertain the following questions, which I intend in later chapters to put to my data and assess empirically:

- Is composite class teaching practised equally much in schools of the two ethnic groups? If not, why are only certain schools practising composite class teaching?
- Is there any difference found for those who practice composite class teaching and straight class teaching with respect to how they teach science in the classroom?
- How do the two sets of Ethnic teachers feel about composite and straight class teaching?
- Could it be that Ethnic Fijian students do not achieve well in science because substantially more of their schools practise composite class teaching as compared to Indo-Fijian schools?

3.4.1.2. Assessment.

External or public examinations are significant features in most developing countries' educational systems including that of Fiji. Essentially, the pattern of examining in Fiji has its roots in the Colonial past where there are a lot of external examinations at Primary and Secondary levels. A system of education which has more examinations can affect the way teachers teach the subject at school. For example, teachers can turn to methods that involve rote learning or memorisation of facts. This is due to the fact that getting all their students to pass the examination and having the highest scoring pupil achieve an almost perfect aggregate score is rated very highly as professional achievements. These are the performance indicators by which many teachers assess themselves.

In light of significant research inside classrooms today, much is known about the influence of curriculum teaching on the achievement of students (e.g. Good, 1983; Waxman & Walberg, 1991). Some research has also been done on "teacher thinking" to
uncover the correlations between teacher behaviour, student behaviour and student achievement (Clark and Peterson, 1986). Results of these investigations are mostly used by researchers to aid teachers and teacher educators to address issues and problems of teaching more effectively.

In developing countries such as Fiji very little research is done to find out the influence of curriculum on the teaching and vice versa. As a result, very little is known about how culture frames and constitutes many aspects of education such as curriculum teaching, classroom processes, teacher-student interactions, parental roles and participations in education and indigenous students' participation in education. Yet the cultural environment may well significantly condition teachers' thought and their action in teaching. As the cultural psychologist Shweder (1990, p. 2) said: "...no socio-cultural environment exists or has identity independent of the way human beings seize meaning and resources from it". What this means in terms of the mental life of teachers is that they cannot isolate their thinking independently from the socio-cultural environment that frames and constructs it.

Teachers' approach in teaching can be influenced by the set curriculum. For example, Fuller, Snyder, Chapman & Hua (1994) in their research in a Botswana classroom to assess the degree of variability in teaching practice and whether the pedagogical variation is influenced by the curriculum and the state policy found that teacher behaviour in the classroom is generally simple, involves instructional tools and is teacher-centred; teachers' instructional routines rely on didactic instructions; and that their pedagogical approach is mainly influenced by the curricular structure which is influenced by the policy action.

This is very similar to what Clarke (2001) found in the analysis of teaching and learning in classrooms in Bangalore, India. Clarke found that culture powerfully and persuasively constructs teachers' implicit and explicit approach to their teaching. This is a reflection of the objective and practices of education in India, where according to the study's findings most of the teaching and learning is focussed on lower-order thinking typified by repetition and memorisation with lack of attention given to the development of higher order thinking such as is reflected in reasoning, analysis and creativity. As stated by Clarke (2001, p 166-167):

....By and large, the system methodically sharpens and hones students' lower order thinking skills, characterised by repetition and memorisation. Teachers, regulated by the primacy of the syllabus, help their students understand and know this syllabus in
its entirety through repetition and memorisation. Higher order thinking typified by
analysis and reasoning is rarely upheld in the Indian educational system.

This type of situation could be happening in Fiji where teachers' ways of preparing
students for external examinations can also be influenced by cultural conditions.
Specifically, the curriculum in some ways reflects the fact that the issue of exam success is
a key for some people, most notably for Indo-Fijians who do not have land. Under this
pressure Fiji's school system has become very exam-oriented. There are National
examinations at classes 6 and 8 as well as Forms 4, 6 and 7, and it can happen that Indo-
Fijian teachers especially operate within a social context where other significant elements
such as parents, other teachers, students, Ministry of Education and members of that
particular culture place some severe demands on them to maximise exam success by their
students. The influence of the curriculum and pressure from the community can force
teachers to narrow their teaching strategies just to those that best enable students to pass
examinations. Such pressures on Indo-Fijian teachers in Fiji are probably greater than any
on Ethnic Fijian teachers, except to the extent that the differential examination results have
become an issue for Ethnic Fijian teachers to redress.

From these considerations I have been brought to entertain the following questions,
which I intend in later chapters to put to my data and assess empirically:

- Is the method used by teachers to prepare students for examinations different
  or the same for the two ethnic groups of teachers?
- If different, how do Indo-Fijian teachers prepare their students for tests and
  external exams as compared to Ethnic Fijian teachers?
- If they are the same, in what way?
- What causes the way they prepare students for examinations to be the same?

3.4.2. Exosystem Influences on Teaching and Learning

3.4.2.1. The curriculum.

Educationalists, teachers and even parents and students often blame "the curriculum"
in terms of the content and context of the syllabus covered for its effect upon the learning
of the subject. Some people think that to learn science, teaching should concentrate on the
contents and the context. Both the content and the context in which science is learnt
influence the learning outcome (Driver, 1989). Others think that in teaching, the life
experience of the students should be involved in order for learning of science to take place
at all and genuine understanding of scientific concepts to ensue. That is, the contents and
the contexts of science learned by students should have some sort of link with their existing
knowledge and everyday experiences in order for understanding to take place. This section
will briefly discuss this conception.

3.4.2.1.1. CONTENTS FOR LEARNING SCIENCE.

The notion of what science should be learnt is also addressed by the constructivist
view of learning. For example, Driver and Oldham (1989) stated that there is a need for
sufficient time for pupils to share, reflect on, evaluate and restructure their ideas during
teaching. Indeed there is a need for more time for teaching and learning if constructivists’
method of teaching and learning is to be used in the classroom.

West and Pines (1985) describe how a constructivist view of learning implies the
components of conceptual development, conceptual resolution and conceptual exchange.
They describe the development of a student’s own intuitive knowledge as something like an
upward growing vine and the learning of school knowledge as the downward growing vine.
They suggest that perhaps science education should be more concerned with the upward
growing vine than the downward growing vine.

A constructivist curriculum would therefore contain more guidelines as to how, and in
what knowledge areas, to develop students’ conceptions and less prescribed scientific
knowledge. If the content of a science curriculum is seen from a constructivist’s
perspective, as mentioned above, the thinking skills required for conceptual change need to
be included (Osborne, 1982).

Fensham (1994) thinks that a curriculum content for “science for all” should have the
following characteristics: it ought to begin as an extension of what the learners already
know from their experience prior to schooling; its learning objectives (practical skills and
knowledge) should have criteria of achievement that most learners can realise at some level
and its pedagogy should exploit the demonstration and practical modes that are inherent to
much science and also to the cultural learning that occurs prior to and outside schooling.
He also argued that the content should be made up of a number of different types of
learning such as of theoretical knowledge, application of such knowledge, intellectual
skills, practical skills, problem solving, science traits and attitudes, impact of science and
technology, personal and social needs, the evolution of scientific knowledge, boundaries
and limitations of science.
Hodson and Reid (1988) support these ideas and argue for the content selected to be both relevant to the students and negotiated. They advocate that content is selected on the basis of what motivates students and suggest relating it to real life situations, emphasising humanitarian considerations, using children’s knowledge, experiences and interests.

Some researchers believe that the content to be learnt in science needs to be sequenced in order for students to understand what is covered. For example, Cagne (1970) came up with a theory of learning hierarchies by stating that people can only acquire pieces of knowledge if they already have certain pre-requisite knowledge. This notion is very similar to Piaget’s theory of cognitive growth, for Piaget argues that concepts are acquired in a hierarchical order. He thinks that the development of operational thinking occurs in all people in a sequence of stages. In fact the implication of this type of view to most people including some teachers is that some things cannot be learned by students if they are not at the right stage of intellectual development. That is, some things are beyond the reach of a student of that age or stage of development to learn. Some knowledge of the more fundamental concepts is seen to be required before moving on to a consideration of others. This is why some people think that the content to be learned needs to be sequenced from simple to complex scientific ideas. There are some critiques made about the work of Piaget (Novak, 1978; Rowell, 1984; White, 1988). However, some of his work has had an impact on the science education program today. For example his work was used as a basis and rationale for the Australian Science Education Project (ASEP). It was seen to give guidance on both pedagogy and the content of the curriculum. For example, in terms of pedagogy, his work encouraged science educators to take

an ‘active view’ of learning and attempt to match the types of experiences given to children to the general pattern of cognitive growth outlined in Piaget — working with concrete objects for younger children and progressing to ideas requiring more formalisation later (Driver 1982, p. 70).

In terms of the content, most curricula today are designed to take into account the different stages of cognitive development of students with respect to the sequencing of the content.

In Fiji, the curriculum development unit of the Ministry of Education emphasises the teaching of the contents by teachers. Certain examinable science topics are expected, so that teachers are sure to cover those topics before the examination, while other topics which are not considered important and are taught after the examination or in some cases are actually left out by teachers because of the thinking that it is not going to be covered in the
examination. Some of these topics or subjects which are not covered or examinable may be very useful for the life of Ethnic Fijians in their villages.

From these considerations I have been brought to entertain the following questions, which I intend in later chapters to put to my data and assess empirically:

- Do teachers teach all the topics given in the syllabus or only some?
- If they teach only some topics or all the topics, what are their reasons for doing it?
- Do both sets of teachers use content teaching when they teach science?

3.4.2.1.2. CONTEXTS FOR LEARNING SCIENCE

It is very important that the contexts of science learned by students should have links with their existing knowledge and everyday experiences or settings. The context in which science is learnt influences the learning outcomes (Driver, 1989). Our ability to use knowledge appears to depend on the context in which the knowledge was acquired (Bell & Brook, 1984). In fact, the context of the learning and the students’ existing knowledge will influence what links will or will not be made.

The settings are those relating to the students themselves, their home life, and the world of leisure, work and the wider environment. For example, studying of forces in an Ethnic Fijian classroom may be learnt in the context of say digging using the ‘I sau ni laulau’ or ‘digging stick’, or say moving a heavy load using an inclined plane or stick. The contexts act as a way to link the science (forces) with the world of the student (their own experiences and prior knowledge of digging or moving a heavy load or whatever).

Contexts which help students for learning science may differ between ethnic groups. Ethnic Fijian students may relate better to contexts which acknowledge and give value to their own experiences and culture. For example, astronomy may be linked to the navigation methods of their ancestors; studying chemical products used in modern medicine may be linked to the use of traditional medicine derived from herbs or plants which are well known to cure diseases; studying the use of fertilisers to retain soil nutrients may be linked to the traditional method of fallow system where planting is done in one area for one year and left vacant for several years to retain soil nutrients until planting is shifted back to the same area. So it is very important that what the curriculum cover should have some connection to students’ real life in their home environment in order for them to fully understand what is learned at school.
From these considerations I have been brought to entertain the following questions, which I intend in later chapters to put to my data and assess empirically:

- How well linked to the setting of the two ethnic groups of students are the topics that are covered in the curriculum? Is the science curriculum relevant to the life of both Ethnic groups of students?
- Does the content of the science curriculum link well with the lived world of the students?
- Is there a match between what Ethnic Fijian students or Indo-Fijian students learn in the curriculum at school with what they do at home or in their community?

3.4.2.2. Teacher qualities.

One of the most researched topics today is the influence of teachers on student achievement. Teacher characteristics which are easily assessed such as years of teaching experience and qualifications have been in focus for long in developing countries. A review study for example, by Husen, Saha and Noonan (1978) to find out the relationships of teacher characteristics such as educational attainment and teacher training, with student performance particularly in less developed countries by drawing data from thirty two studies showed that there is a positive relationship between the amount of teacher training and level of student achievement. Husen and his colleagues concluded that trained teachers in developing countries do make a difference in student achievement.

In Fiji, a report by the Fiji Islands Education Commission (2000) pointed out that schools that have well-trained teachers are the ones showing good performance and achievement level. The report also point to the poor result in examination of schools in rural areas as compared to schools in urban areas. It is likely that the teacher quality is probably lower in rural schools and that less experienced and qualified teachers tend to be sent to rural schools and this may contribute further to the lower quality and performance of rural students who are mainly Ethnic Fijians. From these considerations, I have been brought to entertain the following questions, which I intend in later chapters to put to my data and assess empirically:

- Is there any difference found in terms of the qualification of teachers for the two ethnic schools?
• Is there any difference found in terms of the experience of teachers for the two ethnic schools?
• What does the national figure shows about the quality of ethnic teachers in rural and urban schools?

3.4.2.3. Attitudinal factors.

A substantial body of research has accumulated in the last 2 decades that has examined the correlates of success in academic achievement in general and mathematics and science in particular. Attitudinal and affective variables such as interest in learning mathematics and science, motivation, and academic time have emerged as salient predictors of achievement in mathematics and science. These factors also predict mathematics and science avoidance on the part of students, which affects long-term achievement and career aspirations in the mathematics/science fields (Eccles & Jacobs, 1986; Helmke, 1989; Reynolds & Walberg, 1992).

3.4.2.3.1. INTERESTS, MOTIVATION AND ACADEMIC TIME

Some researchers reported that academic time correlates with achievement (Good, 1983; Good & Beckerman, 1978; Peterson & Fennema, 1985). Academic time is related to interest in a subject which is influenced by motivation and learning (Schiefele & Csikszentmihalyi, 1995).

Walberg (1981) advanced a theory of educational productivity on the basis of 120 research syntheses of over 2,000 studies (Fraser, Walberg, Welch, & Hattie, 1987). He reported that besides previous achievement, family and home environment, motivational variables, and instructional time have the largest effects on eighth-grade achievement. Fraser and colleague found that home environment and motivation affect later achievement through previous achievement.

A recent study conducted by Singh, Granville and Dika (2000) on schools in the United States examined the effects of motivation, attitude and academic engagement on eighth graders' school performance in mathematics and science subjects. In this research, they found that mathematics and science achievement among the eighth graders was influenced by motivation, attitude, and academic engagement. The results of the study were consistent with results reported by other researchers (Eccles & Jacobs, 1986; Fortier, Vallerand, & Guay, 1995; Grolnick, Ryan, & Deci, 1991; Reynolds & Walberg, 1992; Schiefele, Krapp, & Winteler, 1992; Wong & Csikszentmihalyi, 1991). They also reported
that academic time is also an important factor and mediates the effects of motivation, peers, interests and home environment.

It is asserted that the quality of instruction given at the early stage of development can have a crucial impact on the students’ development in their later stages and that this can also affect their interests and motivation. In the Fiji situation, it can happen that students’ interests in science may be affected by the type of instructions or teaching conducted by the teachers in their classes.

From these considerations I have been brought to entertain the following questions, which I intend in later chapters to put to my data and assess empirically:

- Do both sets of ethnic students and teachers have their interests in science in the first place?
- If yes or no, what are their reasons for liking and not liking science?

3.4.3. Direct Interactions between the Child and Parents at Home – A Microsystem

3.4.3.1. Parents’ role construction.

Involvement of parents in students’ academic life is one variable that would seem likely to have important potential for promoting students’ performance at school (Bloom, 1984, Seginer, 1983, Walberg, 1984).

Parents’ role construction (i.e., parents’ beliefs about the actions they should undertake for and with their children) develops as a function of their membership in varied family, community, and school groups. This role construction appears logically related to parental beliefs and actions regarding involvement in children’s schooling. Several investigators’ work has suggested that role construction is influential in parents’ involvement decisions. Ritter, Mont-Reynaud, and Dornbusch (1993), for example, included parental attitudes of “deference toward the school” and parental beliefs that teaching “is best left up to teachers” (p. 115) — both variables that may be seen as components of parents’ role construction — in their examination of differences among ethnic groups in parental involvement. Similarly, Chavkin and Williams (1993) reported differences among ethnic groups in endorsement of the belief that teachers, rather than parents, should be in charge of involving parents in the school; they also reported that parents, across the ethnic groups examined, expressed interest in a variety of potential
involvement roles (e.g., "audience," "home tutor," "school-program supporter" [p. 77]). Neither set of researchers, however, explicitly addressed the specific influence of parents' role ideas on their involvement decisions. Other investigators have simply alluded to the potential influence of parental role construction on parents' involvement decisions. Eccles and Harold (1993), for example, included parents' assumptions about their roles in children's education in their model of parental involvement during children's early adolescent years. Scott-Jones (1991) noted the importance of parental beliefs about linkages between parent responsibilities and teacher responsibilities in young children's literacy learning. These observations suggest that role construction and its constituent variables be given explicit attention in continued work focused on parents' reasons for becoming involved in their children's education.

Hoover-Dempsey and Sandler (1997) in their review on psychological theory and research critical to understanding why parents become involved in their children's elementary and secondary education found that one major contributor to parents' positive decisions about involvement in children's education is to be found in their construction of the parental role. Examination of psychological and educational research suggested that parents' construction of the parental role is likely to be influenced by general principles guiding their definition of the parental role, their beliefs about child development and child-rearing, and their beliefs about appropriate parental home-support roles in children's education.

Parents' role construction appears overall to offer some portion of the answer to the question: why do parents become involved in their children's education?

On the basis of anecdote and general familiarity with the two cultures, in Fiji, it is believed that parental influence and role construction significantly contributes to the differential achievement of Ethnic Fijian and Indo-Fijian students at school. It is possible that Indo-Fijian parents on the whole take a tougher line about their students' school work as compared to Ethnic Fijian parents. It could be related to how they see their role as parents. It could be that Ethnic Fijian parents believe that the education of the children is mainly the teacher's responsibility and that they have no part to play especially at home. They may think that their role is only limited with disciplining and looking after the children at home rather than in helping them with their school activities at home. This is one area which I intend to address in my investigation in later chapters of my empirical data. If its effect on the achievement level of the two ethnic groups is significant then in
the current push for means to improve academic progress of Ethnic Fijian students in science at school, the potential effect of parental involvement in students' academic and social lives definitely should be considered.

3.4.3.2. Parents' general academic guidance and support.

General academic guidance and support of parents can also affect students' performance. For example, a research on this aspect was conducted by Cordeiro and Carspecken (1993) on 20 Hispanic High School students in the United States to find out how this minority group succeed academically. The 20 students all came from low socioeconomic backgrounds and there was no role model of educational achievement of their families. Successful performance requires a separation between the dominant, individualistic culture of the United States and the minority Hispanic culture. They found that parents helped in this process by being 'strict' enough to try to keep their children from getting involved with 'negative' friends. Ultimately, each student had to decide to shoulder the responsibility for academic success alone, without full understanding or total support from the home. This was accomplished through a series of role models or care givers outside of the family.

Direct involvement of parents with children on their school work can have some influence on children's academic performance. For example, a study of direct and indirect effects of parental involvement on American High School Grades by Fehrmann, Keith and Reimers (1987) revealed that direct involvement of parents led to students increasing the time they spend on homework, which in turn has a positive effect on students' grades.

I also want to find out the direct involvement of Indo-Fijian and Ethnic Fijian parents in the ethnic schools I studied. It can happen that there is some difference in the direct involvement of the two ethnic parents with their children at home which may cause the differential performance of the two ethnic groups of students in science at school.

From these considerations I have been brought to entertain the following questions, which I intend in later chapters to put to my data and assess empirically:

- Are there any differences found in terms of the role played by the two ethnic parents at home? If so, what are they?
- Are there any differences found in terms of the activities given by parents to their children at home?
• Could it be that Indo-Fijian parents take a tougher line about their children’s school work than do Ethnic Fijian parents?
• If this is the case, then why do Indo-Fijian parents care so much more about their children’s school work than Ethnic Fijian parents do?

3.4.4. Exo-systemic, Macro-systemic and Chronosystemic Influences on Home Life/ Learning of Children

This section will discuss some literature concerning the characteristics of the social setting and the ways in which it can interact with students’ learning environment and thus condition the academic performance of students at school. These are some of the issues which can have indirect effect on the differential performance of the two ethnic groups of students at school. I will discuss this in three areas: the socio-cultural issues, the geographical issue and the political issues. Socio-cultural issues will include: the cultural conduct of life of the two ethnic groups which will cover their living situation, their adherence to traditional customs and the village authoritative leadership; emphasis placed on church and religion; qualities of the different languages; and the characteristics of a traditional culture based on orality and public memory arts. Geographical issue will cover the distribution of the two ethnic groups in rural and urban areas while the political issues will deal with the easy access to land and resources by Ethnic Fijians as compared to Indo-Fijians.

3.4.4.1. Socio-cultural issues.

3.4.4.1.1. CULTURAL CONDUCT OF LIFE

In this subsection I will discuss the way in which the two ethnic groups in Fiji each live in their community today, and concerning the significance for educational achievement of the different customs for which these two different peoples are well known. I will draw in part on a literature concerning Fiji itself, and also on a literature related to such cultural issues either in specific relevantly similar places elsewhere or in general.

Studies by Coleman, Hoffer and Kilfore (1982); Johnstone and Jiyono (1983); Walberg (1982); Walberg and Schanaham (1983) have demonstrated the significance of home background to academic performance of students. The home background of the students includes their socio-cultural level which according to Eckstein (1977), stands out internationally as a strong influence in explaining variations in achievement. Culture may
provide the motivation to achieve either success or failure. For example, Trueba (1991) thinks that failure of an ethnic group of people to learn may be due to their given socio-cultural system rather than to each individual. As he stated:

Failure to learn may be better understood as related to communication skills which develop in the context of culturally congruent and meaningful social exchanges. It is not an individual failure; it is a failure of the socio-cultural system that denies a child the opportunity for meaningful social intercourse, and thus for cognitive development. (p. 153.)

What this means is that an individual for example may not be achieving well at school because of the mismatch between the type of environment they face at school and the environment in which they are being brought up at home. For example, a child brought up in a communal system of working together collaboratively in doing tasks at home may not be well adapted to the Western school system where individualism and competition are practised. So in this case, it is the culture of the child which produces failure and the individual cannot be blamed for that. Kishore (1983), in his research on the locus of control in relation to academic achievement of Ethnic Fijians and Indo-Fijians in Fiji, found that differences between the ethnic groups in cultural values and beliefs (socio-cultural factors) played a more significant role than socio-economic factors played in causing the discrepancies in academic performance of the two different ethnic groups. To fully understand these socio-cultural factors, it is important to look at the respective lifestyles of the two ethnic groups under study.

Indo-Fijians in rural areas live mostly in scattered homesteads and are mainly at a far remove from their nearest neighbours. For those who live in urban centres, their houses are mostly fenced and guard dogs are almost present in every house to warn and protect the family from any intruders passing by. This epitomises their private or independent lifestyle as compared to Ethnic Fijians who mostly live together in villages in a communal system where social interaction is the very centre of their culture.

Some studies have stressed the fact that due to the type of competitive education in Fiji, Ethnic Fijians who are culturally used to group work and cooperation are usually at a disadvantage as compared to Indo-Fijians. For example, Muralidhar (1989) argued that the present education system in Fiji is highly individualistic and formalistic in nature. As a result, it does not fit well in particular with the traditional Ethnic Fijian cultural norms which value cooperation and group work. Indo-Fijians on the other hand according to him appear to prosper more under this competitive education system. Nabobo & Teasdale
(1994) argue on a similar point that there is a total disregard of Ethnic Fijian ways of learning in the formal school system throughout Fiji.

So it can happen that the two different ways of living of the two ethnic groups has some effect on their differential performance in science at school.

From these considerations I have been brought to entertain the following questions, which I intend in later chapters to put to my data and assess empirically:

• How much opportunity is given in schools in Fiji for group or collaborative learning?
• Do Ethnic Fijian students respond differently to group or collaborative work at school as compared to Indo-Fijian students?
• From field observations, which of the two ethnic groups of students seem to have better opportunity for study at home and for what reasons?
• Is there any reflection of the students’ traditional customs at home seen in learning science at school?
• If so, what are some of the noticeable practices found for the two ethnic groups of students at school?

3.4.4.1.2. VILLAGE AUTHORITATIVE LEADERSHIP

Before turning to look at how I think the authoritative leadership could influence Ethnic students’ learning of science at school, I will first describe the hierarchical segmentation of the Ethnic Fijian village. This is important because each level of segmentation has a leader involved, who is liable to display a traditional type of authoritative leadership. In addition, I will also briefly touch the introduction of a system of administration by the Colonial Government on Ethnic Fijians which is still in use today to govern them and works in a similar way as the traditional authoritative leadership system practised in every Ethnic Fijian villages.

The Ethnic Fijian village is the primary unit of local organisation in the Ethnic Fijian society. Within the village unit are three subdivisions namely the: “mataqali” or clan, which may consists of two or more descendants which may or may not be patrilineally related to one another; the “i tokatoka” or sub clan comprising the descendants in one line of a particular person through several generations; and the individual family of the same descendants living together in a household. Several individual families make up the “i tokatoka”, several “i tokatoka” make up the “mataqali” and several “mataqali” make up the
village. The hierarchical segmentation can be represented in the form of a diagram as shown.

**Ethnic Fijian Village Hierarchical Segmentation**

![Diagram](image)

It is important to remember that in each of these village hierarchical social structures there is endless relativity in the concept of a “leader”. For example, in the individual family level, the eldest man is the “chief or leader in his own house”. Likewise, in the “i tokatoka” and the “mataqali” level, it is the senior male member who is regarded as the leader within his own group and in the whole village there is a selected chief which is regarded as the whole leader of the various hierarchical segmentation described. So in almost every level of these hierarchical segmentations of the village social structure, there is always the leader.

Selection of leaders at these various village social structures is mainly based on seniority of descent in the male line. It is whoever is the eldest who takes the position of the office. It is therefore possible to identify who should be the leader in each of these social levels. The leader will be ranked on the basis of the relative seniority of the founding ancestor. Apart from seniority of descent, there are other characteristic attributes of an Ethnic Fijian leader. This includes the ability of the person to have superior knowledge of customs and village lores. If there is any traditional function in the village, he should be in a position to explain to others how such function is to be held and teach the younger members on how the function is supposed to be carried out in the village.

There is some slight difference in terms of how a village chief is selected apart from the other social leaders in the village hierarchy. A village chief is selected and installed by a special group of people in the village who handle all the arrangements for the ceremonial installation. At the ceremony, the new chief drinks the ceremonial “yaqona” (kava) given
by one of the member of this group. In addition, their selection is based mainly on chiefly lineage apart from seniority and superior knowledge of customs and lores.

The selection of the chief or the leader is surrounded with taboos and it is a widely held belief of Ethnic Fijians that if anyone breaches it, it is going to bring supernatural punishment. This is why the "followers" in Ethnic Fijian villages show respect and deference in their relation with the "leader" or chief. Whenever they talk to the chief, they use the Ethnic Fijian term 'Saka' (meaning: "Sir" in English); they crouch in his presence; and clap their hands after touching him or after he had eaten. They are usually bound by these rules of respect towards the chief or their leader by maintaining silence in his presence.

In all these hierarchical social village level, the type of leadership entertained is the same. They all used the traditional authoritative type of leadership where the orders always come from the top. The leader or say the chief has the power over all group activities and the individuals have very little choice as to whether to join or to leave the group. In this case, the administrative structure depends very much on the traditional hierarchy and what ever the chief or the leader says has to be obeyed with very little say from the followers or people under the leader.

As already stated in Section 2.6.2 of Chapter 2, the vision of the Colonial Government was to protect Ethnic Fijian culture by restricting them to stay in their own villages and for their own leaders or chief to continue to practice their own type of authoritative leadership for their people in their own villages. The Colonial Government then introduced a special system of Ethnic Fijian Administration very similar to the village hierarchical social structure already described. The Colonial Government thought that this would both serve the purpose of protecting Ethnic Fijian culture by the continual use of traditional leadership system and at the same time enable Ethnic Fijians to get used to the modern or Western system of administration or leadership they brought with them.

Briefly, under this type of administration, there are also hierarchical levels like what is found in the village social structure. The Fijian Affairs Board is the controlling and top authoritative body of this new type of Fijian Administration and there are people who work under the Board like the 'Roko' (administrative head of a province), the 'Buli' (administrative head of a district) who works under the 'Roko' the 'Turaga ni koro' (village headman) who works under the 'Buli' in seeing that village activities are carried out. In most cases, the positions of the 'Roko' and 'Buli' are taken by chiefs for the thinking that
people are going to obey or follow whatever is required by them for the proper running of Ethnic Fijian Administration in the village. Like the Colonial Government body this Ethnic Fijian Administrative body also has three distinctive parts namely the legislative, a judiciary and an executive. On the legislative part, there are representatives from the Village Council, the District Council, the Provincial Council and the Council of Chiefs which send their representatives of Ethnic Fijian people to the Legislative Council. In terms of the judiciary, there are Provincial police and native courts which administer the Ethnic Fijian Regulations. (The post of Buli and Provincial Police was later disestablished in 1985 and is no longer in use today). The Fijian Affairs Board which is right on top has both legislative and executive powers. It appoints and pays its own officials who are required to carry out its policies. This introduced Ethnic Fijian Administration forms a large part of the machinery by which the resulting Colonial government policies for the social, political and economic development of Ethnic Fijians are executed. In fact, this Ethnic Fijian Administration which the Colonial Government introduced is like a government within a government and is still used in Fiji at the present time.

Nayacakalou, (1975) in his book Leadership in Fiji mentions some of the conflicting effects of the use of this traditional type of leadership used in Ethnic Fijian villages and said:

...There are many contexts in which the legal rules enforced by the Fijian Administration conflict with the perceived advantage of the village, for example when a man is required by the village headman for work just when he plans to earn a little money for his child’s school fees; or when he goes to town to obtain employment and has to pay a Commutation Rate for the privilege of leaving his village. (Nayacakalou, 1975, p 118.)

Since independence, such practices mentioned by Nayacakalou were somewhat relaxed and the situation in Ethnic Fijian villages today seems to be moving very slowly away from the leader-follower situation where some village people are now moving away from the village to settle independently on their own piece of land and do whatever they wish to do rather than following orders or calls from their chief or village headman on the activities to be done in the village. The situation may have been caused by the influence of Western system of being independent which in most cases is also part of the Indo-Fijian way of living. Such an independent way of living is now being observed to be practised among Ethnic Fijians living in urban areas. This is likely due to the fact that in urban areas, people no longer rely on the traditional authoritative leadership but instead are more used to the modern democratised type of leadership used today which involve freedom of
speech and expression. This could also explain why Ethnic Fijian students who are brought up in urban and mixed schools tend to perform much better than those who are brought up in rural areas. Ethnic Fijian students attending urban schools may get used to the individualistic and independent life they experienced with Indo-Fijian children at the mixed schools and because of the match between this culture and the school culture, their performance in these mixed urban schools is on average better. It could also explain why Indo-Fijian students are doing well academically as compared to Ethnic Fijian students who in most cases are living in rural areas.

It is likely that the over-emphasis of traditional authoritative leadership structure in Ethnic Fijian villages can have some detrimental effect on Ethnic Fijian students too at school.

From these considerations I have been brought to entertain the following questions, which I intend in later chapters to put to my data and assess empirically:

- What do the two Ethnic groups think about the traditional authoritative leadership type of administration practised in rural Ethnic Fijian villages?
- Does it affect the role of Ethnic Fijian parents in caring for their child at home as compared to Indo-Fijian parents?
- If Yes, in what way?
- What type of system is used by Indo-Fijians in their living?
- Does this system affect their roles at home?
- If No, why?

3.4.4.1.3. PLACE OF CHURCH AND RELIGION

The church or the religion could play a prominent part in the differential performance of the two ethnic groups at school. Christianity, brought to Fiji by Missionaries roughly 5 generations ago, is the main religion for the Ethnic Fijian community where as for Indo-Fijians they have different religions with the main ones being Hindu, and Muslims.

Ravuvu (1988) in his book on Development or Dependence describing the pattern of changes in a Fijian village emphasises how Ethnic Fijian people in his own rural village tend to place church as the most important thing in their life rather than anything else. In his other book, (Ravuvu, 1983), he also mentions the fact that many Ethnic Fijian communities today give high priority to the construction of a church building if they had none, or construct a larger and better structure if they had a small one even though some of
them do not even have permanent houses. He mentions that many Ethnic Fijian people are still afraid to openly violate Christian rules and other contractual commitment with the church for fear of being punished by the new Christian God. As he states:

Although the majority of the villages in Colo have not been able to acquire permanent houses of wood and iron, much of their effort was concentrated upon raising funds for the new $40,000 church. This is not a new phenomenon. Giving priority to “the service of the Lord” in order to be “saved from purgatory” is as old as the church itself (Ravuvu, 1988, p. 31).

He mentions that Ethnic Fijian people in both towns and villages tend to occupy a good proportion of their non-working time in church-going and church-related activities on Sundays and most days during the week.

It can happen that Ethnic Fijians may place more emphasis on church rather than on the necessary things required for the education of their children as compared to Indo-Fijians, a difference which may in turn have given rise to the differential performance of the two ethnic groups of students at school.

From these considerations I have been brought to entertain the following questions, which I intend in later chapters to put to my data and assess empirically:

- How highly do parents respectively within one or the other ethnic group value church or religion relative to education?
- By what if any overt or deliberate actions do they instil these attitudes of their own into their children?
- What reasons do they offer in defence of what they do?

3.4.4.1.4. SOME FEATURES OF THE DIFFERENT LANGUAGES

The acquisition of a language plays an important role in the development of a person’s thought system. Yet languages can be very different from one another with regard to the intellectual dispositions that they epitomise and the practical circumstances for which they are suited.

In Fiji, the three dominant languages are Fijian, Hindustani, and English. English is the main medium of instruction at school while both Fijian and Hindustani languages are only emphasised at lower class levels (classes 1-3). Present-day Ethnic Fijian language possesses a much enlarged vocabulary as compared to its size in the nineteenth century. This can be explained in terms of the interaction of the one language with other newly arriving languages, and the alteration of the social landscape, pursuits and thought
structures given the arrival of new peoples. Inevitably, new words were needed, for example for ‘book’ and ‘reading’. In a literate culture the words in a language can be looked up in a dictionary, thus grounding the distinction between “literal” uses of words on the one hand, and on the other hand either figurative or outright incorrect uses of words. In an oral culture there is no firm basis for the distinction between “literal” and “non-literal” uses of words. Specialist vocabularies permitting precision of thought within highly literal modes of thinking are luxuries that can be afforded culturally only long after writing takes hold within a culture and becomes significantly used.

The situation with respect to the Ethnic Fijian language is that language is at most mid-way between the condition it traditionally had and that which it will one day acquire as a result of reading, writing, and important public institutions that depend on them, such as science. The situation with respect to Hindustani is markedly different. It is true that within the culture with which it is associated are far more significant dimensions of orality than can be seen within, say, Pakeha New Zealand culture. Yet speakers of Hindustani are descended from people who have had the technology of writing for thousands of years, as well as many dimensions of culture that depend upon this technology — such as a partly scriptural basis for religion, an institution of law, theoretical pursuits such as mathematics, and empirical science itself. There have been dictionaries among this people for a very long time, and the basis clearly exists in the language for being literal in precise theoretical respects.

From the perspective of situated cognition, learning means change from one socio-cultural context, usually the everyday context, to a new, science context, or in other words changes from the practices of one culture to those of another (Cobern & Aikenhead 1998). As language is a key aspect of culture in the sense used here, science learning also is viewed as change of languages. Learning science according to Lemke (1990) is to learn the language of science. So if one community’s language practices are further than those of another community from resembling the language practices of scientists, it is likely that its children will find science the more difficult to understand. As stated by (Lemke, 1990, p x):

When we talk science, we are helping to create, or recreate, a community of people who share certain beliefs and values. We communicate best with people who are already members of our own community: those who have learned to use language in the same ways that we do. When the people with whom we are trying to communicate use language differently, use it in ways that make sense of a subject differently than we do, communication becomes much more difficult.
To elaborate on this, we might say that there are two different communities intersecting one another in any science classroom situation: the science teachers’ community, comprised of people who already speak the language of science, and the students’ community, comprised by contrast of people whose language (or thus whose whole “Form of Life” in the sense of the philosopher of language Ludwig Wittgenstein\footnote{See his \textit{Philosophical investigations}, G.E.M. Anscombe (trans.), Oxford: Blackwell, 1953.}) is markedly antithetical to that of science. In fact many teachers are but marginal members of the former community, a fact that in some ways compounds the difficulties that the teachers face in communicating science to the children in their charge.

To some extent, the problem may just be that it will be difficult for the students to understand the science language used by teachers if they have not come across those or similar terms in their own language. On the other hand, if the student’s language does already have terms which can express the scientific concepts with which they are asked to become familiar, then it is likely that they will find it easy to understand the science. However, significant dimensions of the problem may be much deeper and less tractable than possession of an unsuitable vocabulary or lack of possession of a suitable vocabulary. The linguistic challenges for some children perhaps devolve on a deep-lying difference between their very form of life and that of scientists or even the teachers of science; difference of vocabulary is perhaps but a weak indicator of this deeper issue.

In considering the Ethnic Fijian and Indo-Fijian cases in the science classroom, it is likely that the type of culture which has linked for many thousands of years with writing, reading, and activities for which these activities are necessary conditions will have a vocabulary that is more favourable to science learning at school than does a culture shaped much more strongly by orality and uses of oral memory arts. This problem is likely to be observed in classroom situations where teaching of science is done in both English and students’ own language. However, we might seriously underestimate the extent of the difficulty and the difference between the two cultural groups if we attend simply to the question of \textit{vocabulary}. There is a broader and deeper question, concerning the whole \textit{Form of Life} in a Wittgensteinian sense; and while I would like to investigate it, I have struggled in this connection to distil some relevant research questions that I can usefully put to my data. I need to say more (see next sub-section) before introducing the deeper-going questions. Suffice it to say for the time being that I have been brought to entertain the
following initial questions about the languages in Fiji, questions which I intend in later chapters to put to my data and assess empirically:

- Within the two respective ethnic groups how do teachers explain difficult scientific concepts in the curriculum to their students?
- Do they explain such concepts in English or in their own language?
- How do teachers of both ethnic groups find teaching science in both English and their own language in the classroom?
- What if any difficulties do teachers face in explaining such concepts?
- Do their students find it easy to understand the terms or words used?
- Could it be that Ethnic Fijian students' under-achievement in science is related to the difficulties they face in terms of the relatively meagre Fijian vocabulary when it comes to teachers' explaining scientific concepts in the curriculum?

3.4.4.1.5. GULF SEPARATING ORAL CULTURES FROM SCIENTIFICALLY ORIENTED ONES

An oral or traditional culture such as that of the Ethnic Fijians is very different from contemporary scientifically oriented culture such as I have myself experienced by my studying science to high levels. In some ways I have personally found it more difficult to estimate the differences accurately because I share in both cultures. Some of the differences which I am going to argue might not be considered by other people, particularly those of oral cultural background, to be as marked as I now estimate them to be, or as much the cause as I estimate them to be of the differences in levels of achievement in school science of Ethnic Fijian students as compared to Indo-Fijian students. The differences that I now recognise can be explained under the following headings.

- Ways of disseminating beliefs and validating knowledge.

As international, hegemonic and seemingly universal as scientific knowledge may be, there nonetheless is a plurality of knowledge systems, and each knowledge system, including that of science, has a historical and cultural context. Fiji's educational system presents fragments of Ethnic Fijian, Indo-Fijian and other minority knowledge systems that have come from different cultural and political circumstances. It also presents aspects of the knowledge system of science. Children acquire much of their knowledge outside of school. A key question is what do they make of this great mix of influences? On the basis
of observations that I have made in the field, and my experience as a person belonging to an oral culture, I intend to discuss whether Ethnic Fijians are held back in science because they are influenced by their culture to have an alternative understanding of how official knowledge gains its validity. I will also examine the case of Indo-Fijians in Fiji and will argue that they more readily accept the kind of understanding a scientist has of how official knowledge must gain its validity.

Science can be characterized as having a singular orientation to literal, objective truth. One consequence of this orientation is that practitioners of science recognize a difference in principle between on the one hand what people may think or say and on the other hand what it would actually be correct for them to think or say. In science, no matter who says what, it potentially could be wrong. The key question is: how good is the evidence for it? In other words, because science is constituted by a recognition that anyone can err, science concerns itself crucially with the question of evidence. In science, it is not supposed to be the station of a person so much as it is the quality of the evidence that the person can adduce, which can argue that what that person thinks should become the way of thinking of other people as well.

By comparison, the traditional ways of thinking and talking in an oral culture can quite fail to mark out a distinction between what (as it happens) is thought or said and what (in fact) is actually objectively true. In an oral culture, people have a way of thinking and talking that is geared very much towards everyone being in agreement with their elders or with one another as a community. Such a way of thinking may have useful functions, but it is scarcely oriented as science is to objectivity and to literal truth.

It is actually difficult to say whether or not such traditional ways of thinking and talking can be fairly classified as systems of belief. It’s not clear whether the word ‘belief’ should even be used here because the English word tends to have a meaning that is directly associated with objective, literal truth. ‘believes’ is often thought to mean simply ‘believes true’ i.e. ‘believes literally true’ i.e. ‘believes objectively to be the case’. But the thought structures surrounding the English word ‘believes’ have adjusted to what they are now during cultural development over tens or hundreds of generations in the presence of literacy and theoretical inquiry. The English-language conception of ‘belief’ may also be tied to scriptural, “revealed” religion, and thus to the expectation that to “believe” (in a religious sense) is to accept as literally true the word of the Bible. Needham (1972) has argued that belief as a category is a recent cultural development and was first formed by the practice of
people's publicly affirming faith in God. 'Belief' (in the relevant sense from scriptural religion) is supposed to be a strongly literal mental attitude, and it is not clear that all cultures sustain that kind of literalness of thought.

Where Indo-Fijians and Ethnic Fijians in Fiji are at with respect to these issues is an important question, and I intend to devote a lot of attention to this question in the course of my further work. I believe that the situation is shifting generation by generation but that present-generation Ethnic Fijians still in large numbers for much of their lives participate in traditional thought structures that are not like those of science.

In a traditional or oral culture such as the Ethnic Fijian, knowledge and information is usually spread by way of mouth usually from the elders to the younger generation who trust and obey whatever is relayed by the elders, so that they become willing to say precisely the same things. In this sense members of the younger generation tend to believe what their elders say without question. What is not clear is whether this kind of belief is the same as "believing to be literally true".

Following and obeying whatever is said by the elders is part of their custom and is seen in every part of their communal living from the whole village situation to each individual family. For example in the village, there are channels in which information is passed on from the chief to the various clans to sub-clans and down to individual families. Such channels for flow-of-information are still very much in use in most Ethnic Fijian villages today. Whatever the chief says is obeyed and not questioned by the whole people in the village. The same custom is seen in every individual family where the children or the young obey and follow whatever is said by the elders or the parents without questioning. To question in any way whatever is told or instructed by elders is regarded in Ethnic Fijian culture as bad manners and as showing disrespect. Children are often taught firmly by their parents to avoid doing such things at home.

In looking at this situation, it can be seen that knowledge or information is received and in some sense believed simply because of the trust that the younger generation holds in whatever is said by the older generation. Since the older generation is taken to know more because of the length of time that they have lived and have been experiencing things, the younger generation trusts what they say. While the younger generation willingly says the same things that their elders have told them, and thus willingly thinks along similar lines, it is not completely clear that they thus form a literal belief in what their elders have told them. They operate with notions of trust in authority, but it is unclear, partly for this
reason, whether they hold those things that they trust on authority to be part of literal, objective, truth. It is not that they would positively deny that those things are true; the point rather is that they think within categories significantly different from the scientific ones of literal, objective, truth.

In an oral culture it is desirable that most of the beliefs that there are should be held in common, and that they should be memorable. In the case of the beliefs of people in a scientifically oriented culture, there are no such requirements. It doesn’t matter at all in scientifically oriented cultural conditions whether more than a tiny minority of people ever come to consider, say, that gamma ray bursts come from remote cosmic cataclysms over distances of billions of light years, or that paramecia have evolved considerable internal sophistication even while remaining unicellular, or that benzene molecules gain in chemical stability because of resonance in the outer bonding electrons. The fact that such proclamations are highly esoteric and thus the concern of specialists helps to ensure that their worth will be judged simply on the basis of evidence. The functioning of thought in the context of oral culture is quite different.

During my investigation, I interviewed many members of the two ethnic groups in order to find out what type of thought system they have and whether or not it matched the way science orients itself to literal, objective truth. The result of my interviews especially with community elders strongly suggested to me that people of the two ethnic groups have significantly different thought systems. The ethnic Fijian thought system is based on oral tradition (completely different from how science is oriented). By contrast, the Indo-Fijian thought system better respects the distinction between what is thought or said and whether what is thought or said is literally true, and so tends to better resemble the scientific thought system.

Of course my purpose in the present chapter is not to discuss what I believe my data show, but rather is to discuss what questions I have put to my data. Suffice it to say for now that on the basis of the above considerations I have been brought to entertain the following questions, which I intend in later chapters to put to my data and assess empirically:

- When Ethnic Fijians believe whatever is said by their elders, is it the same as believing something to be literally true?
- What about Indo-Fijians? What type of thought structure do they have?
• Is their thought structure similar to that of Ethnic Fijians where everything is
told by the elders is expected to be true because they are taken to have lived
longer and thus know more?

• If not, then which of these thought structures better resembles that of science,
in which things that are believed or accepted are accepted as literal truth?

• Could it be that Ethnic Fijians are held back in science because they are
influenced by their culture to have an alternative understanding of how
official knowledge gains its validity?

• ‘Traditional’ versus ‘modern’ intellectual society.

In a traditional or oral culture like Ethnic Fijian, the process of belief dissemination
develops little awareness that there may be any alternatives to the established body of
beliefs. By contrast, modern or scientifically oriented cultures officially make a virtue of
challenging received ideas and inventing viable alternatives. Ethnic Fijian society is
significantly ‘traditional’ or thus structured in some ways oppositely to that of Karl
Popper’s vaunted ‘Open Society’, whereas scientific oriented culture is ideally ‘open’ in
Popper’s sense, or as I shall say, ‘modern’. I believe that Indo-Fijian culture is significantly
more ‘modern’ in the relevant sense than Ethnic Fijian culture, or at least that it is
important to investigate whether such a difference exists in broad terms. My concerns here
very closely resemble Popper’s, for Popper believed that only an opening of society could
produce the transition needed for the take-off from tradition to science. To Popper, this
transition implies a growth in the awareness of alternatives. Popper also implied that this
transition requires that communalism be replaced by individualism.

For my own part, I believe that it is the awareness of alternatives which is crucial for
the take-off into science. Pace Popper, both communal and individualistic societies can
assimilate science and can even involve themselves in its advancement. But an individual
from whichever sort of society does not acquire the dispositions of a scientist without first
developing awareness that whatever may be the established body of beliefs there always are
potential alternatives to it.

Traditional and oral culture like that of Ethnic Fijians can reason excellently in the
idiom of their beliefs but they hardly reason outside, or against their beliefs because they
have no other idiom in which to express their thoughts. In other words, the absence of any
awareness of alternatives makes for an absolute acceptance of the long-established beliefs
of their people, and removes any possibility of questioning them. For example, in any Ethnic Fijian village there are certain sacred grounds, such as where ancestors first settled and also burial grounds of high chiefs, which people are not permitted to use or even set foot upon. These places are typically regarded by Ethnic Fijians as taboo. People are often told by their elders that these areas are out of bounds and people are not supposed to go there for if they do, something unfortunate is going to happen to them.

I recall a time in the village when groups were working communally to clear the bush in order to create a plantation, when one of the young men happened to weed very close to the ancestral house site called “yavutu” which is sacred to the people of the village. An unfortunate thing then happened to this young man, when he lost all his hair after two weeks; but not until this event happened did people in the village attach significance to his having weeded very close to the sacred ground. However, when his hair fell out, this is what they blamed for it. There was no other alternative explanation given by the village people as to the cause of this unfortunate event; instead, people’s thought automatically centred on the belief which is told to them by the elders.

When I spoke to people of the village about this, they tended to put aside the hypothesis and explanations that I tried to bring up, such as that there must have been some sort of disease suffered by the victim or he must have got some blood problem which could cause by natural means the loss of all his hair. Their reasoning seemed resolutely to centre on their traditional belief without considering other things outside that. This is what I mean when I say that a traditional and oral culture like that of Ethnic Fijians hardly reason outside or against the established beliefs. They have but the one belief system in which to express their thoughts. They hardly think that their thought is wrong because it is in the texture of their thought that whatever is told by their elder is always correct. The degree of fear and respect that one acquires in relation to a sacred place or object is determined by the peoples’ past experiences, and of what people believe they are being told. A disturbance of the sacred is for most of them a disturbance of their own thinking and feeling. It creates tension and conflict within the person as well as in the community. Thus it can be seen that most Ethnic Fijian ways of behaving are those which are consistent with the concept of the group. They do not often take their individual belief away from the belief of the whole community. Until such time as this concept of the group is changed, they will continue to maintain and preserve whatever the group believes.
Another example to illustrate the point is the Christian belief which is often emphasised to Ethnic Fijians that prosperity, peace and good life, could be achieved only if the people first served the Kingdom of God and gave willingly unto his work their attention, labour and wealth. The people continue to serve the church and provide all that they can to support church activities in the hope that their needs and aspirations will be fulfilled if they do all these. Some of them even owe money for their children’s school fees yet ensure first that they have completely paid their church dues. They have been brainwashed by Priests and church Ministers to believe in the Christian principle. The belief which emphasises that the individual must work hard for his own good and assume responsibility for his own welfare has been dropped by the people. To try and take away this thought system from them would be very difficult just because of their belief that whatever is told by the Priest or Minister is true because of his hierarchical position in the church and because he is regarded as the ‘man of God’.

This of course is different from a scientifically oriented thought system where there is a highly developed official awareness that criticism can be a good thing, and that people should be free to consider alternatives to the established body of belief. In scientific oriented culture, ideally all angles are taken in looking at a problem; an established body of belief ideally does not monopolise what can be thought.

In light of the above discussion, I will highlight the following questions that I intend to take to my data in later chapters and thus analyse empirically:

- What causes the thought system of oral cultures like Ethnic Fijians to be ‘traditional’ and not ‘modern’ like literate cultures?
- Do all generations of Ethnic Fijians have this type of ‘traditional’ thought system?
- If not, then why are only some having this type of thought system?
- Could it be related to literacy?
- If so, in what sense?

- **Literacy and intellectual ‘openness’**.

Writing and literacy are thought by some people to have been the key enabling conditions for the very ignition of science. Such authors contend that writing and literacy are in large part responsible for the rise of distinctively modern modes of thought such as we observe in science and in other contemporary fields such as law and politics. I have
discussed some of these studies already in Section 3.3.2. These studies support the view that in literate cultures, people's consciousness of language itself is very much structured by their writing system.

I believe that writing helps us come up with different modes of thinking because the presence of a text can allow us to interpret, discuss and criticise things very easily compared to if it was to be given orally. This is possible because writing can allow us to set two pieces of text side by side in order to check them for identity or to look for relations between them. It would be difficult to do this orally because of the limited amount of information that can be stored in any one person's memory. Thus while writing is used to preserve information much as oral memory arts do, it helps us to easily identify the items of information in a systematic order in relation to other items of information available. It is often difficult to do this orally especially when there is more information given out orally. The other important thing to mention is that being equipped with a writing system, one is capable of preserving in writing everything that could be said orally. This in fact tends to set the stage for the evolution of a new, literate form of discourse, and hence for a new mode of thought.

My argument tends to agree with what is proposed by Goody and Watt (1968) relating literacy to the rise of a certain new style of reasoning. It is true that the work by Goody and Watt was later criticised by Scribner and Cole (1981) who, when they distinguished literacy from schooling, found little evidence for a general effect of writing on reasoning. However, Goody's most recent work (1987) strengthens his original claims regarding the distinctiveness of the alphabet and he tends to stick to his earlier notion that a written record has decisive practical advantages for carrying out a variety of cognitive functions.

It is for this reason that I think there are differences in what is stored mentally when one speaks as opposed to when one writes. For example, Hildyard & Hidi (1985) in their study on oral-written differences in the production and recall of narratives amongst children who are still acquiring literate competency found that there are structural differences between the written and oral productions of elementary school students. Their study showed that because writing permits closer attention to detail and makes repeated scanning possible, children who write are better able to recall their productions than are children who narrate. This showed that in writing, children learn to notice the wording and develop the ability to examine, vary, and edit their wording in order to make the discourse or text a
more precise reflection of the intended meaning. Similar findings were also reported by Hildyard and Olson (1982), Horowitz (1968) and Sachs (1974). They all found that children's recall of what they read is qualitatively different from how they recall language they hear.

In considering this fact it can be said that if a culture is well used to literacy from many generations back this will confer an advantage within school learning, as compared to a culture that remains significantly oral, and has had very few generations to adjust to the possible uses of writing. In short, with particular reference to the subject of my study, Indo-Fijians could be significantly advantaged in school learning over Ethnic Fijians because they have been culturally influenced by the system of reading and writing for many generations before their arrival in Fiji during the indentured system.

It may be for this reason that people from long-literate cultures are more likely to find school subjects such as science easy to grasp especially when it is taught at school, as compared to the experience of people from cultures that were until very recently predominantly or exclusively oral.

A very important question one may ask after considering all the aspects discussed above that separate oral cultures from scientifically oriented ones is whether or not a person can belong to both cultures. This is finally discussed here according to my own experience.

- Can a single individual belong in a thoroughgoing way to both kinds of culture?

I believe that a single individual can belong in an almost but not quite thoroughgoing way to either kinds of culture, but that in doing so, it is likely that the person may lose some familiarity with his or her own culture. It may be like learning half of the things here and half of the things there that at the end, the person may not succeed in achieving the aims of the new culture without losing parts of his or her original culture.

This is probably why certain Ethnic Fijian elders are double-minded about schooling, as I have discovered directly during my interviews with them in my field study. Some of them feel that school dropouts when they return to the village do not any longer follow their traditional village lore as they should, and at the same time, have lost many of their traditional customs because of their long absence from the village or community. Consequently, when they drop out from school and return to the village, they are at a loss with respect to all the traditional ways, yet at the same time cannot apply what they have learned in science at school to practical issues facing their villages. In short, to some
Ethnic Fijian elders the knowledge of school dropouts seems a dead loss. Nothing of any good came from the time spent in formal education and much was lost. They blame this on the school, or worse, on schooling in general.

The children who are successful neither in the village nor at school may well be confused as to which type of culture to follow. That this kind of confusion seems common is why I personally think that a single individual cannot fully belong to both kinds of culture. However, I believe that an individual person can cross from thoroughgoing membership in a traditional or oral culture to a thoroughgoing membership in the literal or scientific oriented one so long as he or she takes great trouble about it and does not shut himself or herself up into limited alternative explanations of his or her beliefs. To set the stage for change from a traditional or oral to a scientific outlook, there should be a highly developed awareness of alternatives to the established body of belief.

I personally believe that such a crossing may not have to be made by a larger community if it is to happen at all. I am considering myself as an example in proving what I have mentioned here. I am the person in my village with the most significant amount of formal education and in most cases whenever I come across incidents like what I have already mentioned or stories told by elders for example, which are contrary to my thought, I always enquire about it and in most cases I tend to disagree with what they believe. They will say that I do not believe it because I am not in the village sufficiently much of the time to follow the traditional system of their beliefs. This again indicates that their traditional way of thinking is not at all open to alternatives. It is as though their beliefs and thought hang together somehow in a closed container that cannot be extended.

As I have already stated, they do not often think that their traditional thought may be wrong. My own way of thinking is oriented more towards the scientific ideal which implies that even experts are fallible. I seek to believe what is well evidenced rather than what is generally held simply on the personal authority of the elders. On the basis of my own crossing from the one to the other culture to this extent, I am inclined to think possible the crossing from thoroughgoing membership in a traditional or oral culture to a similarly thoroughgoing membership in the culture of science. Any person can cross over from the traditional or oral culture to the scientific culture as long as there is a presence of a vision of alternatives. However, the question which some may ask is: What enables a person to change or to cross over from the traditional or oral culture to scientific culture?
The answer I think of is that motivation and will-power enables a person to change or cross over. In my case, it is the motivation of my parents, combined with my will-power that came later when I discovered that educational achievement could lead to other kinds of success. In addition, I have needed a vision of alternative thinking and to achieve this, a person needs to have besides the tradition-bound sense of understanding or thinking also a broader and different sense of understanding and thinking. As a result of education, people can be made more likely to look at things in alternative ways and not only concentrate their thought system on a very limited area conditioned by their pattern of ritual behaviour and belief. Yet how successfully education can have such a broadening effect depends in part on the background people bring to it. Education is the way forward but is not easily able to have its full effect given the hold of traditional thought forms amongst Ethnic Fijians and how antithetical these are in some ways to Western knowledge. For Ethnic Fijian students to move from a traditional or oral culture to a scientific oriented one there is a need to break this barrier by encouraging the education of the Ethnic Fijian people.

I myself believe in what I said that we are likely to lose some of our culture if we cross over from one culture to another because I am also experiencing this with my life. I can say that while I am a well educated person in my village, I can also admit that my being absent from home for a very long time due to my trying to gain literacy in the form of higher education opportunities, across all the years from my early childhood days until now, has cost me a lot in terms of my knowledge of and familiarity with traditional Ethnic Fijian customs.

These considerations led me to ask the following questions, which I will take to my data in later chapters and answer empirically as best I might:

- Are Ethnic Fijian teachers who are better equipped to think scientifically at the same time less in tune with their own indigenous culture?
- Are Indo-Fijian teachers who are better equipped to think scientifically at the same time less in tune with their own culture?
- What significant differences, if any, are there between the two situations?
3.4.4.2. Geographical issues.

3.4.4.2.1. RURAL AND URBAN DEMOGRAPHIC DIVIDE

During the earliest years of the indenture system, Ethnic Fijians sometimes lived near Indo-Fijians on the same estates. However, conflicts between the two races prompted the Colonial government to separate them (Gillion, 1962). One Colonial policy used to protect the Ethnic Fijian culture was to leave them in their own villages to their traditional ways. Ethnic Fijians were not allowed to work in the sugarcane plantation and Indo-Fijians were forbidden to live in Ethnic Fijian villages. In addition, the Education Board prohibited Indo-Fijians from attending an Ethnic Fijian school and vice versa (Norton, 1990). So it could be said that the geographical distribution of the two main ethnic groups in terms of where they live and attending separate schools could be the cause of the differential educational achievement of the two ethnic groups at school.

The situation in Fiji today is that the majority of Ethnic Fijians live in rural areas and outer islands as compared to Indo-Fijians. The achievement gap is a function of many other gaps such as for example the gap in resources between urban and rural schools. Urban schools may be well facilitated with things like TV, Computers, Libraries, Newspapers, telephones etc. which helps to facilitate learning whereas rural schools may not have or very little access to them. According to Johnstone and Jiyono (1983) the interaction of students with such facilities is very important in enhancing students’ learning achievement at school.

The majority of Ethnic Fijian schools are located in rural areas today because of the majority of Ethnic Fijians living in rural areas. As a result, the majority of Ethnic Fijian students attend rural schools, compared to Indo-Fijians who attended mainly urban schools. Urban schools are mainly ethnically mixed schools with better achieving students usually because of its availability to resources which enhance teaching and learning. This could be a major factor for the differential achievement of the two ethnic groups at school. For example, a study by Harris (1975) on the achievement of sixth form students in Fiji indicated that most Ethnic Fijian students who succeed in sixth form were the ones that received their education in schools of good academic records. Narsey (1994) and my previous study, Dakuidreketi (1995) to find out about Ethnic Fijian students performance at the University of the South Pacific found that Ethnic Fijian students did not perform well because very few of them attended ethnically mixed schools which often have superior
performance of students. Narsey (1994) also found that Ethnic Fijian students in good mixed secondary schools performed significantly better than their counterparts in Ethnic Fijian elite schools located in rural areas.

It could be that the availability of school resources and facilities in urban schools as compared to rural schools contributes to the differential achievement of the two ethnic groups at school. A survey by Nabuka (1984) point to the disadvantaged state of Ethnic Fijian schools compared to Indo-Fijian schools in their level of facilities (e.g. science laboratories, number of books in the libraries, and the variety of modern office equipment) in their rural location. A report by the Fiji Island Education Commission (2000) still mentioned this problem in rural Ethnic Fijian schools. It may be that this demographic divide of the two ethnic populations gives rise to their achievement gap in school subjects including science.

The physical build-up of the homes of the two ethnic groups may also have some effect on how their children do their studies at home which may have some indirect effect on their children’s performance at school.

From these considerations I have been brought to entertain the following questions, which I intend in later chapters to put to my data and assess empirically:

- Is there any difference in terms of the resources found for the two Ethnic schools studied?
- What are the views of the two ethnic groups on the effect of rural and urban inhabitants on the performance of the two ethnic groups of students at school?
- Are there any differences observed in terms of the physical build up of the homes of the two ethnic groups? If so, what are they? What is the effect of such difference on the work of the child at home?

3.4.4.3. Political issue.

3.4.4.3.1. EASY ACCESS TO LAND AND OTHER RESOURCES

The attitude of students towards their school work can be affected by some outside influences too which in turn can affect their performance in their school subjects including science. For example Narsey (1994) in his study on the Ethnic Fijian students’ performance at the University of the South Pacific found that Ethnic Fijian students
probably did not have the attitude to work hard because things like scholarships, employment and resources in general were relatively easy to come by for them. It is understandable that the present government has implemented an affirmative action plan to improve the situation of Ethnic Fijians. However, it can happen that this system of easy access to resources, scholarships, positions and promotions can accentuate rather than abate the disparity in academic performance between the two different ethnic races. Ethnic Fijian students and parents will think that even if they do not achieve well academically, they will still be given these opportunities because they know that the government will always be helping them anyway. In such an environment, students may, more or less inevitably, develop a careless attitude to academic standards and performance.

The availability of more land among Ethnic Fijians as compared to Indo-Fijians may be the cause of the differential achievement of the two ethnic groups at school. It could be that Indo-Fijians work hard at school and achieve better in education because they know that that is their only means of survival whereas for Ethnic Fijians, they have their own land in their various villages which they can survive upon if they do not do well at school.

It could also be that Ethnic Fijian parents in rural areas have not really appreciated the importance of education in their lives because of its conflict with their traditional customs and cultural attributes as compared to Indo-Fijian parents.

From these considerations I have been brought to entertain the following questions, which I intend in later chapters to put to my data and assess empirically:

- What are the two ethnic groups’ views about the question of land issues in relation to the differential achievement of the two ethnic groups at school?
- How highly do parents respectively within one or the other ethnic group value education relatively to other interests, for example the land?
- Is there any difference in terms of the attitude and motivation of the two different ethnic groups towards their school work?
- If so, what are the differences and why would one group have a greater need for achievement in life than the other?
- By what if any overt or deliberate actions do they instil these attitudes of their own into their children?
- What reasons do they offer in defence of what they do?
CHAPTER 4
Research Method

4.0 Introduction

In this chapter, I will begin by describing my rationale for the method I used to do this research. I will then move on to describe the preparatory stages before I explain the data collection techniques and procedures. I will then discuss the data analysis and finally in the last section, I will briefly describe the writing-up process.

4.1. Rationale

The present study used both qualitative and quantitative methods to find out the reasons for the differential achievement of Ethnic Fijian and Indo-Fijian students in science at primary school.

Research method in general can be described as a theoretical discussion of the ways in which the research is conducted, and includes a discussion of the field work, research processes and the writing. In particular reference to qualitative methodology, Taylor and Bogdan (1998) stated that:

Qualitative methodology refers in the broadest sense to research that produces descriptive data, people's own written or spoken words and observable behaviour..... It is a way of approaching the empirical world. (P. 7).

I have used a qualitative approach in order to understand the ways that the participants make sense of different experiences that they face within both the school and the home settings — the two main areas I originally chose to look at in this particular research. I wanted to focus upon participant's perspectives and to make sure that their perspectives were presented as accurately as possible, (Bogdan & Biklen, 1992, p. 32.)

In qualitative inquiry, the researcher is the instrument (Patton, 1990). Therefore the validity and reliability of qualitative data will depend to a great extent on the methodological skill, sensitivity, and integrity of the researcher.

In this thesis, I chose to do an intensive study of the school and the home microsystem of the two different ethnic groups in order for me to find out the multiple
interactions that are going on in these two settings which according to Bronfenbrenner's (1979) ecological theory can affect the student's psychological growth and development. Thus I chose to carry out an intensive study of the teaching and learning of science at primary school classrooms together with the cultural background and the home upbringing of the students in order to find out as far as I am able some of the causes for the differential achievement of the two ethnic groups of students in science at school. I am taking the child as a base in these two micro-settings and I looked at what interactions the child has with the teachers at school or the parents at home or the peer group and other members of the family or community and also the sorts of activities, the roles which characterise these microsystems of the child.

In keeping with the ecological theory, my research also examines some aspects of relationships between the home and the school as well as selected exo- and macrosystem influences. My study further acknowledges the historical specificities of Ethnic Fijian students participating in my study (in Bronfenbrenner’s terms – chronosystem).

4.2 Preparatory Stages

4.2.1. Ethical considerations

Before I conducted my field work in Fiji in 2001, I worked on my proposal for a period of six months detailing the aims, research questions and research approach, literatures related to my study and the time line for my research. I submitted my proposal, for approval for my research from the Human Ethics Committee of the University of Canterbury. Compliance with ethical guidelines which govern research at Canterbury has been an important consideration for my research, as discussed below.

4.2.1.1. Anonymity, confidentiality, pseudonyms

One of the most important issues I faced in presenting this research concerned the need to protect my participants’ identities. Given the areas in which I conducted my research in Fiji, any promise of anonymity remains ambitious (Tolich and Davidson, 1999). The very way participants speak or the anecdotes they have shared with me, risk exposing their identity to readers who might know the individual
participants. In contrast to anonymity, confidentiality (where connections between what is said and the speaker's identity are unidentifiable) was more easily promised - (Refer to Appendix C for copy of consent form). In this research, I assigned pseudonyms to all participants and withheld aspects of their character that might show their true identity.

With respect to this commitment to confidentiality, I have made sure that all the audio-tapes and hard copies of transcripts are securely locked, and when in transit, they were always in my possession. Where people are mentioned in reported sections of the transcript, I have described their identity with the role they had. For example, teachers I would describe as either male or female mentioning not by room number but rather simply by class level the class they teach, and by pseudonym the school in which they are teaching. I believe that this has been a successful strategy to convey participants’ meanings while preserving my commitment to confidentiality.

4.2.2. My Position as an Insider/Outsider

In doing any research, the researcher’s position as an insider or outsider is crucial in gaining knowledge and understanding of the people or area under study. Some insider researchers claim to have a more privileged and balanced view while some outsider researchers believe their neutrality grants them greater objectivity and role flexibility (Wolf, 1996). According to Zavella (1996), “we are almost always simultaneously insiders and outsiders” (p. 141) and should discuss what this means for our particular research projects.

I agree with Zavella that I came to this research as both insider and outsider. In my work within the Ethnic Fijian schools and community, the participants and I were all Ethnic Fijians and we had all experienced varied degrees of understanding of the Ethnic Fijian culture. In relation to all my research work in schools, it is relevant that I was once a school teacher, and so can consider myself an insider among teachers of both ethnic schools. However, my position as an Ethnic Fijian put me as an outsider in the Indo-Fijian community and also my position as a PhD student put me as an outsider for all of my participants particularly those from my own cultural background.

Before I went out to do my field work, I asked myself a number of questions such as: Would my experiences within the Ethnic Fijian community or village over
the many years be to my advantage and make for enhanced rapport? (Olesen, 1994). Would our shared positioning as teachers enhance or restrict the research? Would my age and ethnicity limit at some instances the data gathered? I wrote down my responses to these and similar questions, starting a process of Journal writing that I maintained throughout my field work.

My background proved to be important when I discussed this research with my participants. For example my being an Ethnic Fijian and a teacher provided some insider positioning which established my credibility. Prospective participants who know my situation well did not have any problem with their participation in my research. However, at some stages of the data gathering, participants who did not really know me well asked me who I was, who is this research for and why was I doing it? Once I clarified all this to them, they willingly participated.

Having an established relationship with my participants was extremely helpful for without their cooperation, this research project would not have proceeded so easily. I also realised a particular problem of being an insider. For example, the fact that I had been a teacher at secondary and tertiary institutions and had long mixed around with Primary teachers of both ethnicities had the potential to create the feeling among some of the teachers that I had worked at much higher levels than they had. This had the potential to make them concerned not to allow me to see the real situation taking place in their various classrooms. Potentially they might have felt the need to pretend to do things in a proper way because of my presence.

On the other hand, being an outsider had some positive advantages. For example some Indo-Fijian parents because of my position felt more comfortable in talking to me as a teacher and a parent rather than as an Ethnic Fijian male.

4.2.3. Before Entering the Field: Pilot Study in New Zealand

Since the two main data collection techniques I planned to use in my field study were interviews and observations, I was advised by my supervisors to try out these techniques first at some New Zealand primary schools. I sought permission from the Principals of two schools to do my pilot study in their schools, (Refer to Appendix D). Both principals agreed and I began constructing separate questions for the teachers, students and parents or community members based on my research questions. I
prepare an observation template to record my observations during the teaching of science in these New Zealand classrooms.

Since the New Zealand setting is completely different from the Fiji setting, my questions on the pilot New Zealand Schools did not cover all of what I planned to find out in Fiji. I later modified my interview questions to include other areas such as the perception of various participants about the difference between oral cultures and scientifically oriented ones. Separate interview questions were constructed for teachers, students, parents and members of the community, (Refer to Appendix E).

I constructed my observation sheets to include descriptions of classroom activities, behaviours, actions and a range of interpersonal interactions between children and teachers and organisational processes evident in the classroom. Through my pilot work, I aimed to get the opportunity to experience the reality of an observation and interview setting and to practice the listening, questioning and the technical skills that are part of conducting interviews. At the same time, I was able to gauge the usefulness of the timeline I had constructed in my proposal together with the qualities of the information and consent sheets I had drafted.

My several visits to these two New Zealand primary schools observing and interviewing students and teachers was a very effective strategy just as I had hoped. Students’ and teachers’ responses to the draft questions and the draft observation template I prepared highlighted various ways in which I needed to include for observation to use later in my field study in Fiji.

In consultation with my supervisors, the pilot study prompted me to change and improve all my paper work — making the consent sheets and observation sheets clearer; drafting my letter to Head Teachers of the Fiji schools, rearranging my timeline and reworking the interview questions in a more concise format.

Consents from teachers and students in Fiji were obtained in writing. Letters were sent to respective Heads of schools chosen before the research was conducted giving a brief explanation of the purpose of the research, (refer to Appendix G). I requested the Heads to inform his or her staff about my proposed visit. The letter also mentioned my intention to conduct observations inside and outside the classroom and to interview teachers with some of their respective students during the visit. A consent form was included in the letter sent to respective heads of schools where research was conducted. (See Appendix C).
I verbally informed parents and members of the community about the research purpose when I went to their community, and I obtained their verbal or written consent before I conducted interviews with them.

4.2.4. Entering the Field

The field work took place in Fiji for a period of six months beginning in May 2001 and ended in November of the same year. Fiji schools have a total of three terms. First term begins at the end of January and ends at the end of April. Second term for that year began in mid-May until mid-August and third term continued from that time until it ended in the first week of December. The time of my visit allowed me to be in the schools for the last two school terms of 2001.

My earlier plan was to focus my study mainly on two schools together with the respective home environments along with the larger contexts of the two ethnic groups. I was particularly interested in schools which are largely taught by teachers from the respective ethnicity; however this earlier plan changed as I will describe later.

The two schools that I initially selected were both familiar to me and located in an area that I knew very well. I had strong prior connections with one school having studied there myself. The other one was known to me indirectly – through my brother who teaches close to that area. Given the intensive nature of my study, this familiarity was an important factor in my selection of these schools.

I wanted to see similar activities covered by each school within the same term, because I was interested in looking at the interactions between the children and the teachers of both ethnic schools particularly in terms of the classroom activities before students sit for their classes 6 and 8 examinations towards the end of the second school term. I decided to spend alternative fortnights visiting either of the selected schools — that is, to visit one school for two weeks and move on to another school for two weeks and having repeated visits to the two schools until the end of my six-month study.

I began my field study on the Ethnic Fijian rural village and school that I knew best, Natoa village and its primary school. This was the village and school in which I was born and reared, and in which I lived for much of my young life. I spent the first two weeks of May in Natoa village living with my own relatives and carried out my investigation at the village school and the community. During the next two weeks, I
moved to an Indo-Fijian school — Dioka Primary, where I stayed with my younger brother who teaches at a nearby secondary school.

After I completed four weeks of observation at these two ethnic schools, I had a telephone conference with my supervisors in New Zealand concerning my visit to the two ethnic schools. Through our discussion of my field observations thus far, it became clear that the main difference was the type of teaching practised at the two ethnic schools. That is, one of the schools was practising composite class teaching (Natoa) whereas the other was practising direct class teaching (Dioka). I had not realised that the reason for this difference was the size of the school. Because the two schools were not of the same size, they did not practise the same type of teaching (one practising composite class teaching while the other had straight class teaching). I realised that to compare well what was happening inside and outside both Ethnic schools, there was a need to look at similarly sized schools. This meant that the two types of schools should be of the same size, should practise the same types of teaching and should also have the same socio-economic level.

This initiated me to look for two other schools — one Indo-Fijian school with the same size and socio-economic status as the Ethnic Fijian school of Natoa, and one Ethnic Fijian school with the same size and socio-economic status as the Indo-Fijian school of Dioka.

In this way I decided, while in the field, to intensively study four schools instead of only two as earlier proposed. This meant that I had to select two additional schools that had similar socio-economic status and grade level to those of the two schools already visited. Grades of schools in Fiji determine the number of teachers allocated to each school and whether or not straight or composite class teaching is carried out. My intention was to minimise variation among the ethnic schools under study, yet to have studied straight versus composite class teaching in both ethnic environments.

I obtained a list of all Fiji Primary schools from the Ministry of Education and using the information about the grades of Primary schools in Fiji (explained in Table 4), I was able to easily identify and select my other two schools. I chose Kristi Indian School which has the same level (ED 6D) and socio-economic status as the previously studied Ethnic Fijian school of Natoa and one other Ethnic Fijian rural school (Loma District School) which also has the same level (ED 5E) and socio-economic status as
the previously studied Indo-Fijian school of Dioka. (Please refer to section 2.9.4. on Chapter 2 for the description of school levels.)

My choice for these two extra ethnic schools was also based on the fact that I have close relatives and school mates living in the vicinity of these schools with whom I could stay while conducting my field work. In addition, I knew some of the teachers teaching in these two schools and I thought that this would enhance my communication with staff and students, overcoming any problems that might result from the relatively shorter notice they received about my visit compared to the other two schools I had already visited.

I was fortunate to encounter no problems with my communication with teachers and students, once I was introduced to them by the teachers whom I already knew very well. Both schools accepted my request to conduct my research with them and I managed to mix around freely with teachers, students and members of the community during my study at these two additional schools.

My earlier plan was to also visit two ethnic urban schools to be able to look at its parallel with the rural schools I visited. I retained this and visited these schools in the third school term.

4.3. Data Collection Techniques and Procedure

The field work was carried out by using four kinds of data collection techniques. This includes multiple observations; semi-structured open-ended interviews; document analysis of prescribed syllabi and selected policy documents; and using my own written experiences and reflections of being a student and teacher in the Fiji education system for some time. This allowed for greater understanding of both my participants’ perspectives and the contextual factors (Bogdan & Biklen, 1998).

4.3.1. Multiple Observations.

Multiple observations is the technique that allowed me to obtain rich descriptive data through spending substantial amounts of time in the school and in the community listening to people’s spoken words, engaging in conversations with participants and observing the teaching and learning and participants' activities and behaviour at school and within the community.
Most of the time I spent in the field work was used for observations in terms of the interaction between students and teachers at school together with the interaction between students and parents or community members at home.

My observation at school was made along the dimensions of classroom teaching, physical set up of the school, and activities done by students and teachers. In terms of classroom teaching observation, I mainly looked at the type of teaching and learning involved and the interaction between the students and the teachers in the classroom. The observations allowed me to find out whether or not students are faced with any difficulties in the classroom and whether or not their difficulties are related to the teaching of the subject or other factors.

For the physical set-up of the school, I mainly looked at the type of materials or resources available such as student’s text and activity books, science equipments, proper filing system, and other materials necessary for the enhancement of teaching in the classroom.

I also observed the interactions between students and teachers in terms of the activities they do outside the classroom such as morning and afternoon duties or activities.

At home, I made first-hand observations of the interaction between students, parents and other members of the community particularly in terms of their lifestyle activities, their roles and how important are their activities and roles they do for their lives in the village or community they live in. Sometimes I worked alongside the village community especially in their allocated communal tasks in order to gain more information about their roles and activities. In this way, I think that the community also felt comfortable with my being around them for they treated me as an insider rather than an outsider.

4.3.1.1. Classroom observation procedures

Before I conducted my classroom observations, I made prior arrangements with the Head teacher of the relevant school, concerning the class I was going to observe and the time of observation. Generally the Head teachers were reliable in passing onto the teachers concerned the information that I would be coming at a particular time in order to observe their class. In most cases, a chair and a table were already placed at the back of the classroom, for me to do my classroom observation.
For every classroom observation I made, I used the observation sheet, (refer to Appendix F) to fill in the necessary contextual details of the class before I commenced the actual teaching observation.

My observation sheet consisted of four column headings titled: "Time", "Activity", "Teacher Says" and "Student Says". During the observation, in addition to recording these details, I also noted down how long a particular activity lasted. This information should enable me to find out the types of interaction which went on in classrooms between the teacher and the students. I also noted down the movement of teacher in the classroom during the teaching and sketched the movement on the observation sheet. This should enable me to find out whether the teacher was only paying particular attention to certain individuals in class.

The observation sheet also included two reflection sub-headings at the end: "Salient points and Why" and "Questions to be asked or Clarified" which I filled in at the end of every observation. Usually, I would approach the teacher after the lesson to clarify my questions or doubts. In some cases, if I wanted to confirm whether or not some teaching activity was commonly used by a teacher, I noted that and would confirm it during my next teaching observation of that teacher. For example, if during my first observation, I found that there was excessive note giving or directive teaching, I noted that down in my observation sheet to be observed again in my next classroom observation with the same teacher.

In my field notes, I wrote my interpretations, hunches and reflections by recording these as separate paragraphs headed as 'Observer's Comments'. These comments were to inform my propositions at a later time. I kept a separate folder for the observation sheets for each teacher I observed at each school. I noted down the salient points I found for each respective teacher of the school, and finally I examined the common themes or activities found for each teacher during my observation of their lessons. I compared and contrasted this with other teachers of the same school and later jotted down the commonalities I found amongst these teachers. I later entered these into my laptop after a week of observation at each school.

4.3.1.2. Frequency of visits to schools and communities

Direct observations were conducted on a full-time basis from 8:00 am – 4:00 pm each week day. I started visiting all the four schools in a round robin fashion
completing one school observation in a week and moving on to the next school for another week until the end of the third and final school term of 2001. It was impossible for me to visit a school in one day and then move on to the next the following day because of the geographical proximity of the four schools.

As I moved to observe each school in a week, I also observed the ongoing activities of the child, parents and members of that particular school community. I was interested in dimensions such as the time in which they do the activities, physical set up of their homes, the roles each participant plays, and interpersonal dynamics during the activities. At home after school, in most cases I would either play with the village teenage boys, or do some activities together with the community, or sometimes in the evening I would find myself sitting around a bowl of kava with the community elders, cracking jokes at each other or singing some songs enjoying the completion of the day’s activities. I recorded all the activities I observes within the communities in my journal.

As mentioned earlier of my intention to also visit two ethnic urban schools, I paid a visit to the urban schools following the same pattern of observation as I had used within the four intensively studied rural schools and communities. Since the time limit for conducting my field work was for six months only, I thought of spending these last two weeks at these ethnic urban schools by at least conducting a few classroom teaching observations for their non-examinable classes. I also carried out focus group interviews with some teachers, students and parents (see Table 6). I did not observe their examinable classes (classes 6 and 8) knowing that they had already sat for their National Examinations during my time of visit so that the teaching was no longer liable to be comparable with that of the examination class teachers of the four intensively studied rural schools.

During the second term school holiday, I also collected some official documents from the Ministry of Education main office in Suva which I thought might amplify, illuminate or further inform some of my findings.

In doing my intensive field study for the four schools, I did bear in mind that I should try and focus my investigation on my research questions in my proposal. However, during my field study, I did not limit my investigation only on these focus areas since I also came across other very important findings which I did not even consider when I earlier constructed my research questions. Some of these findings are
very interesting and could also contribute to the problem about differential performance that I am investigating.

4.3.2. Interviews

Interviews, in particular, permit flexibility in several ways. For example, as compared to written questionnaires these can help clarify the questions and ensure that the respondent understands them. Interviews can also be used to obtain information from people who cannot read.

There are many different types of interviews. Cohen and Manion (1994) distinguished four types: structured, semi-structured, non-directive and focus interview. Each particular type has its own advantages and disadvantages. The ways I managed the interviews depended very much on the conditions in which the participants and I were situated. This is elaborated in section 4.4.2.2. My goal was to conduct informal semi-structured interviews with either individuals or groups of students, teachers, parents, and members of the community about their experiences and perceptions about the chosen theme area related to the teaching and learning of science at school and the relationship between what the child or parents do at home to the child's school work.

4.3.2.1. The interview sample composition.

There are no rules for sample size in qualitative inquiry (Cohen & Manion, 1994). Usually, it is accepted that the sample size depends on what the researcher wants to know, the purpose of the inquiry, what will be useful, what will have credibility and what can be done within the available time and resources. The validity, meaningfulness, and insights generated from qualitative inquiry have more to do with the information-richness of the cases selected and the observational and or analytical capabilities of the researcher than with sample size. One may add to the sample as fieldwork unfolds. In addition one may change the sample if information emerges that indicates the value of a change. For example in this particular research, as noted earlier, I started off observing just two ethnic schools and later decided that I should in addition study two others.

The number of respondents that I included for interviews (of teachers, students, parents and community members) depended on how many gave me their prior verbal
or written consent to be interviewed. My main source of interview data was taken from the 57 participants of the four intensive studied ethnic schools (Table 5) and from the six group interviews of teachers, students and parents, each group consisting of four or three participants from urban schools (Table 6).

Table 5. Composition of Interview Sample – Intensively Studied Schools

<table>
<thead>
<tr>
<th></th>
<th>Loma</th>
<th>Dioka</th>
<th>Kristi</th>
<th>Natoa</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teachers:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fijian:</td>
<td>4</td>
<td>0</td>
<td>1</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>Indian:</td>
<td>0</td>
<td>4</td>
<td>3</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>Students:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fijian:</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Indian:</td>
<td>0</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td>Class:</td>
<td>(5, 6, 7 &amp; 8)</td>
<td>(4, 5, 6 &amp; 8)</td>
<td>(5, 6, 7 &amp; 8)</td>
<td>(5, 6, 7 &amp; 8)</td>
<td></td>
</tr>
<tr>
<td>Parents:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fijian:</td>
<td>4</td>
<td>0</td>
<td>1</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>Indian:</td>
<td>0</td>
<td>4</td>
<td>3</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>Community Members:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fijian:</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Indian:</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>14</td>
<td>14</td>
<td>14</td>
<td>15</td>
<td>57</td>
</tr>
</tbody>
</table>
Table 6. Composition of Focus Group Interviews of the Two Urban Ethnic Schools

<table>
<thead>
<tr>
<th></th>
<th>Urban Ethnic Fijian School</th>
<th>Urban Indo-Fijian School</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Teachers:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fijian</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Indian</td>
<td>2</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td><strong>Students:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fijian</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Indian</td>
<td>1</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Class</td>
<td>5 (two), 7 (one)</td>
<td>5 (one), 7 (two)</td>
<td></td>
</tr>
<tr>
<td><strong>Community</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Members:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fijian</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Indian</td>
<td>0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>10</td>
<td>10</td>
<td>20</td>
</tr>
</tbody>
</table>

Due to issues of anonymity and confidentiality, I significantly restricted my descriptions of participants here in the thesis itself. Here, I am only describing participants such as teachers, students, parents and community members, only through their groups or assigned roles. In chapter 6, I use pseudonyms on interview excerpts instead of the real person's names. As far as I can I will not allow my own perception of individuals' characteristics to colour my descriptions of what they said. In fact it is extremely difficult to be non-evaluative or non-judgemental when describing people (Taylor & Bogdan, 1998), for this reason I shall use all due care and try to be as descriptive as possible.

I chose to use focus group interviews for the two urban schools because I did not have time to conduct individual interviews in addition to doing classroom observation.
during the two last weeks of my field work. One advantage of using the focus group interview is that it emphasised communal group discussion and interaction. I think that this provide a more familiar environment for both Ethnic Fijians and Indo-Fijian participants.

4.3.2.2. Interview settings

The settings differed according to the status of participants and individual preferences. The setting for teachers' interviews was usually the school according to the individual teacher's preference. In most cases, these interviews took place in their own classrooms when students had left the school. In some cases, the school library was also used.

All student interviews were conducted at school either in the school library or in a free classroom. Interviews were mainly conducted during lunch hours though a few were also conducted in the afternoon before the children went home.

All interviews of parents and other community members occurred in their respective homes in a space of their choosing, most often in the afternoon or at night. The setting was informal, sitting on the floor or mat with the participants, and in most cases when kava was served around. During most interviews, children, and other members of the household were also present in the house but were either in bed or doing other things.

Informal interviews were employed to allow conversation to occur naturally thus enabling me to gather a great deal of information. As I became a more confident interviewer, I grew more flexible about moving between topics and moving aside to issues that the participant indicated to talk about more. My growing confidence also enables me to relax and enjoy the interviews with the participants. The data from interviews consisted of direct quotations from people about their experiences, opinions, feelings, and knowledge about the area about which I questioned them during the conversation or interviews.

I recorded all the interviews that I conducted by audio-tapes with prior consent of the participant. Not all participants wanted to hear their interviews replayed; however, for those who wanted, I allowed them to hear it by replaying the tapes and I told them that they may at any time ask me to delete any part of the conversation that they did not want to be preserved.
4.3.3. Written and Policy Documents

Documents can serve as sources of rich descriptions of how the people who produced the materials think about their world (Bogdan & Biklen, 1998). I obtained some documents for analysis in my study. The type of documents include: prescribed science syllabi and course prescriptions; the Science Teacher's Handbook; curriculum documents from Curriculum Development Units; Ministry of Education Annual Reports; test papers and analysis forms from the various schools; newspaper articles and other documents such as the lists of Fiji primary schools and examination results for the two ethnic groups from the Ministry of Education.

Since latest examination records for the two ethnic groups were not entered in computers at the Education Office during my time of visit there, I had a difficult time trying to compile the ethnic results — particularly in science subjects since results were only given as an overall pass in the examination sat rather than in individual subjects. However, I managed to compile some which I have used in the tables and figures in my earlier chapters.

4.4. Data Analysis

This section describes the method I used to analyse the data collected from the interviews, field observations and written documents. One of the features of qualitative research is that data analysis is an ongoing process. Some analysis in the field is required as an ongoing part of data collection (Bogdan and Biklen 1992). Ongoing data analysis as argued by Bogdan and Biklen (1992) in fact leaves a researcher "in good stead to do the final analysis after you leave the field" (p. 154). I too started part of my analysis in the field while doing my field study — for example when I realised that the schools I was observing in the first two weeks of my study was not of the same level, and socio-economic status, I decided (in consultation with my supervisors) to choose two other schools of the comparable level and economic status. Apart from this, I also wrote and reread my field notes and in some cases, I changed or modified my interview questions after listening to some interview tapes. This helped me generate further questions which I used in later interviews to enable participants to clarify their ideas. This type of analysis though not extensive, was carried out during my field study.
In commencing my intensive data analysis, back in New Zealand, I started off by transcribing interviews (those interviews which are done in Ethnic Fijian language were first written down in Ethnic Fijian language and later translated to English language). This process of transcribing and entering interview data consumed a lot of time in my data analysis stage because more than half the interviews with Ethnic Fijian participants were conducted in Ethnic Fijian language, because that was the language in which the participants were most comfortable speaking. (The exception was a small number of Ethnic Fijian teachers who preferred to speak in English.) On the other hand, most Indo-Fijian participants were comfortable with speaking in English during the interview. (The exception was a few parents and community members who preferred to talk in a Hindi-Fijian dialect.) In any event I had to spend much time in transcribing the interviews in the language used by participants and then later translating them into English. In fact the process of transcribing involved listening to the tapes at least 3 times in order to check that whatever was said by the participant was duly translated and typed accurately.

My next step was to code my data in order to develop coding categories to make it easier for me to organise it (Bogdan & Biklen, 1992; Dey, 1993). I sorted out and organised all the data into coding categories by setting up word files on the computer, and cutting and pasting from the original transcripts of observer comments and field notes into these specific word files.

After entering and coding all the data, I printed it out and began reading all the data sources to try and discover emerging themes or categories. The reading required a lot of concentration and thinking especially in trying to figure out the key points and checking whether or not the emerging themes or categories recur in other interview data. During this phase, I tended to write alongside the margin of each paragraph of the data source document print out whenever I came across themes related to others I had already read in the document. I also wrote comments in different colours or pasted thin coloured papers on the printed document indicating the different categories. I did this throughout the whole document of the interview data source. I then revisited my writings and noted down the recurring patterns of the emerging theme points on a new set of papers together with the code and page number of where each particular theme appeared on the data base document. This helped me to put all
the similar emerging theme points together in a way that carefully tracked which sources it came from.

At this point, I began to discover that my data was not as clear cut as I expected. I first began with a large number of categories and discussed these categories with my supervisors as a way of breaking down these categories into themes. I progressively worked through all the transcribed interview data by following the same process as I have outlined above.

The interview based analysis was done concurrently with the classroom teaching observation analysis. Since my analysis also involves a quantitative aspect, I had to construct tables in some cases, in order to quantify some aspects of the qualitative data from my teaching observations and the interviews. For example, in order to find out whether or not there is any difference in terms of the way science is taught by the two ethnic groups of teachers in their respective ethnic schools, I analysed my classroom teaching observation sheets for each class from class 1 to class 8 for the four schools. For each observation sheet, I looked at the types of activities done by the various teachers during their lessons. These are the activities directly conducted by teachers with the children which can affect their learning of science in the classroom such as, whether or not teachers: allow students to work in groups; direct students in their work; conduct book and content teaching; give more notes during the lesson; allow time for students to ask questions during the lesson; and switch to own language at times during the course of teaching.

I did this with the intention to find out whether or not similar activities prevail in the two ethnic classrooms. For example, Table 7 shows my summary for the teaching of class 8 for all the four schools studied with respect to the activities stated above.
Table 7. *Types of teachers’ activities observed during a 1 hour class 8 lessons for each of the schools*

<table>
<thead>
<tr>
<th>Activity</th>
<th>Loma</th>
<th>Dioka</th>
<th>Kristi</th>
<th>Natoa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allowing students to work in groups</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Directing students with experiments or activities in class</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Book and contents teaching</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Giving notes and rote learning</td>
<td>_</td>
<td>✓</td>
<td>✓</td>
<td>_</td>
</tr>
<tr>
<td>Allowing no time for students to ask questions</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Switching to own dialect or language</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Marking or correcting students’ activity exercises during the lesson</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>_</td>
</tr>
</tbody>
</table>

*Note.* ✓ = Yes, or is done by the teachers, _ = No, or is not found to be done by the teacher

Loma = Big Ethnic Fijian School – straight class teaching
Dioka = Big Indo-Fijian School – straight class teaching
Kristi = Small Indo-Fijian School – composite class teaching
Natoa = Small Ethnic-Fijian School – composite class teaching

I constructed sets of Tables for activities in each class I observed (from class 1 to class 8) for the four schools. These tables were then interpreted together with the interviews and document sources as far as feasible (see Chapter 6).

Through on-going discussions with my supervisors and further reading of pertinent theoretical frameworks, I decided to focus on more extensive and salient use of Bronfenbrenner’s ecological model to make meaning of my data than I had originally intended. This lead to further re-organisation of my conceptual categories for data interpretations.

Previously, I was organising my categories by considering only two areas; the school and the home and I was treating them as two more or less separate entities with
less attention to the connections that they have with one another. However, with my new focus, I realised the importance of the embeddedness of these settings. Thus, my final categories emerged to be: direct interactions between the child and the teacher at school (a microsystem); exosystem influences on teaching and learning; direct interactions between the child and parents at home (a microsystem); and finally the exosystem, macrosystem and chronosystem influences of the home life and learning of children.

I have taken account of my own assumptions through revisiting my observer comments and reflecting on these during all stages of my analysis.

4.5. Writing

The writing of my thesis did not only begin after my data analysis stage but instead had already commenced at the beginning of my research process (Taylor & Bogdon, 1998). In fact I drafted my first two chapters dealing with the introduction of my study and the Fiji settings while I was working on my proposal during my first year of doing my study.

Writing according to Richardson (1990, p. 9) "...is not simply a true representation of an objective reality, out there, waiting to be seen. Instead, through literacy and rhetorical devices, writing creates a particular view of reality." What this means is that to write does not mean to simply tell of the research at the end but in fact it is a way of "knowing" a method of "discovery and analysis" (Richardson, 1994, p. 516).

In qualitative research, it is important to note that the writing process is as much about how and what the researcher writes as about the participants' narratives (Bogdon & Biklen, 1992).

So it is important for me to consider carefully what I am going to write in my thesis and whose stories I have chosen to tell as well as what I am supposed to leave out. During my writing, I have made sure to respect the paramount need for anonymity and confidentiality.

Finally at most stages of my writing, I continued to return to the transcripts and the audio-tapes of my participants to find out whether or not my writing was sufficiently involved what they had said. In looking back at what I have written, I believe that I have achieved this aim.
Chapter 5

Village and School Settings

5.0. Introduction

To illuminate both the village and school life situation sufficiently that my data analysis can be well understood, I will give a brief description of the four villages and their respective schools. I will also describe the daily life or routine of the four separate communities that I observed during my field study. The description has been reconstructed on the basis of the information I gathered on each of the four communities and schools. The four villages or communities are Natoa, Dioka, Kristi and Loma of which Natoa and Loma are Ethnic Fijian villages while Dioka and Kristi are Indo-Fijian communities. The names of the four villages or communities and their respective schools and teachers mentioned are pseudonyms; the place names of surrounding Provinces and nearby town centres are real.

5.1. Natoa

5.1.1. The Village

Situated on the North Western part of Tailevu Province about 80 kilometres from the Nausori Town lies the rural village of Natoa. Its distance from the nearest small town is about 30 kilometres. The old village of Natoa was located beside a river, the means of transport to and from towns for the village people during the early days. However when the feeder road was constructed connecting the area to the main road, the new village shifted about 2 kilometres from its old location near the river, inland to the feeder road. All travel to and from the village is now via this road. Travel to Natoa village from Suva takes about 3 to 4 hours drive without stop.

Bush and forest-covered hills and valleys surround the feeder road to the village from the main road. The distance from the main road along this feeder road to the village is about 12 kilometres. The road is very narrow as it winds up the hills and ridges until it is a couple of kilometres from the village where it begins to descend.
Along these hills and mountains are scattered plantations. Segments of bush and forest can be seen slashed and left to dry. Smoke comes almost continuously from the plantations on the hills and valley, signalling that slashed bush is being burned. A few village pastoral farms are seen along the way and as the road approaches the village near a hilltop, the beautiful green valley and the winding of the river can be clearly seen. The old village, still visible, used to be located down this valley near the river bank. The new village is also visible from this site, with glistening iron roof tops and swaying coconut trees growing around and within the village boundary. The feeder road does not end at the entrance to the village but continues downwards to other nearby villages and settlements.

Opposite the entrance to the village lies a simple bus shelter built by the village people to cater for people and children going to and from town or attending the local Secondary School. An Indo-Fijian bus company used to serve this route but due to bad road conditions, the company no longer operates on this road. In the morning, this shelter is usually packed with people waiting for the village truck to carry them to and from their various destinations. Likewise people also meet at the shelter in the afternoon to wait for relatives who may have returned home from towns or other destinations. The bus shelter seems to be the central point overlooking the village on the left and the school on the right hand side of the road. At this site, the school is clearly seen with four main buildings arranged neatly on a grassy hill and the four teachers' quarters arranged in a line below the school block. A large playing field is located below the school buildings perpendicular to the road. By foot it is about 300 metres from the village to the school.

The village has undergone various changes during the last decade. Footpaths have recently been built by the village people from the bus shelter to every corner of the village. Big pine posts carrying electricity, lining the footpath from the main road, were very recently introduced to the village, having been made possible by the government's rural development programme. Permanent structures of various sizes with wood walls and capped with roofing iron stand all around, completely replacing the traditional thatched dwellings that predominated until roughly two decades ago. Four concrete and iron buildings are seen at Natoa village. Of these, two are the church and the community hall, which are easily recognisable by their very large sizes.
The total number of houses in the village is about 60. This does not mean that there are also 60 families in the village because each household may have more than immediate family living together in an extended family situation. To illustrate the relationship in an extended family, consider Peni, a boy of 10 at Natoa Village School. Peni lives with his father, mother, one brother age 12 and three sisters (age 6, 8 and 15) together with his paternal grandfather and grandmother as well as his father’s younger brother and his wife and their children (two boys and a girl) and his father’s younger sister and her two children (one boy, one girl). Peni had until recently also lived with his father’s older brother and younger sister and her two children, but when his father’s older brother found a job in Lautoka, he moved there with his wife and children. However, since Peni’s father’s younger sister has two children but was not married, she and her two children have to remain in the extended family for support.

The village consists of five ‘mataqali’ or clans and each of these clans builds their houses together on the same location of the village area surrounding the chief’s house which is in the middle of the village. Each of these houses is built on a ‘yavu’ or foundation which is sometimes built very high with rocks or soil all around it. People of high social standing in the village such as the chief live in a big house with a high foundation. A new house can be erected on an old foundation. This foundation normally belongs to the first occupant of the site and his male descendants and in most cases is named. Unless permission is granted from the old occupant of the yavu, no one else would build a house on the old yavu. However, if there is no other vacant yavu available in the possession of the family or mataqali, a new yavu will be constructed.

Traditional Ethnic Fijian houses usually have three doors. Even though most of these houses have changed from thatched roof to corrugate iron ones, houses at Natoa village still follow the traditional Fijian structure of three doors. The main door is the one usually accessible and close to the cooking place and is the part of the house which is considered low socially. The two side doors mark the division of the house into its two main social parts, the high or private part and the low or public part. In fact these side doors act as an open ‘partition’ for the separate two main parts of the house. The high part of the house is the area between the two side doors and the end of the house without a door. This is where the head of the house and his family sleep.
and keep their few belongings. The lower or public part of the house is where cooking, eating, washing and drinking kava is usually undertaken. The two side doors are not often used except by the owner of the house and honoured visitors and the chief whereas the main door is mainly for public to enter and leave. Apart from the three doors, all houses in the village now also have windows to allow for fresh air and light in the house which is a necessity for good health — a concept or trend first introduced in the last century.

Every house in the village is seen to cover its floor with very large ‘ibe’ or mats traditionally woven by women from the leaves of a kind of pandanus plant. Special small mats called ‘idavodavo’ are widely used by the village people to be spread out on the floor to sleep on at night. However, some houses in the village now have beds with mattresses which they use at night to sleep on.

The village has a chief who gives orders to the village people through the village headman for whatever tasks are to be done communally in the village. The chiefly position is not elected or appointed but instead is inherited and is often passed on from the most eldest chiefly status to the next one in line especially when one dies. The village has a headman or ‘turaga ni koro’ who unlike the chief is always appointed or elected by the people of the village at a village meeting. His responsibility is to see that all the rules of the village are followed and obeyed, and he also acts as a mediator between the village community and the District, Provincial and government offices. He conducts a village meeting every month, and sees to the overall running and division of labour within the village community.

Village meetings are attended by adult men and women who in most cases are married and have children. Teenagers who have left school may also attend the meeting but together with young children are not supposed to participate. They can listen to the meeting, but will not be allowed to talk or give their views. This is due to the thinking that they are still young and their ideas may not be good enough for the overall running of village life. In addition, the Ethnic Fijian culture dictates that they are the ones who are supposed to listen and obey whatever is decided by the elders and that they therefore do not have any place in the decision making of the village community. At a young age, they are only to obey orders and do the work which is agreed upon by the village elders during village meetings.
During meetings, the chief will sit in the centre upper-hand of the meeting house and the rest will be sitting in the lower part of the house facing him. Usually, elder men will be the ones doing most of the talking and debate whereas women will hardly ever do the talking except if the woman is of chiefly background. In the meeting, if certain things are not solved or it does not come to a compromise, the chief makes his decision and that decision is final and cannot be questioned by anybody else in the community. This hierarchical model of decision making is also present in every Ethnic Fijian family where the father or elders make decisions and expect their young to listen and obey orders. This arrangement still holds true today in the village of Natoa.

Land in the village is owned communally in clans or ‘mataqali’ rather than individually. Most of their good arable lands are either bought as freehold or leased by Indo-Fijians who reside on their leased or freehold land close to the village. Land which is used by the village people for subsistence farming is mainly rugged and mountainous with very little development taking place. The community relies on subsistence farming - especially planting root crops such as cassava, taro, kumara, banana, yams, with some vegetables and fruit for living. ‘Yaqona’ (Piper methysticum) or kava is grown by almost every family in small patches and largely for local consumption. Occasionally a few mature plants are cut up and sun-dried and either sold to vendors in town or pounded and sold in small paper bags to be consumed within the village community. The type of agriculture that they practise is the ‘slash and burn’ type where they clear the land first by cutting down trees and then burn it when the leaves get dry. This method seems to them the most expedient for them to use to cultivate their land because they have no machinery for clearing the land or for planting on a large scale. Although burning has some harmful effects such as killing micro-organisms in the soil and can also give rise to soil erosion, the village people continue to use this method because they have experienced the fact that the ashes that are produced by burning woods and grasses help to make their plants grow well. In fact, ashes from burning woods and grasses are found to be rich in plant nutrients such as phosphorus, calcium and nitrogen which the people in the village may have no knowledge about. There is very little use of chemicals and fertilisers in their plantation. When they find that the soil nutrients are depleted, they shift to another new area for planting.
The village is surrounded by large areas of forests which continue, as in the past, to provide hunting grounds for the village community especially the men. Wild pigs, pigeons, flying foxes, wild yams, fruit and edible leafy plants are hunted and gathered at times to supplement the daily food supply. The forest and the bushes also provide medicinal plants for the treatment of various diseases; timber for knife- and axe-handles, digging sticks, dance clubs and spears; and logs for firewood, canoes, and materials for house building. There also is an abundant supply of other resources in the bush such as cane for making baskets and fish traps, fibres for making mats, and dyes for beautifying and decorative work. These things are readily available to anyone in the village who wishes to utilise them. These wide ranges of micro-environment and resources enable the people of Natoa to live an almost self-sufficient life.

5.1.2. The School
When I visited the school in 2001, it had a total roll of about 84 students — 47 boys and 37 girls. All these students are Ethnic Fijians. The total number of teachers teaching in this school is four (2 males and 2 females) who are also Ethnic Fijians. Table 8 shows the number of teachers with their respective classes, ethnicity, qualification and years of teaching experience.
Table 8. Teachers with Respective Classes, Ethnicity, Qualifications & Years of Teaching Experience (Natoa)

<table>
<thead>
<tr>
<th>Classes</th>
<th>Teacher</th>
<th>Gender</th>
<th>Ethnicity</th>
<th>Qualification</th>
<th>Years of Teaching</th>
</tr>
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<tbody>
<tr>
<td>1 &amp; 2</td>
<td>Adi</td>
<td>Female</td>
<td>Ethinic</td>
<td>Teaching</td>
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<td></td>
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<td>Fijian</td>
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<tr>
<td>3 &amp; 4</td>
<td>Mela</td>
<td>Female</td>
<td>Ethinic</td>
<td>Teaching</td>
<td>8</td>
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<td>Fijian</td>
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<td>5 &amp; 6</td>
<td>Amena</td>
<td>Male</td>
<td>Ethinic</td>
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<td>Taniela</td>
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<tr>
<td>7 &amp; 8</td>
<td>(Head</td>
<td>Male</td>
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<tr>
<td>Teacher)</td>
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<td>Fijian</td>
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</table>

Briefly, the school was established by the people of Natoa village in 1955 to cater for the education of their own children and the very few children who come from the nearby settlements. Prior to 1955, the village used to send their children to another nearby school. However, some of the difficulties faced by the village people during those early days of schooling were the long distances it took for children to walk from their respective homes to the nearby school. There was no road at the time and children had to walk on the bush track every morning and afternoon to attend school. On their way to the school, they had to cross a few rivers and streams and during rainy seasons they often stayed home without attending school because of the difficulty in crossing the rivers and streams. My father, who was one of those who experienced these difficulties, told me that even if they managed to attend school every day, they would typically be very tired when they arrived at school. This really affected their learning. Most of the time when they arrived home, they just felt like having their bath and dinner and going to sleep straight away without even looking at their school work. When it came to examinations, they often did poorly as compared to children of that village school. In terms of employment, there was none of their
group who ever gained a job like people from where the school was located. Because of these difficulties and unfortunate events, the Natoa village people came up with the idea of establishing their own primary school in their village to cater for their own children.

All teachers live in the school compound with their free houses provided and they are also given free land in the school compound to plant for their own living. The school is run by the village school committee which consists of a Manager, Assistant Manager, Secretary, a Treasurer and 5 other members chosen from the village community. Since most of the committee members are villagers and not very well educated, the head teacher takes the responsibility of an adviser to the school committee on matters requiring urgent attention for the school and he also informs the committee on any development needed for the school.

The school does not have a secretary to do office work for the teachers such as typing of examination papers, and doing other work like photocopying, duplicating etc. All this work is expected to be done by each individual teacher. There is no proper library for the school and a room which they regard as their library is filled with old books stacked in cartons; some placed on a few available book shelves but often in irregular order without the use of the Dewey System. There is no librarian for the school and it is the responsibility of each class teacher to give library books to students, which I hardly ever found to be done by teachers to their respective classes. The school only provides a few textbooks for the children. These are mainly the ones which are a bit too expensive for parents to buy. Activity books and exercise books are expected to be bought by parents. Only some of these Activity books are sold at the school and if a book is not available at school then parents have to purchase it from book shops in town. The school does not have any Junior Science Laboratory for students to do their experiments and for teachers to prepare themselves for their science lessons. Apparatus and chemicals are just stored in an old cupboard not in an orderly manner. There seemed to be no proper filing system where old school records such as examination results, previous years’ test papers etc. are kept. Most of these records seemed to be missing from where they are improperly kept in an old cupboard.

The school recently acquired electricity and piped water supply - the two main things which we did not have during my days of schooling at this school. I remember
how we used to fetch water for the teachers and for the school flush toilet from a nearby stream — about 300 metres away from the school every morning and afternoon during duty hours. In addition, benzene light was used for extra night classes at school — a system where teachers have extra tutoring and teaching every evening to prepare students for external examinations such as the Fiji Intermediate Examination and the Fiji Eighth Year Examination. That system is no longer regularly practised by exam class teachers, even though the school now has electricity. The recent availability of electricity for the school has given the opportunity for the school committee (on the advice of the Head Teacher) to purchase a school photocopier and a video to aid both teachers and students at school. The school now has two brush cutters for cutting grass around the school compound which significantly eases the work for students every afternoon of cleaning the compound.

5.1.3. Daily Routine

Sleeping in the early morning is often disrupted by the normal practice of ‘kaci’ (loud call) from the ‘turaga ni koro’ (village headman) allocating the daily tasks to be done in the village by the community in village groups. In most cases, morning tasks before breakfast usually involve weeding either around the house or around the community hall, church, school, chief’s house or whatever place the village headman thinks suitable to be worked upon for the general cleanliness of the whole village. After the ‘turaga ni koro’ makes his call, male elders are seen to come out of their houses already changed into their working clothes with cane knives in their hands and meeting at the location to which they have been called ready to begin the morning work. At the same time elder women will also wake up and light fires in their respective kitchens to cook for their family breakfast. Firewood is the main fuel source for cooking food. A person standing anywhere in the village can easily smell burning woods and smoke from the kitchen around the village at any time of the day. Those who cannot afford to buy matches are found to go around fetching their fire from other households.

School children if they are still sleeping are often awakened by their respective mothers or by adults in their various homes when the school ‘lali’ or gong goes at 6:00 am. They will be doing some activities such as helping their mother to clean the pot, fetching water from the open village taps or some may be weeding around their own home until the next lali is beaten at the school at 7:00 am. At this time children
will be sent to have their bath and brush their teeth at either the nearby creek or the open tap within the village. On cold mornings, children are often reluctant to have their bath but instead just wash their face, brush their teeth quickly, and return home covering their body with their towel to keep them warm. By this time, breakfast will already have been prepared by their mother or by the elder women at their various homes. A normal breakfast in the village homes will consist mainly of root crops such as 'dalo' (taro) or 'uvi' (yam) or 'tavioka' (cassava) or 'kumala' (sweet potato) or 'uto' (breadfruit) with greens and some tea and fruit. Bread and crackers are only consumed by families who can afford to buy them from the village co-operative shop. The purchasing power of most families in the village depends very much on the regularity in which they earn money from selling some of their root crops in the market and for the few who own small dairy farms – from their milk earnings. There are a few government and company workers in the village but they are only seen in the village during Christmas and New Year celebration or whenever there are some village social gatherings such as death of a relative, marriage or a call from the village people for a 'soli' (collection or donation of money for a purpose).

Morning work for village elders or men might take about 1 to 2 hours to finish depending on how fast they complete the task allocated by the 'turaga ni koro'. They will wash their hands or have their bath and return home for breakfast after their morning work by which time most children already have had their breakfast in their various homes, and are on their way to school. Children carry their school materials and fresh root crops to school every morning. The fresh root crops are usually cooked by an allocated group of mothers at school for the children’s lunch.

The next 'lali' from school would go at 8:00 am by which time all children are expected to be in the school compound. Those who are not moving swiftly with the time are found to be running from the village to the school compound when they realise that they are going to get late. Loud calls from the prefects and from the teacher on duty at the school gate are often heard as they try to hurry late comers entering the school compound after 8:00 am.

In the village, another round of 'kaci' or loud calls by the 'turaga ni koro' will be heard after the children have left for school. By then the elders have had their breakfast and have reminded everyone of their task for the day. Although the village people do not work with time, an observer in the village would see that by 10:00 am,
the village is emptied of its men, who leave with their long cane knives and join their various allocated groups to work in the plantation on a round-robin basis either clearing the bush or planting crops. Digging sticks are often seen to be also carried along to the plantation or their area of work especially if the group’s task for the day is not for weeding but mainly for planting crops such as yams, taro, sweet potato, cassava and banana. Garden forks are seen in the possession of only those who can afford to buy one.

While the rest of the men begin work in the plantation, the owner of the plantation may prepare lunch for the rest of the group. Normally, when the owner of the plantation knows that the group is going to work in his plantation that day, his wife and a few other relatives will also come and help in the cooking of lunch in the plantation for the group. Lunch in the plantation typically consists of root crops such as taro or yam or cassava together with some green vegetables in ‘lolo’ (coconut cream) or sometimes mixed with fish or meat if this is available. This is often cooked in an open fire or in some cases there is a small house built near the plantation where some eating utensils are kept for the purpose of having lunch during communal work or when the family spend a few days in their own plantation. Planting groups rarely return to the village for lunch because of the long distance from the plantation to the village. After lunch, they will rest for a while and continue to work again until sunset.

Village women do a variety of activities in their homes and outside while men are occupied on the plantation in their communal work. The women’s chores include things like cooking, caring for the baby, weaving mats, house cleaning, clothes washing in the nearby creek or tap, cleaning flower beds around the house, weeding in the plantation, fetching firewood from the nearby bush, and fetching green vegetables. The location of the village close to the river and its tributaries provides inhabitants with important life sources such as fish for local consumption. Fishing by net is also an important activity for the women. Other main means of catching fish are by lines and hooks, and even by skin-diving using simple goggles purchased from the village shop and spears which they make locally from iron wires. Still another means of catching fish is by using torches at night when the water is clear. The position of the new village further inland to the hills and mountains closer to various streams has made it necessary for the women to practice prawn netting.
Elders, unlike their children, do not follow clocks or watches, or go by the time in
doing their respective work. They only distinguish morning, mid-day and afternoon
by looking at the sun rise and sun set. At sunset, they will return to the village with
some root crops and firewood on their back to be used for the next day. Their
working clothes are often covered with sweat and dirt and because they have to walk
for a long distance back home - anyone who sees their face can easily tell their
tiredness.

At school, the teacher on duty is always the first one to be in the school block
before 8:00 am and he or she with the help of the prefects will be seen moving
children around to their various duty areas when children arrive in the morning.
Children are allocated various areas around the school compound in houses to pick up
rubbish and to maintain its cleanliness for the whole week. The school has four
houses altogether, each named after four Fijian trees namely: Dakua, Vau, Yaro and
Yasi. Each House Captain will be seen to move around helping the teacher on duty in
supervising students during their morning duty hours.

The four teachers (two males and two females) take turns in their weekly duties
at school. Their duties include seeing punctuality of students to every area they move
to at school, supervising students’ morning and afternoon activities and conducting
school assembly every morning and afternoon. At 8:00 am, the rest of the teachers
rush in to the staff room to sign in. Typically the head teacher is by then already
sitting at his table. He checks the time book at the end of every week and this helps
him to fill out the teacher’s daily register which is sent to the Ministry of Education at
the end of every month.

School assembly is usually conducted by the teacher on duty every morning
(after morning duties from 8:00 am to 8:15 am) and afterwards students move straight
to their respective classrooms. Sounds of hymns and prayers will be heard from the
four classrooms as teachers conduct devotion with their classes every morning before
class begins. The school has 8 classes altogether (class 1 up to class 8) and each
teacher takes two separate level classes. Each respective teacher has his or her own
timetable for the respective class he or she takes.

A bell goes at 8:30 am signifying the beginning of the class. Teaching will
continue until 10:30 am when another bell will ring signifying recess time. Recess
takes 15 minutes until another bell goes at 10:45 am when classroom teaching will resume until a wooden gong is beaten at 12:00 noon for a one hour lunch break. At this time, children will come out of their classrooms and parade near the flagpole where the teacher on duty will be waiting to give some announcements (if there are any). After this, students move in a single file to the dining hall. The school has a large dining hall and a kitchen for mothers to cook and prepare lunch for the school children every day. It has its own eating utensils which are used by all students at lunch time every day. In the dining hall children sit in their four houses. The teacher on duty will choose one student to conduct the prayer before the children take their lunch. The teacher on duty will move around with a pen and notebook checking the variety of food prepared by the mother’s group and he or she may have some chat with the mothers before he or she leaves for lunch. Village mothers are in fact divided into 5 groups and each group has its day to cook and prepare food for the children. Each group has to bring food like meat, greens, and fruit to go with the root crops brought by the students in the morning. The group of mothers that prepares the most balanced diets for the children over the whole year is given a prize during the school annual prize-giving day. After lunch, eating utensils are cleaned by the mothers, wiped and kept in a cupboard in the dining hall for use the following day. Sounds of laughter and talking will be heard as soon as children get out of the dining hall. The playground will be filled with children playing various sorts of games. It is common to see children taking off their shirts while playing due to the high humidity and when the wooden gong (lali) is beaten at 1:00 pm children will quickly wipe off their sweat, put on their shirts again, have a quick drink of water from the tap and rush back to their own classrooms. They must be there before the teacher re-enters the classroom for the resumption of afternoon classes. Teaching will continue until 3:00 pm when the wooden gong is again beaten, signifying the end of the classes. At this time, higher classes (classes 3 to 8) are seen to quickly change into their working clothes and move into the flagpole area with their cane knives for whole school parade. Here, the teacher on duty will dismiss the lower classes (classes 1 and 2) while the higher classes move into their various working areas for work which always lasts for one hour. Such extra afternoon duties will include classroom sweeping, weeding and planting of flower beds, weeding and planting in the school vegetable garden, collecting firewood for the teachers and for the school kitchen, cleaning
toilets and some other work needed around the school compound. A duty roster is changed every term to allow equal opportunities for students to work inside and outside the classroom. At 4:00 pm, when the wooden gong is beaten, shouts and cheers are often heard from the various working areas around the compound signifying their joy as they come to the end of the school day and afternoon's work. Children then return home in chattering groups, stopping along the trails to investigate every point of interest. So between 8:00 am, and 4:30 pm, the village is almost devoid of the sounds of laughter and children at play which are the characteristic of village life.

Teachers are supposed to sign off at 4:00 pm but on most occasions, it will only be the teacher on duty who will do this since he or she will be the last one to leave the school block at this time. On most occasions the rest of the teachers would already be at their various homes in the school compound before the higher classes break off at 4:00 pm. Village teenage boys will be seen entering the school playground around this time with rugby balls to do their training and playing. It is not uncommon to also see some school children mixing around with these elder boys in the playground until late afternoon.

On most occasions when children return home from school in the afternoon, parents are still not at home. Due to various activities also done at school, when children arrive home, they are often hungry. Without any tea or piece of food prepared for them at home, the hungry children often turn to looking for any of a variety of fruit in the bush and nearby plantations to fill their empty stomachs. If they are not allocated any afternoon tasks at home, then they are often seen to roam around aimlessly in the village and doing things like playing, swimming in the nearby stream and doing other activities with their peers. Because there is absence of supervision by parents in the afternoon, children are mostly found to be involved in the activities they are doing until dusk.

Children are loved but they are also much made use of by their parents and relatives. There is always the desire on the part of some adults to have children to take the load of daily chores off their own shoulders. Because of this reason, children are taught to learn to carry out most of the adult work or tasks at an early age at home. Sometimes, children would have been previously told ahead in the morning before they left for school to do various tasks such as cooking dinner, washing clothes,
fetching firewood, pulling root crops from the garden, weeding and planting. Parents in most cases expect their children to do some of these activities or tasks at home when the children return home from school especially when they will be late from the plantation or other activities they do. Children are often overloaded with extra afternoon work at school and the expected tasks they have at home apart from playing or doing other unsupervised activities so that when night falls, students are often very tired and inclined to go to sleep straight away with very little attempt to revise their school work. Furthermore, with the common social gathering of relatives at home and drinking ‘yaqona’ or kava, it is very hard for the school children to concentrate with their studies at home — especially with the open ‘partition’ structure of the village homes.

Some relaxation is needed for the adults due to their heavy community work during the daytime. A normal practice for village adults every evening would be the social gathering and drinking ‘yaqona’ or kava while they tell stories and talk about their daily work. ‘Yaqona’ when taken tends to relax the body and mind. ‘Yaqona’ is not bought from shops as in the urban centres since nearly every family in the village plants it in their garden. Drinking ‘yaqona’ used to be seen only amongst village elders and only during special occasions or functions in the village but now, the younger generation who recently left school (dropouts) are also seen practising this almost every day in the village. On most occasions, ‘yaqona’ drinking in the evening carries on until late into the early hours of the morning. Some of those who consumed ‘yaqona’ late at night can often be seen spending the next day sleeping without doing any work at home or in their plantation.

Church activities and ceremonies play a prominent part in the lives of the villagers of Natoa. Christianity, brought to Fiji by Missionaries roughly 5 generations ago, is the main religion for the village community. The church building is an obvious and prominent physical landmark of Christianity in the village. The people equate having a proper church building with strong faith in the new religion and its ultimate goal, the salvation of the soul. Thus the village of Natoa gives high priority to anything to do with the church. Church-going and church related activities often occupy a good part of the working time. It is most common to see parents worshipping God in their homes and also at church instead of spending time with their children about their school work at home. Sunday is regarded as a very special day
for the village community since most of them are Christians and they all go to church on this day. They often wear good clothes and prepare very good food for the day. They worship God for the whole day without doing any other activities. Children are not allowed to roam aimlessly around the village on Sunday. They always attend Sunday school which is often conducted by some village elders at the village church. Apart from Sunday, there are other days for church service such as Wednesday and Saturday afternoons. These daily activities are the ones seen to be regularly practised by the people of Natoa.

During the time of my observation, only a few people in the village have entered government services and none has ever become a lawyer, doctor, scientist, politician, businessman, or shopkeeper. The people for the most part are subsistence farmers, planting mainly for family consumption and selling excess produce in order to buy necessary things like clothes, knives, canned food as well as to pay for school fees and other communal obligations. Very few people in the village (about 6 during the time of my visit) run small dairy farms in which they earn their living from milk sold locally.

The village community still practices the Ethic Fijian custom of communal sharing called ‘kerekere’ or borrowing without repaying. A man can not refuse requests for his belongings from relatives under the custom of ‘kerekere’. This diminishes the attraction of commercial or salaried occupations in the village. The village is neither too isolated to be free from outside influences nor too accessible to be involved fully in the cash economy. Its people still practice hunting and gathering; cultivating and grazing, but they also buy and sell. Few of the people have gone further and become wage earners. It is a village in the process of change and whether these changes are for better or worse, only time will tell.

5.2. Dioka

5.2.1. The Settlement

Dioka settlement is located in the Province of Ra about 20 km from the nearest small town of Vaileka. The settlement consists of houses which are scattered along a distance of about a kilometre along both sides of the road to Rakiraki. There are about
50 households in the settlement perched on either side of the road. The settlement is flanked by two ethnic Fijian villages named Kira and Loa.

Most of the Indo-Fijians who settled at Dioka were the descendants of the indentured labourers from India who came during the colonial days but later opted to remain in Fiji after their 5-year contract period elapsed. They were freed from their indentured contract and were allowed to settle wherever they could lease or buy freehold land. Most of them formed settlements of scattered homesteads instead of living in villages like the Ethnic Fijians. Despite difficulties, an increasing number of them became Fijian leaseholders in the Ra and Rakiraki area. A few free Indian immigrants later joined them and the settlement now consists of a mixture of different castes. Their rural settlement did not replicate the clustered village organisation that indentured labourers had left behind in India. Instead, habitation took the form of loose settlements, where houses were dispersed in a social as well as a geographical sense.

Almost all the Indian households of Dioka lease land from the two Ethnic Fijian villages close by. The leased plots are large enough to guarantee that when a house is built on each plot, the houses will be widely separated from one another. Most of their leases are renewed for a period between 30 to 100 years depending on the consent of the Ethnic Fijian owners. Very few Indo-Fijians living around this community have freehold land. As the allocation of land plots largely determined settlement, people from the same part of India or from the same cultural and religious groups were not usually congregated together. Each Indo-Fijian family knows the boundary of their leased land.

A few things struck me during my stay at Dioka settlement. One is that their land boundaries are usually well fenced with individual houses inside the fenced boundary. In terms of the interior arrangement of their houses, it is common to see their houses having a sitting room separate from the kitchen, dining and bed rooms unlike Ethnic Fijian houses which are usually open without partitions. In addition it is rare indeed to see extended Indo-Fijian families staying together in the same house. I was told that lack of land mostly forced young men to leave the household since extended families cannot all survive on one small piece of land. Once a couple is married, they have to find their own way in which to earn their living separate from the rest of the family. Another thing which amused and impressed me is the fact that
nearly all the Indo-Fijian heads of household families can speak some Ethnic Fijian language very well; similarly, the majority of Ethnic Fijians from the villages enclosing Dioka settlement can speak Hindustani fluently. There is also a mixed language which is neither Fijian nor Hindi (Hindi-Fijian) which is also used by those who do not understand either ethnic language. Actually it is becoming difficult to remark precisely the division between Fijian and Hindi-Fijian, and between local Hindustani language and Hindi-Fijian. Many words, some originally Fijian, some originally Hindustani, and some originally English or from other languages, have by now become incorporated in both Fijian and Hindustani.

Indo-Fijians around this community have various religions, but most are either Hindus or Moslems. However, Sikhs are a small but significant minority. All Moslems who came to Dioka settlement belong to the Moslem League. The Moslems established their Mosque (temple) both as the religious centre, and as a place for the education of the people. Moslems all celebrate Moslem festivals such as Prophet’s Birthday, which is now a national holiday in Fiji. They also pray every day. Hindus pray or carry out their religious worship in their various homes. Most Hindus invite a priest to conduct religious rites (puja) for them, usually in response to some pledge they have made to perform this puja if something they pray for is granted. It consists of the priest reciting rituals, and the distribution of the fruit etc. to the people after the puja. The most important festival which all Hindus celebrate is Diwali, the festival of lights, which is also now a national holiday in Fiji. Diwali is still the day most Hindus of Dioka look forward to, for on that day, everybody drives evil away symbolically by lighting up the whole settlement.

I was told that Indians in Dioka were also visited by Christian missionaries in the past as now but resisted conversion to Christianity and the flow of missionaries to Dioka weakened as missionaries realised that their effort were fruitless. The main Hindu group that missionaries converted in Fiji are South Indians, and there have never been many in the Dioka settlement. Like rural Ethnic Fijians; rural Indo-Fijians always keep and protect their religion and regard it as being very important in their life. It is very rare to see cross-cultural marriage of Indo-Fijians with Ethnic Fijians in this rural Indo-Fijian community. This shows how they remain intact in their religion and culture.
The people of Dioka mainly practise subsistence farming. Some families of this subsistence farming community have moved to other areas around Fiji especially in town areas searching for jobs, land and other means of survival and they still regard Dioka as their old homeland because they were brought up in this area during their early days.

5.2.2. The School

Dioka Primary is a day school with a total roll of about 190 students - (101 girls and 89 boys). There are also a few Ethnic Fijian students (total of 5) attending this school. They are mainly the ones who reside very close to the school compound although the rest of the village children attend the Ethnic Fijian Primary school for the two Fijian villages close by. The school is controlled and administered by the school committee consisting of eight members who are all Indians living around the community of Dioka. It is a medium sized school with level ED5E according to the Ministry of Education classification of Primary schools in Fiji. The number of teachers teaching at the school is eight (four males and four females) - all Indo-Fijians with the exception of one female who is an Ethnic Fijian. The head teacher is a male Indo-Fijian who has the longest year of teaching at the school (30 years) as compared to the rest of the other teachers at the school. The school has an Assistant Head teacher (male Indo-Fijian) who assists the Head teacher in his administrative work. [Note: all schools having the level ED5E and above have an Assistant Head Teacher]. The Assistant Head teacher mainly looks after the discipline of students while the Head teacher concentrates on the administration of academic work at school.

All teachers of Dioka Primary School are qualified having Primary teaching certificates. A few of them have gained or are still pursuing higher qualifications like Diploma and Degree. Table 9 shows the number of teachers with their respective classes, ethnicity, qualifications and years of teaching experiences.
Table 9. *Teachers with Respective Classes, Ethnicity, Qualifications & Years of Teaching Experience (Dioka)*

<table>
<thead>
<tr>
<th>Classes</th>
<th>Teacher</th>
<th>Gender</th>
<th>Ethnicity</th>
<th>Qualification</th>
<th>Years of Teaching</th>
</tr>
</thead>
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<td>Indo-Fijian</td>
<td>Teaching Certificate</td>
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<td>2</td>
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<td>Indo-Fijian</td>
<td>Teaching Certificate, Diploma</td>
<td>10</td>
</tr>
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<td>3</td>
<td>Raju</td>
<td>Male</td>
<td>Indo-Fijian</td>
<td>Teaching Certificate</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>Maria</td>
<td>Female</td>
<td>Ethnic Fijian</td>
<td>Teaching Certificate</td>
<td>10</td>
</tr>
<tr>
<td>5</td>
<td>Vijay (Head Teacher)</td>
<td>Male</td>
<td>Indo-Fijian</td>
<td>Teaching Certificate</td>
<td>31</td>
</tr>
<tr>
<td>6</td>
<td>Sanjay (Assistant Head Teacher).</td>
<td>Male</td>
<td>Indo-Fijian</td>
<td>Teaching Certificate</td>
<td>26</td>
</tr>
<tr>
<td>7</td>
<td>Atish</td>
<td>Male</td>
<td>Indo-Fijian</td>
<td>Teaching Certificate</td>
<td>5</td>
</tr>
<tr>
<td>8</td>
<td>Kamal</td>
<td>Male</td>
<td>Indo-Fijian</td>
<td>Certificate, BA (pursuing)</td>
<td>17</td>
</tr>
</tbody>
</table>

Teachers are not provided with quarters at the school and they have to find a place to live while teaching at the school. This is not difficult for them since most of the teachers are the ones residing among the Indo-Fijian community for several years. Some of the present teachers were also former students of the school.

The land where the school is built is a native leased land and owned by the natives of the nearby village — Kira. The school is still leasing the land but because it was burned down twice by the native land owners during the last two coups (1987 & 2000), I was told by the head teacher that the school management has already purchased another piece of land (freehold) for the construction of the new school.
building since the nearby villagers of Kira are having a dispute with the school management about the land. The cause of the quarrel between the Indo-Fijian School management team and the native village of Kira was the boundaries to which the school compound has been extended. The native villages think that the management team has been using that piece of land illegally without paying its additional lease to the village. This quarrel between the two communities has been on-going for quite a while and I was told by the head teacher of the school that this was one of the reasons for the burning down of the school twice during the last two coups in Fiji. Temporary sheds were already erected and divided up into 8 separate classrooms where teaching was conducted during the time of my visit to the school. Each classroom has all the desks and chairs for each individual student; a blackboard; and a table and chair for each teacher in their respective classrooms. All these materials were donated by nearby Indian schools and the Ministry of Education. There was a temporary staff room built which consists of the head teacher’s office, a room for books and photocopying machine and the toilet for staff members. The students have a separate ablution block in the burned building which they still used because it had not burned down during the coup of 2000. The school has a female secretary, who looks after all the secretarial work of the school like typing, photocopying, mailing, selling of school stationeries to students etc. The school also has electricity just like Natoa Village School. Despite the fact that the school was burned down in 2000, it has substantially regained all the necessary things required for teaching.

5.2.3. Daily Routine

The use of time is one thing which is very precious for the Indo-Fijians at Dioka settlement. They work to time when they do their daily activities from morning until afternoon. In the early morning before the children go to school, individual households especially men are seen to work in their various plantations either ploughing using bullocks, hoeing, weeding or applying manure or spraying in their rice or cane field, or vegetable garden. Some families who have a few cows will be seen coming out into their paddock to milk the cows for family consumption. Women would mostly remain at home preparing breakfast and children prepare themselves for school. Men are often seen to do these morning activities on the plantations before they return home for breakfast between 7:00 to 8:00 am.
At the dining table, the main food seen will be “roti” (pancakes made from flour) or rice with either meat or vegetable curry which sometimes go together with dhal and other variety of Indian dishes. The dietary patterns of the two ethnic groups around Dioka also bear testimony to inter-ethnic interactions. Certain Ethnic Fijian foods such as cassava and “kumala” (kumara) are commonly grown and eaten by the Indo-Fijians of Dioka while Indo-Fijian foods, particularly “roti” and curry are enjoyed by their Ethnic Fijian neighbours.

After breakfast, when children leave for school, men typically rest for a while and afterward continue with their work in the field. Their farm sizes are generally not very large due to the unavailability of land. The majority of them have leased land within the range of 2 to 5 acres. However, most of the available leased land for each family is totally used up in planting various types of crops or for pasture for grazing a few cows and hardly any area is left idle. Individual farmers mostly use fertilizers in their plantation in order to maintain soil nutrients since the small piece of land is continually planted every year for the number of years they have been leasing the land. Life is hard and it is very difficult for the family to survive especially with the shortage of land.

The main vegetables and fruit planted in most of their gardens are cabbages, lettuces, egg-plants, chillies, pumpkins, tomatoes, cucumbers, beans, and pawpaw. These are fast-growing cash crops which are grown for a few months and then either sold on the road side or (when there is sufficient supply) taken to the nearest small town during weekends to a marketplace. These vegetables and fruit fetch good prices in the local market especially when they are of a kind that is consumed by Ethnic Fijians as well as Indo-Fijians.

Apart from sugarcane and vegetables, rice is another major subsistence crop in Dioka. Most locals grow rice because it is also a very important part of their daily diet. Wet rice cultivation is the traditional method. It involves preparing the seedbed for the seedlings. The usual practice is for the land to be ploughed properly and left for planting during the wet months. When the seedlings are about one foot high, they are pulled out in preparation for planting.

The field needs to be weeded at intervals in order to ensure a good harvest. Harvesting is often done manually where all adult members of the family take part. Threshing is mainly done by horses walking over the harvested rice in circles. This
method of cultivation still continues, but is no longer the dominant method of cultivation at Dioka. It often consumes a lot of time and effort and it also depends much on the availability of rainfall which is always a problem on this area. Dry rice cultivation is by now the most common method of cultivation. Rice in this case is seeded once the field has been prepared and weeds are kept under control by spraying. Insecticides are also used. Harvesting and threshing are carried out in the same way as for wet rice cultivation. A few locals also grow Fijian root crops like cassava, taro, and yams. Some who have a few cows in their paddock sell milk every morning around the rest of the community.

At home, women usually do daily housework like looking after the baby, cooking, washing and cleaning the house. Around about 10 am, women would come out into the ploughing field or area of work bringing some cold drinks or tea to family members who are working. It is very rare to see Indo-Fijian farmers staying at home without doing any work during day time. Men will continue to work until mid-day when they will come home to have their lunch. Their work will continue after some rest at lunch time until the afternoon when they will once again be served some tea or (if it is a hot day) cold drinks at round about 2 pm by their wives or by the elder women at home. In most cases, men will continue to work in the farm until about 4 or 5 pm if there is still light whereas women will go home and wait for their children returning home from school.

At school, when children arrive in the morning before 8:00 am, they have allocated areas around the school block to pick up rubbish in houses just as is observed at Natoa Village School. However, instead of the teacher on duty supervising all the students in their various areas of work, all teachers of Dioka Primary participate in looking after children’s morning duties. Teachers know their various responsibilities when they arrive in the morning. However, like teachers at Natoa Village School, teachers of Dioka also take turns in doing their duties every week at school. A teacher on duty usually has the responsibility of supervising students in their various areas as they do their morning duties (even though class teachers also help in this area). They see to the punctuality of students in every area. They move to and fro at school and also conduct the school assembly every Monday morning and Friday afternoon. A bell rings at 8:15 am at which time students wash their hands and move to their various classrooms for roll call and reading until another
bell goes at 8:30 am when classroom teaching will normally begin for all the classes. This will continue until 10:25 am when there is a recess for about 15 minutes. Classes will resume at 10:40 am until 12:00 pm when the bell goes for lunch. Lunch break is for one hour. During lunch time, students are supervised in their own classroom by their respective class teachers — i.e., teachers have to sit down with the students for at least 15 minutes while the students eat their lunch in the classroom before students are allowed to move out and wash their hands and do whatever activity they can do after lunch. Teachers during this time can also eat their lunch while sitting in front of the class. I was told that the purpose of this exercise was to enable teachers to check student’s diet (balanced diet) and also to prevent students from throwing their rubbish carelessly around the school compound since the students typically bring their lunch in parcels. (A ‘parcel’ is usually some curry, rolled up in some roti, wrapped in greaseproof paper.)

Afternoon classes resume at 1:00 pm and continue until the final bell at 3:00 pm signifying the end of the school day. There is no extra 1 hour afternoon duty from 3:00 pm to 4:00 pm as is seen at Natoa Village School. Some students are allocated from each class to do classroom cleaning, but this is often done 10 minutes before the last bell goes at 3:00 pm. Students go directly home at 3:00 pm with the exception of teachers who have to remain at school until their signed off time at 4:00 pm; unless they want to leave early for some purpose in which case they have to ask permission from the Assistant Head teacher. Compound cleaning is the responsibility of the school committee which employs a labourer to do the work. When children break off from school at 3:00 pm, they will go straight to their various homes and within 10 minutes time, there are hardly any school children found within the school compound.

It is common to see Indo-Fijian mothers at home when children arrive home from school in the afternoon. In most cases, tea will be prepared for their children when they return home from school. Children are not often found to be released by parents to mix around with other community members in the afternoon. Instead, children usually do activities around their various homes and they are not often given difficult tasks to do after school. Parents also allow more time for their children to do their school work in the afternoon. Even when some visitors are around chatting with members of the family in the afternoon, children’s study or school work at home are
not often disrupted because students do their studies in their bedroom separate from the sitting room where social functions always take place.

In the evening, some men might be seen consuming ‘yaqona’ or kava but this will comprise only one or two basin mixes before they have their dinner. Kava drinking at Dioka is not as regularly practised as at Natoa village.

Education has been a very significant factor in the lives of the Indo-Fijians at Dioka. I was told that for some time after the Indo-Fijians’ first arrival in the area the community did not have any school to provide education for their children. Many of the descendants of theindentured people were illiterate; however they were determined to provide some education for their children so that the children could become better off than their parents. Initially, education was gained from some of the old people who were literate, and in some cases from those who had had some kind of education during those early days. These people became teachers but did not charge for their services. They did not systematically allocate time for their teaching either. Interested people had to find times convenient for the teachers. I was told that at times some people during those early days went to the teachers’ farms and waited while they ploughed. When they rested from ploughing, they taught people by talking informally with them. Teaching was usually in the vernacular languages, (Hindi and Urdu) emphasising reading, numeration and the transmission of accumulated wisdoms and experience to the young people. This idea of schooling or to get educated is therefore not new to the Indo-Fijians of this settlement. In fact, this inspired them to build their own primary school to cater for their own children. Parents still push for the education of their children because they have seen the good effects of it. In a few generations some who started from subsistence farming have moved into middle-class jobs such as shopkeepers, taxi drivers, blacksmiths, and many (as I was told by various elder parents) have earned jobs as policemen, teachers, lawyers, and doctors as well as in various government centres around the country today.

5.3. Loma

5.3.1. The Village

Loma village lies in the Province of Naitasiri about 6 kilometres away from the nearest government station of Vunidawa and about 80 kilometres from its nearest town of Nausori. The village lies very close to a river which the village people still
use as a means of transport. They now also benefit from a new road constructed a few years ago to join Vunidawa to Loma and other nearby villages in the district.

The Fijian village of Loma is much bigger than Natoa in terms of the number of houses and its population because it incorporates in addition two other, smaller villages which lie very close to one another. These two small villages in fact consist of people from the main village of Loma who have moved out to settle in their own “mataqali” or clan land. The two small villages still come under the jurisdiction of the main chief at Loma but after several years of living in their own “mataqali” land, the residents of the two small villages have created their own chiefs to look after them. Even though each of these two small villages has its own chief, whenever the whole people of Loma perform traditional ceremonies, it is the main chief of Loma who is the highest of the three — sitting in the middle and always drinking the first bowl of “yaqona” or kava before the other two chiefs.

Like the village of Natoa, Loma village has undergone changes in terms of the structure of their houses, which now have mainly corrugated iron roofing and wood or concrete walls. There are footpaths around the village, and tap water is available both in the village and at the school. During my time of visit, the village has its own generator which supplies electricity to the school and to every house in the community.

The arrangement of houses with different clans living together on the same area of the village surrounding the chief’s house in the centre of the village is no different from any other nearby Ethnic Fijian village including Natoa. Even the interior construction of the houses is generally the same, typically with three doors and windows and without partitions, while mats are usually spread on the floor for people to sit on.

All the traditional customs and social practices found at Natoa village are also practiced at Loma. These include the custom of respect, “kerekere” or borrowing without replacement, the way in which village people conduct meetings, the custom of working communally, the social gathering at night and drinking kava. People in the village listen and obey whatever is told by their chief without questioning and this is a norm to all other Fijian villages in this area.
5.3.2. *The School*

Loma District School was established in 1948 by the 3 village communities of the Loma District because it was very difficult to send their students to Vunidawa --- another Fijian school about 6 kilometres away from the district since the area was not accessible to road during those days. Their main means of transport to Vunidawa during the early days was by boat through the main river which runs very close to the nearby villages. However, students often missed classes during periods of heavy rain because of river flooding and it is very difficult for them to travel by boat especially when they have to travel against the flow of strong river currents when they return home. This is why they built their own school in the village of Loma. The school unlike Natoa is built within the village boundary but separated from the village by flower hedges which act as a boundary between the village and the school. Today the school is accessible by road linking neighbouring villages and schools.

Loma District School is a rural school administered by the school committee which consists of 8 members who are all Ethnic Fijians living in the three villages of the district of Loma. The total number of teachers teaching at the school is eight (six males and two females) all of whom are Ethnic Fijians except one Indo-Fijian. Table 10 shows the number of teachers with their respective classes, qualification, races and years of teaching experiences.
Table 10. *Teachers with Respective Classes, Ethnicity, Qualifications & Years of Teaching Experience (Loma)*

<table>
<thead>
<tr>
<th>Classes</th>
<th>Class Teacher</th>
<th>Gender</th>
<th>Ethnicity</th>
<th>Qualification</th>
<th>Years of Teaching</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Ana</td>
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<td></td>
<td></td>
<td>Fijian</td>
<td>Certificate</td>
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</table>

The head teacher is a male Ethnic Fijian who also originates from Loma and has been serving in his own village school for the past ten years. His assistant head teacher is a male Ethnic Fijian from a nearby village who has been teaching for a long time (about 20 years) before he was posted to this school in (2001).

Like other schools which have assistant head teachers, his main area of responsibility is the disciplining of students while the Head teacher is expected to look after the overall administration of the school. However, during my visit to this school, I found that most of the Head teacher’s responsibility is also done by this Assistant Head teacher and this can be explained in terms of the traditional ties between the two villages from which the two Heads come from where they most often support each other in doing their village activities. Whatever task is supposed to be
done by one is taken up by the other due to the Ethnic Fijian tradition of helping each other.

Loma is a day school with a total roll of about 184 students — 86 girls and 98 boys. All students attending this school are ethnic Fijians from the 3 close villages around the district. Teachers of Loma District School are all qualified Primary teachers gaining their teacher’s certificates from the various teachers’ colleges in Fiji. However, none of them gained qualifications such as a Diploma or a Degree. Their years of teaching service differ and range from 2 to about 25 years as shown in Table 10.

Like teachers at Natoa, teachers at Loma are provided with quarters built by the school community. They are also given some land around the school compound to plant their own crops. [Most Ethnic Fijian village schools provide teachers’ quarters and land for planting for the purpose of attracting teachers at their respective schools.]

5.3.3. Daily Routine

There does not seem to be much difference in terms of the activities done by the people of Loma to those that are done by the people of Natoa village from morning until evening. Its people mainly rely on subsistence farming for their living. The people still practise ‘slash and burn’ agriculture. Planting and building of family houses is still done communally. They still hunt and gather, cultivate and graze, but they also buy and sell. They have plenty of land for farming but most of these lands are left idle and still covered with forest partly because much of the territory is rugged and very difficult to develop and also because the land is owned communally rather than being owned by each individual. The people plant root crops such as cassava, taro, kumara, yams; vegetables like cabbage, water cress, taro leaves, carrots, lettuce, beans; fruit like tomatoes, corn, water melon, cucumber, chilli etc. Those who have farm implements are found to have larger farms, and to have extra products harvested and sold at either Nausori or the Suva market. The village people also plant ‘yagona’ or kava in their plantation which is harvested mainly for consumption during village functions and meetings.

The community, like any other Ethnic Fijian village community does not follow the time when they do their respective work. People normally do their communal work after breakfast and either take their lunch with them to the plantation or it is cooked in their small thatch house in their garden. They work in their respective
plantations (which are usually a distance away from the village) and they return home when the sun goes down in the evening. The people work in groups for about three days in a week and use the other three days in doing their individual work or activities like for example selling their crops in the local market. Since parents often arrive home late from their plantation, students are often left unsupervised when they return home from school. It is not uncommon to see some people sleeping during the day without working in their various plantations.

Like the people of Natoa, the Loma people regard Sunday as a very important day for worship. They often remain in their homes without doing any work and attend church service in the morning and afternoon in their respective village churches. Children have Sunday school every Sunday morning where they are all expected to attend. They are not supposed to play on Sunday and if they are caught doing so, they typically are taken to the village elders who will discipline them by giving them corporal punishment.

Drinking “yaqona” or kava is also very commonly found amongst the community in the afternoon and it has spread to other working areas like the school. Teachers of the school (mainly male ones) also drink “yaqona” to relax their mind after a day or week’s hard work and in most cases it always ends up late in the morning. The Head teacher who is very fond of the drink always leads them in the “yaqona” session. This could be one of the reasons for his late arrival at school most mornings.

There is a slight difference observed in terms of the school time table as compared to that of Natoa. At Loma District School, since the school is located within the village, students are expected to arrive earlier at 7:45 am rather than the normal time of 8:00 am. As soon as they arrive, they are given their toothbrush (which is normally kept at school) to brush their teeth. A wooden gong is beaten at 8:00 am at which time the school will either have assembly (Mondays and Fridays) and class inspection or teachers conducting morning devotions with their respective classes in their own classrooms until a bell goes at 8:15 am. From 8:15 am to 8:30 am, marking of home work is done in each class. Different teachers prepare their own subject time table for the lessons they are taking but they all begin class at 8:30 am, have recess at 10:30 to 10:45 am, lunch from 12:00 to 1:00 pm and resume classes from 1:00 pm until 3:00 pm.
Whereas students at Natoa have their lunch at school, students of Loma District School have their lunch in their own homes in the village. Because of this, there is no opportunity for teachers to check students’ diet at lunch time like the other two schools visited. However, like the other two schools visited teachers of Loma District School are scheduled to have weekly duties at school and have the same responsibility as teachers of the other schools do when they are on duty. Like Natoa Village School, Loma District School also engages students with extra afternoon work inside and outside the classroom from 3:00 pm to 4:00 pm every school day with the exception of rainy days where they only work inside their various classrooms doing special duties. The overall compound cleaning and other work needed for the school is done by the school community.

Teachers are supposed to remain in their various classrooms or at school during school hours from 8:00 am to 4:00 pm except at lunch time when they can go home to have their lunch. However, at both the Ethnic Fijian schools of Natoa and Loma, it is not uncommon to see teachers remaining in or around their homes within their teaching hours and before their sign off time at 4:00 pm. This is one disadvantage of teachers having their homes situated within the school compound. Teachers do not use up their school work time efficiently in doing school work but instead are attracted to do some other activities which are not school based in their various homes whenever they find some free time during school hours.

5.4. Kristi

5.4.1. The Settlement

The settlement is situated in the North of Tailevu Province about 8 kilometres from the small town of Korovou and is close to the sea. It is a settlement composed mainly of South Indian descendants of the indentured labourers who came to Fiji during the colonial days and who now choose to live in Fiji and earn their living by farming.

Indo-Fijians in fact did not have much choice since the Colonial Government’s option for them was to choose from either going back to India or to stay on their own in Fiji after the completion of their 5 years indentured labour contract. The Colonial Government did not offer free land for them. So any indentured people who chose to stay in Fiji had to find his or her own means of survival. Since the sale of Native land
is not permitted by law, (only freehold land can be purchased) it left no choice for those who chose to manage their living by farming but to either lease pieces of land they found suitable to support their living from Ethnic Fijian landowners or to buy freehold land. This is the type of situation which is also faced by the Indo-Fijian farmers of Kristi settlement. Most of the land which they leased belongs to the nearby Ethnic Fijian village of Mata. A few of them have managed to save enough money to have purchased their own piece of freehold land from descendants of European settlers who have been living in the area since the Colonial days. The Indo-Fijians of Kristi chose to live in this particular area because of its flat and fertile soil which is suitable for varieties of vegetables, and rice apart from dairy farming.

Unlike the Ethnic Fijian communities of Natoa and Loma, the Kristi settlement hardly has any forest area visible since all the forests have been almost completely cleared and developed for farming. All this change has been made by the Indo-Fijians when they first came to occupy the land. Like Dioka, the homes of Indo-Fijians at Kristi settlement are scattered on both sides of the road leading towards the Ethnic Fijian village of Mata. A few Ethnic Fijians from Mata village have also built their houses within the Kristi settlement and have also done some vegetable and rice farming practised by the Indo-Fijian community around Kristi Settlement. The boundaries of each individual family’s land are marked by barbed wire fences. Like Dioka, the internal structure of the houses observed at Kristi settlement have separate rooms for living, dining, and kitchen and bed rooms. In addition, extended families are often not living together under one roof. Once a couple is married, they look for their own home and means of survival rather than relying on parents or other members of the extended family.

Some Indo-Fijian couples, with their land lease about to expire have approached the Ethnic Fijian chief of Mata village traditionally to ask for the extension of their lease which in most cases, the chief agrees to. In some cases, whenever the village people collect money for some important project in the village, their Indo-Fijian neighbours are invited to also give their contribution. This mutual relationship between the two different ethnic communities has developed for a long time and it will be very difficult for the two communities to be separated from each other. Most Indo-Fijians of Kristi need the Ethnic Fijian support in order for their lease to be
secured and at the same time, Ethnic Fijians of Mata village need financial support from the Indo-Fijians of Kristi.

5.4.2. The School

Kristi Primary School is a South Indian school established in 1953 by the South Indian Community of Kristi settlement to cater for the Indian migrants who settled along this area. The school land is leased to the people of the above-named village and the lease is renewed every 50 years. The lease is about to expire at the end of 2001 and I was told by the school manager that the chief of the Ethnic Fijian village has agreed to extend the lease for another 50 years.

Kristi Primary School is a non-government rural school administered by a committee of the Indo-Fijian community residing near the settlement of Mata where the school is built. The village of Mata has its own separate primary school which is a few kilometres away from Kristi Primary School. However a few Ethnic Fijian parents from Mata due to their closeness to the Indo-Fijian community send their children to Kristi Primary School instead of sending them to their Ethnic Fijian School.

Kristi Primary School has a total of four teachers (3 male Indo-Fijian and one female Ethnic Fijian). The school head teacher is a male Indo-Fijian and there is no assistant Head teacher for the school because it is a small school — ED6D (lowest level). Kristi Primary is a day school with a total roll of about 123 students — 57 girls and 66 boys. Out of the 123 students, 5 are Ethnic Fijians and the rest are Indo-Fijians.

All teachers are qualified having gained their teaching certificates from Teachers’ College. Two of them are currently doing their degree extension studies at the University of the South Pacific while another has a Diploma in Hindi. Each teacher takes two separate classes. The majority of teachers have more than 20 years of teaching experience. All this information is summarised in Table 11.
Table 11. Teachers with Respective Classes, Ethnicity, Qualifications & Years of Teaching Experience (Kristi)

<table>
<thead>
<tr>
<th>Classes</th>
<th>Class Teacher</th>
<th>Gender</th>
<th>Ethnicity</th>
<th>Qualification</th>
<th>Years of Teaching</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 &amp; 2</td>
<td>Ravi</td>
<td>Male</td>
<td>Indo-Fijian</td>
<td>Teaching Certificate, Diploma</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 &amp; 4</td>
<td>Chandra (Head Teacher)</td>
<td>Male</td>
<td>Indo-Fijian</td>
<td>Teaching Certificate</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 &amp; 6</td>
<td>Ramesh</td>
<td>Male</td>
<td>Indo-Fijian</td>
<td>Teaching Certificate, Diploma</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 &amp; 8</td>
<td>Ana</td>
<td>Female</td>
<td>Ethnic Fijian</td>
<td>Teaching Certificate, B. Ed. (Pursuing)</td>
<td>8</td>
</tr>
</tbody>
</table>

Like the teachers of Dioka, teachers of Kristi Primary School are not provided with quarters in the school compound. Most of them reside among the school community and they either walk or travel by bus from their home to school. Nearly all the Indo-Fijian teachers teaching at this school were once brought up through this primary school.

5.4.3. Daily Routine

During my field study at Kristi settlement, I stayed with one of my relatives at the village of Mata, the village which owns most of the land at Kristi settlement. The village is located on a hill top and its location is such that any activity happening within the Kristi settlement can be easily observed from the village. Early morning when the rest of the family were still asleep, I used to be woken up by the sounds from the village, and I would then take a walk down the Indo-Fijian shop to buy some bread or biscuits for breakfast. What actually strikes me most is the effective use of time by the Indo-Fijian farmers during the early morning as compared to the Ethnic Fijians of Mata village. Most of the time I could see Indo-Fijians already doing
various activities in their farms such as planting, ploughing or weeding in their long plots of vegetable gardens, or milking cows in their small dairy farms; whereas, during that same period of time, the majority of Ethnic Fijians in the village of Mata were still in bed. These types of activities seem to be the normal routine I observed with the Indo-Fijian community of Kristi during my stay at Mata village. Their blocks of land are usually occupied with varieties of vegetables and root crops and are never left idle for one year as is commonly found in the two Ethnic Fijian villages of Natoa and Loma. This shows how much Indo-Fijians are committed to their work. While men did these activities women on the other hand did most of the house work at home and may help their husband in the field in some ways too like for example delivering water or tea in the plantation during working hours.

The type of food taken by the Indo-Fijian community of Kristi is very similar to that taken by any other Indo-Fijian communities in Fiji, where rice and ‘roti’ are the dominant starchy food taken together with vegetables, meat, curry and dhal. However, some of them have also turned to consuming some Ethnic Fijian types of food such as cassava, taro, and yam with fish in coconut cream. This is probably due to the interaction between the Indo-Fijian communities of Kristi with the Ethnic Fijian village of Mata. They have a very good relationship with the nearby Ethnic Fijian village of Mata and that is why most of them know how to speak the village dialect fluently too. They also respect the village chief and this is probably why he has given consent to them to extend their school lease for another 50 years.

The Indo-Fijian community of Kristi like the Indo-Fijians of Dioka mainly rely on crops they plant in their small pieces of lease-land to earn their living especially by selling their crops to the local market. They plant different varieties of vegetables and some of them also plant Ethnic Fijian foods like cassava, taro, yams, and kumara. To retain the fertility of the soil in their garden, they often use manure and fertilizers in their garden to improve the growth and yield of their crops. Some of them who owned small dairy farms managed to produce their home-made ghee in their homes rather than buying it from the shop which is very expensive. Ghee is mainly used in cooking purposes and in making one of their common foods — the ‘roti’ which is made from flour. A few Indo-Fijians in Kristi use their leased land to graze a few cattle to provide milk and ghee for family consumption. Their farm yields are not much because their block of land is not big enough to cater for more crops or for more
grazing of their cows. Rice planting is also practised but it is done mainly for family consumption rather than being sold to markets.

The majority of Indo-Fijians who live around the Kristi settlement are Hindus with a small proportion of Moslems and a few Sikhs. How they worship and celebrate festivals is very similar to what the Indo-Fijians at Dioka practised.

The school time table is a bit different from that of the other three schools studied. The daily programme for the school is that as students arrive at 7:30 am they straight away do their morning studies until a bell goes at 8:15 am when they will begin with their morning duties until 8:30 am when another bell will ring. Morning duties include classroom sweeping and picking up rubbish around the school compound. Students are divided up in to four houses named after the four different colours: Red, Blue, Green and Yellow. Each house has a respective area to pick rubbish from every morning and each teacher is also allocated a house to supervise in the morning duty time.

Like the other three schools, teachers of Kristi Primary School also take turns in doing their duties at school. Their main duties are to see that students are punctual, attend to their morning duties and they are also responsible for conducting assemblies in the morning and afternoon if needed by the head teacher to make very important announcement to the school.

Students will wash their hands and get ready for assembly (every Mondays and Fridays) or class inspection (for other days) until 8:45 am. A session on moral values and morning talk begins at 8:45 am and ends at 9:00 am when normal class will begin. Recess is from 10:30 am to 10:45 am and class will resume after that until 12:00 noon when they will have their lunch in their own classrooms supervised by class teachers. Children of Kristi Primary, like Dioka Primary also bring their own lunch to school and teachers supervised students during their lunch hours in the classroom when they eat their lunch. They also checked students' lunch and stressed the importance of having a balanced diet. They are expected to remain in the classroom at least after the children finished their lunch. Toothbrush bell goes at 12:35 pm and students can undertake whatever activity they wish after that. Class resumes at 1:00 pm and it continues until 3:00 pm when the students will break off and go home straight away with the exception of teachers who will remain and do some of their private work until their sign off time at 4:00 pm when they will leave.
the school compound. Kristi Primary like Dioka Primary School does not allow students to have extra afternoon work as is seen at the two ethnic Fijian schools of Natoa and Loma.

Unlike Natoa and Loma, when students of Kristi return home at 3:00 pm, they are not often seen to play or roam around the school compound or other areas again. When they arrive home, tea or some food is always prepared for them by their mothers who are at most times present at home. In addition, scarcely any work is allocated to the children beyond the schoolwork that they need to do. In consequence much more time is given to them to do their homework or to revise their school work. Moreover, in most cases they are not disturbed by the social gathering of people at home which is so characteristic in Ethnic Fijian homes. There may be some “yagona” or kava served in the afternoon for some Indo-Fijian people of Kristi but not much because they had to buy it from the shop if they want more. This is the main reason for their not consuming a lot of “yagona” — because it costs them a lot of money to buy it from the shop since they do not plant it whereas in the case of the two Ethnic Fijian villages of Natoa and Loma, “yagona” is planted by nearly every household. Students in most cases have their own private studies in their own room, away from such “yagona” drinking as might take place.
Chapter 6

Data Interpretation

6.0. Introduction

This chapter presents my interpretation principally of the data that I collected from classroom teaching observations and from the home environment of the two ethnic groups. My hope in my confronting these data has been to find out whether the differential performance of the two ethnic groups of students in science at school is influenced by the way the two sets of ethnic teachers teach science at their ethnic schools or whether it is influenced by their cultural upbringing at home. At times during the course of interpreting these data, other data sources such as participants’ holistic ideas from interviews, documents collected and my own experience are brought in to support the interpretation that I proffer of my observations. Quotes and participants’ verbatim accounts are presented as indented paragraphs in the chapter.

I have organised the topics I interpret according to the different settings emphasised in my theoretical background chapter, in which, using Bronfenbrenner’s ideas, I have pointed to the importance of relationships between systems as critical to the child’s development. Can these ideas be used to explain the differential achievement of the two different ethnic groups at school in various subjects including science? I have attempted to organise this chapter in a way that shows that they can. In particular, I have attempted to lay out my findings and my interpretation of these findings so that the reader can clearly see all the various systems or settings which can affect the child’s development and thus his or her performance at school rather than envisaging child development as a process occurring within a single setting such as for example what is happening only at school between the teacher and the students. In fact for children of either ethnic group, the children’s inter-personal relationships are embedded in the larger social structures of their community and the wider society. Political and social factors at various levels can impact upon their development and thus their achievement at school. Here, I have interpreted the results of my findings with respect to the main settings I used in Chapter 3. This includes: direct interactions between the child and the teacher at
school (a microsystem); exosystem influences on teaching and learning; direct interactions between the child and parents at home (a microsystem); and finally exosystemic, macro-systemic & chrono-systemic influences of home life and learning of children.

In each of the four main settings listed, the main findings are first summarised before it is interpreted and discussed.

6.1. Direct Interaction between the Child and the Teacher at School (A microsystem)

The direct interaction between the child and the teacher and between the child and other children at school can affect the child’s development and performance at school. One needs to consider each teacher as an individual, each child as an individual, and the form of their relationship as potentially unique. All of these things impact upon the development and academic performance of the child. Some of the areas in which the child and the teacher have direct interaction at school which I looked at during my field study are summarised below. What I found out from these considerations in relation to the two ethnic groups I shall discuss shortly.
SUMMARY OF THE FINDINGS

Direct Interactions between the Child and Teacher at School

Teachers’ Practices and Beliefs

Both ethnic groups of teachers:

• Engaged their respective students in group work, but always direct their students on what to do during group work for the authority of the teachers was always paramount.
• Over-relied upon instructions given in the teacher’s guide or text book while conducting their science teaching. Thus there was little if any opportunity for them to engage with students’ spontaneous thinking or use a constructivist teaching approach.
• Taught according to the syllabuses set out by the Ministry of Education for teachers to follow.
• Asked more recall-type questions than application or long-answer questions in class and very few opportunities were given to students to ask questions in class. [Students of both ethnic groups were notably unwilling to ask questions spontaneously. Indo-Fijian children were better disposed than Ethnic Fijian children to approach a teacher with a question after a class, but like the Ethnic Fijian children they were disinclined to ask their teacher questions during class time.]
• Emphasised note giving and rote learning especially in higher level classes (classes 6, 7 and 8).
• Regularly switched to their own/native language during the course of their teaching of science. However the Ethnic Fijian students and teachers face special difficulties because Ethnic Fijian language lacks words for certain scientific concepts. The experience of Indo-Fijian students and teachers relative to the Hindi language seems notably better on this count.
• Carried out composite and straight class teaching and there is not much evidence to support the assertion, that the preponderance of composite class teaching in Ethnic Fijian schools disadvantaged Ethnic Fijian students. Composite classes have a positive rather than negative effect on Ethnic Fijian students.
Direct Interactions between the Child and Teacher at School (Cont)

Teacher’s Practices and Beliefs (Cont)

There was no significant difference in terms of:

- The number of weeks spent by the two ethnic groups of teachers in doing their revision before the commencement of the final examinations.

- The regularity in conducting tests before the External Examinations.

- The way the two Ethnic teachers constructed their trial tests before the Final National Examinations for their examination classes such as classes 6 and 8. (The types of questions asked and the set up were mostly similar to previous years’ External Examinations.

- How they relied on the blueprint set by the Ministry of Education in constructing their tests.

What is remarkable is that in both ethnic teachers:

- The number of weeks they spent in revision for examinations was very high.

- They regarded students’ preparation for examinations as being very important and this is why trial test questions were set in a way very similar to the final examination.

- They made sure that all examinable topics were covered, and revised before examination.

There was a slight difference found in how the two ethnic teachers analysed their trial tests.

- Indo-Fijian teachers of both Indo-Fijian schools had a proper analysis system where formal analysis sheets were used to find out the weak areas of students so that they could work out the reasons for diminished performance. This enabled Indo-Fijian teachers to rectify the problem areas of students.

- Such a system was not used by the Ethnic Fijian teachers of the two Ethnic Fijian schools.
Direct Interactions between the Child and Teacher at School (Cont)

Students' Relationship with Teachers

- The custom of respect and deference for elders tends to inhibit Ethnic Fijian students from asking questions not only in class but at all. They respect teachers like they respect any elder at home and this is reflected in the classroom situation where they are always shy to ask questions in class for they think that by asking questions in class, they may be chided by teachers for being too clever and not respecting them. Likewise they do not approach teachers out of class time with questions because of their culture of silence out of respect. Although Indo-Fijian students also do not often ask questions in class, they were significantly more keen to bring questions to their teachers after class, and they did this often and without evident inhibition.

- Corporal punishment is still practised at the two Ethnic Fijian schools intensively studied but not at the two Indo-Fijian schools. The practice is feared by Ethnic Fijian students, in whom it represents a strong reason to refrain from asking any questions of their teachers. The emphasis in the Ethnic Fijian culture upon the use of corporal punishment to discipline children at home could contribute to its use by Ethnic Fijian teachers at school. Ethnic Fijian teachers' practice of ridiculing or embarrassing students whenever they gave wrong answers in class created fear among Ethnic Fijian students, and this may also inhibit them from asking questions.

Students' Extra Afternoon Duties at School

- Both ethnic schools engaged their students in doing morning duties; however in the afternoon when school ended at 3:00 pm, whereas both Ethnic Fijian schools engaged their students with an extra one hour of outside work before sending the students home, children at the two Indo-Fijian schools were sent home at 3:00 pm. At the Indo-Fijian schools, the outside work was done by people employed by the school, and it was assumed that the children needed to use time beyond the end of the school day on their homework.
6.1.1. Teachers' Practices and Beliefs

In doing my classroom teaching observation in particular, I was on the look-out both for differences in teaching approaches differentiating the two ethnic school environments, and for unwarranted uniformity, where this would disadvantage one group of students because of their cultural differences.

6.1.1.1. Allowing students to work in groups.

I chose to look at this activity in order to find out whether teachers engage students to be actively involved in the activities or experiments during the lesson. This is based on the idea that students will both understand and also remember things the more readily if they do the activities in groups rather than only hearing or watching what is done by the teacher. I sought to determine whether there are ethnic differences on average among children concerning how welcome or effective group activities at school might be, and whether there are differences between the two ethnic school contexts in how fully group activities are incorporated into classroom practice.

When working in groups, students will share ideas, and thereby learn from each other, which in effect can improve their achievement in science at school. I found teachers to hold officially to the view that group activities aid learning. Moreover, I found that Ethnic Fijian teachers were still more positively disposed, in principle, to the idea of group work, and did in fact use it more, than Indo-Fijian teachers. For example, one of the Ethnic Fijian teachers whom I interviewed characterised as follows what he thinks is the way to teach science that is best for the students:

To me, I think students should actually touch or do the activities and experiments themselves in order for them to understand and achieve better in it. It goes with the saying: "I hear I forget, I see I may remember, but when I touch it I cannot forget". (Interview: Vili, male Ethnic Fijian Head teacher teaching class 6, Loma, 2001.)

This idea coincides with what Vygotsky (1978) thinks that students learn more when they are actively involved with others in the activities they are doing. He thinks that social interaction and joint problem solving is what helps to structure individual activity and allows students to develop skills in higher mental processes.

I sought to find out whether or not the two ethnic groups of teachers engage their students in group work while teaching science at school. Table 12 shows the result of this.
Table 12. Engagement of students in groups

<table>
<thead>
<tr>
<th>Class</th>
<th>Loma</th>
<th>Dioka</th>
<th>Kristi</th>
<th>Natoa</th>
</tr>
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<tbody>
<tr>
<td>1</td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

The data shows that in general, the majority of both ethnic groups of teachers tend to engage their students with group work. Both large ethnic schools (Loma and Dioka) tend to involve their students in more group work than the small ethnic schools (Kristi and Natoa). This is probably due to the large number of students in each class for the large schools in which straight class teaching is often conducted as compared to small ethnic schools which always have combined class or composite class teaching due to their small number of students in each class. Teachers in large ethnic schools probably find it easy to teach by allowing students to work in groups due to the large class size. It is also evident from the data that Ethnic Fijian teachers tend to involve their students more in group work than their Indo-Fijian teacher counterparts. For example, comparing the two small ethnic schools from the table, I found that only classes 3 & 4 teachers of Natoa (Ethnic Fijian School) did not engage their students in group work whereas for the small Indo-Fijian school (Kristi), teachers of classes 3, 4, 5 & 6 were not found to engage students in group work during the classroom observation.

Before I gathered my data I was concerned that lack of group work in school might be a factor working against Ethnic Fijian students. I reasoned that Ethnic Fijian children are better used to cooperative endeavour, because such ways of working are the mainstay of their culture. I felt that schools might be poor at encouraging such ways of working however, to the greater detriment of Ethnic Fijian than of Indo-Fijian children. However, what I found was that Ethnic Fijian teachers not only held the belief that group
activities are beneficial for students, but also did duly involve their students more heavily in group work. Comments such as the following lend support to the argument:

I personally think that students especially Ethnic Fijian students do well when they are working in groups because they tend to exchange ideas, discuss these ideas among themselves and help to participate well in class. (Interview: Taniela, male Ethnic Fijian Head Teacher teaching classes 7 & 8, Natoa, 2001.)

...You understand science if you do the activity or experiments and working in groups will help students to discuss their work with others. ...Most of the time they (Ethnic Fijian students) just remain quiet and that is why I often use this approach of letting them to work in groups. ...I found that those who did not talk or participate more in class do so well in groups. ...I think, if anything is to be done for our Fijian students to help them to participate in class discussion or to drive them to ask questions in class, they should be encouraged or allowed to work in groups all the time. (Interview: Amena, male Ethnic Fijian teacher teaching classes 5 & 6, Natoa, 2001.)

As I had anticipated, my data showed me that Ethnic Fijian students prefer this system of working together, probably because they are used to it in their homes or the village. So I believe that their teachers are correct to suppose that they are especially apt to be advantaged if a similar situation is created for them at school. The reluctance of students to call out answers openly in class when the teacher individually questioned them in front of the class could be an indication for this. If the teacher chooses an individual to stand up and give the answer, the student is often reluctant to do it. This is probably due to their lacking sufficient confidence to give the answer when they are asked individually because the context in which they are used to feeling confident is when they are together with their own friends and can talk about what they think. It seems that peer group loyalty is more the norm for Ethnic Fijian students. They would rather prefer to talk to their friends or peers to share things with rather than with their teachers or other adults. That is probably why they love to work in groups. The following extracts from the interview with Ethnic Fijian students are highly informative:

I prefer working in groups because by working in groups, we can always exchange ideas and help each other in trying to do the experiment by reading the instruction given. (Interview: Maku, male Ethnic Fijian class 7 student Natoa, 2001.)

I like working in groups and finding out the answers to questions or problems together. (Interview: Fulori, female Ethnic Fijian class 7 student Loma, 2001.)

...Sometimes it is very difficult to talk to the teacher and that is why I always bring it to my friend. (Interview: Kelera, female Ethnic Fijian class 6 student Natoa, 2001.)

The idea of group learning and group assessment is not new. I made similar recommendations (Dakuidreketi, 1995) in a study of first year university science
students at the University of the South Pacific. Ethnic Fijian students perform and work well if they work in groups. My data seem to show that their teachers realise this reasonably well, and that there consequently is extra emphasis on group work in Ethnic Fijian schools. Thus one hypothesis which I entertained concerning what might be the cause of poorer Ethnic Fijian performance in science on average seems undermined by the data I collected. This said, another quite different issue does arise. There may be a greater mismatch between the work done and the forms of assessment for Ethnic Fijian students because they work more in groups. It remains that students are examined very much as individuals, and that raises the problem whether it is fair on Ethnic Fijian students to assess them altogether on individual work when group work is more comfortable for them and more often practised in their classrooms.

Group work within the classroom has a number of positive points. For example, Williams (2000) in her report on the Fiji Islands Education Commission mentioned what she found and experienced when she participated in an experiment on group work and assessment with a multidisciplinary, multicultural, intergenerational and multilingual group of University students at Hamburg in Germany. She observed students in a classroom using the group learning method. Assessment of these students was based on the final group products, presentations, discussions and attendance. By being directly involved in this experiment, she was able to judge the matter and was also able to obtain the views of the students. In fact, group work has a lot of advantages. One is that it tends to instil a sense of responsibility in all the students. In addition, it inculcates a sense of excitement, expectation and creativity. Students have a spirit of sharing both ideas and the experience that they have with each other. Group work allows students to participate actively in their own learning, to discuss, and to develop a desire to learn and to continue to learn.

A point that should be borne in mind is that the participants in Williams' (2000) experiment were University students in Germany. However the outcomes indicated from the considerable potential that there is for learning based on group work. One of the problems observed in Williams' experiment was that students had to work so hard throughout that they had little time for reflection. However, the positive points mentioned above tend to outweigh this negative one. I interpret my data as showing that group work is emphasised in Ethnic Fijian schools especially, and that this is appropriate and (apart from the problems that I identify in the next sub-section) helpful. However
this underlines my concern about assessment. It probably disadvantages Ethnic Fijian students to be assessed all the time at individual performance tasks, when they are culturally more comfortable with group work and actually practise that more.

6.1.1.2. Directing students.
Students tend to learn and understand more if they undertake experiments and other activities themselves, hands-on, rather than the teacher directing them all the time during the course of teaching. This can also affect how students perform in science at school. In observing the two ethnic groups of teachers’ teaching of science in their various classrooms, I was interested to find out whether or not the two ethnic groups of teachers direct students on what to do whenever they do activities or experiments in class. Results of the analysis of my teaching observation on this particular variable are shown in Table 13.

From the previous table, (Table 12), it is clear that the majority of teachers of both ethnic groups tend to engage students in group work during their teaching of science in the classroom. However one common observation during group work in most of these classrooms is that students are always directed by teachers on what to do during the course of their group work or experiment and this tends to nullify the whole purpose of students working in groups. The purpose of working in groups is to encourage students to participate, take responsibility for their learning, and work collaboratively with each other. This will allow each member of the group to think, criticise and give his or her own ideas about the activity they are doing, for this is the basis of scientific thinking. In most cases, teachers of both ethnic groups are found to be very authoritative and directive in their roles during their teaching of science as seen in Table 13.

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An example of a directive and authoritative approach is shown in the extract of teaching of a class 7 & 8 Ethnic Fijian teacher during his Basic Science lesson. In this lesson, students were supposed to do the activities to find out how rocks change to soil. However, instead of students doing the experiment themselves, they were directed by the teacher all the time on what to do. It is the teacher who has the authority and students have to obey whatever is stated or given by the teacher. For example:

T: All read instructions 1, and 2.

S: (All reading): “Light the burner. Hold the marble with your tongs and heat it strongly for 60 seconds.”

T: Do it now, and make sure to observe what happens to the marble.

After the students have done this, he then continued directing them on the things they should do.

T: That is enough! Place the marble in cold water now! Observe! Group 1, turn off your gas burner! ...Okay, take it out again and heat it on the burner once again for 60 seconds. Observe what happened?

S: (Group 1): The marble breaks into pieces.

T: Right, that is how rock can be broken into small pieces. That is, the sudden change in temperature can cause rock to break to form soil.

(Classroom Teaching Observation: Taniela, male Ethnic Fijian Head teacher teaching classes 7 & 8 Natoa, 01/06/01.)

In this situation, students are working in groups but they do the experiment according to the order or instructions directed by the teacher. It is the teacher who directs them on what to do. Secondly, the teacher seems to be giving all the things which students should be thinking about in this experiment. Instead of asking students to think about the relationship between the results of the experiment to the topic they are trying to investigate, he is telling the students the answer that rocks will break that way to form small particles of soil. And yet there are many questions left unanswered. For example, do rocks in natural settings ever get heated as much or cooled as rapidly as do the pieces of marble in this experiment? Is what happens to the piece of marble in such extreme circumstances really at all telling about rocks and soil in natural settings?

A similar situation was also observed in an Indo-Fijian classroom where a class 5 & 6 teacher was demonstrating to the whole class about the common products of burning any material.
T: Now we are going to start off with the wood, okay? ... When I put it on the plate and heat the plate, I want you to see what is happening and also smell if you can smell it, okay?
S: (All): Yes Sir!
T: After this I will ask you to answer the questions in your books.
[Teacher starts burning things on the tin lid while students watch].
Can you see the reaction or what is going to happen when we heat these things?
[No response from the students]. He then continued.
Do you cook cassava or rice at home? Sometimes when you over-cook it, what happens?
S: It turns black; it turns to carbon; it smells. [Students all call out different answers]
T: Right you can see the colour. See the colour changing? It's no longer green now eh?
S: (All): Yes.
T: It's changing its colour now to brown. What colour is it changing into?
S: (All): Brown!
(Classroom Teaching Observation: Ramesh, male Indo-Fijian teacher teaching classes 5 & 6 Kristi, 26/07/01.)

In this teaching extract, it can be seen that the teacher is the one doing the burning rather than the students themselves. Secondly, it is the teacher who is telling the students all the changes happening during the burning rather than the students figuring out for themselves the changes taking place. The teacher even gives the students the answer to the questions he wants them to think about while doing the experiment. He tells them that the colour is no longer green and is changing to brown colour.

In both the examples given, the teacher could have just let students read the instructions by themselves and figure out in groups what to do and why, rather than directing them to do all the things he said. However, this was not done by the teacher. In this type of situation, the students are not allowed to do their own enquiries about the activities or experiment they are trying to do which is the basis of scientific learning. In the same way, students are not given the opportunity to think critically if all the things they do in groups are always given or directed by the teachers all the time. Students need to discover things by themselves. They will learn from this experience. After all, that is how scientists work to discover new things. They do not work by looking at things done by another person while they watch.
As it happens, I approached my study very much expecting to see evidence in the science classroom of an overly directive approach by teachers. However, I wondered whether the approach by Ethnic Fijian teachers might on average be more directive than that by Indo-Fijian teachers, partly, I reasoned, because of cultural factors that might make Ethnic Fijian students on average more docile in the classroom, and partly because Indo-Fijian teachers might, I reasoned, be on average better receptive for cultural reasons to the inquisitiveness of the children themselves and to orchestrating learning about that. On the basis of my data I conclude, however, that there is very little difference between the two ethnic groups of teachers in this regard. My interviews with some students of both ethnic schools confirmed what I found in my classroom teaching observations that the directive and authoritative approach is used by both ethnic teachers in teaching science in their various classrooms. This is shown in the following extracts, first from an interview with an Ethnic Fijian student, and then from an interview with an Indo-Fijian student:

Q: During my observation on your class, I found that you work in groups while doing the experiments. Tell me, do you often do this in class? I mean, the students doing the experiment themselves rather than the teacher doing it for you?
A: No, most of the time, he will just demonstrate it for us while we watch.
Q: So you do not always do the experiment in groups like what I saw?
A: No, not always.
Q: Do you understand the activities when you watch it done by him like that?
A: No, sometimes I do not understand it because some of the things he tries to show us sometimes do not usually work and he tries to tell us that it works that way. In fact, we did not even see or experienced it the way he told us that it will happen.
Q: When you were doing the experiment in groups, I found that your teacher tells you to all read out each instruction loudly before he allows you to do the experiment. Did he always tell you to do this whenever you do the experiment in groups?
A: Yes, he always instructs us to do that when we work in groups.
Q: Why did not he allow you to do your own reading in groups and try to figure out what to do by yourselves?
A: I do not know. Probably he told us to do that so that we can all do each part of the experiment at the same time so that we can all finish the experiment or activity before the end of the period.

(Interview: Vatischeva, female Ethnic Fijian class 8 student, Natoa, 2001.)
Q: Tell me some of the things you like when your teacher teaches you science in the classroom.
A: In the classroom, I always like doing experiments.
Q: Have you ever done any experiments in the classroom?
A: Yes.
Q: By yourself, in groups or demonstrated by the teacher?
A: In groups.
Q: Is that what you always have? I mean whenever you do science you work in groups?
A: Yes, but sometimes our teacher also demonstrates the experiment for us before we do it in groups.
Q: So you watch him do it before you do the activities?
A: Yes. That is right.
Q: Do you like that?
A: No.
Q: Can you tell me why?
A: Because he is kind of not letting us to do it on our own.

(Interview: Anita, female Indo-Fijian class 6 student, Dioka, 2001.)

In the first extract, the Ethnic Fijian student clearly stated that watching the experiment done by the teacher does not help students to understand what is done. When the experiment does not work, the teacher tells the students that it is supposed to work in some other way than that demonstrated, without the student even experiencing it. Often an experiment is done by the teacher for the purpose of completing it in time, and not because that is the best way for students to learn from the investigation.

In the second interview extract with the Indo-Fijian student, a similar thing was mentioned, that even when students do the experiment in groups, the teacher always directs them by demonstrating first before they actually do the experiment.

The practice of teachers using directive and authoritative approach without allowing students to do the experiments on their own at lower class level may have contributed to students' loss of interests in the subject. This student's interview extract clearly illustrates it:

Q: When do you develop your interests in science?
A: When I was in class 7.
Q: Can you tell me why it only begins in class 7 but not at the lower level?
A: Because at lower level, I was not interested.
Q: Can you tell me why?

A: Because I did not do the experiment. It was the teacher who always did the experiment for us. We did not do anything.

Q: So you did not like that?

A: No, it is not like when you do it by yourself. I like to do it by myself or in groups.

(Interview: Fulori, female Ethnic Fijian class 7 student, Loma, 2001.)

My observation and results of interviews point to the fact that the directive and authoritative approach of teachers in teaching science is still the same as what I experienced during my earlier days of learning science at primary level in Fiji. What teachers practised during those earlier days continues to be done by teachers of both ethnic groups today and there seems to be very little creative or constructivist teaching of science taking place.

Science is basically a way of learning. One way to present science therefore is as a process whereby new knowledge is uncovered and in which activities and experiments are the tools of discovery. To teach science in this way reflects the nature of science and also fosters the intellectual development of the individual. If encouraged, children can learn to use the method of science to find out for themselves. That is, they can be helped to implement all the ways of finding out that scientists themselves use, through observing, measuring, classifying, communicating and asking questions, testing, recording, inferring, predicting and drawing conclusions. This method of science is not used by the majority of teachers at the four ethnic schools I studied. Instead of allowing students to do experiments by themselves, the practice of teachers demonstrating in front for students to see the experiment is still seen in schools of both ethnicities. In some cases, teachers choose people to come up and do part of the experiment for the rest of the class who usually stand around to see. Experimental procedures in the student’s activity books are often instructed by teachers to be read aloud by all students before he or she demonstrates in front for the rest of the class.

A better approach could be for the students themselves to read these procedures and try to do the experiment independently either individually or (better) in groups, while the teacher moves around to see what the students do. Working in groups should help them to figure out what they do for the activities and should also allow each member of the group to challenge individual ideas brought up during group work which will promote and encourage critical thinking. Students would in that case be allowed to
think and find out things for themselves rather than being spoon fed all the time by the teacher. In fact, placing the pupils in a problem-solving situation where they have to carry out simple investigations of their own is important in order to develop positive attitudes in them about science and to help them achieve insights into the process of science. As two of the teachers mentioned when I interviewed them concerning the best way they think science should be taught in the classroom:

I believed that in order for teaching to be effective, both the teacher and the students should participate in the lesson. Students should not be spoon fed all the time by being given all the answers to questions. Science is a way of finding out the truth about something and it requires a lot of enquiring. Teachers should therefore allow students to enquire and respond freely rather than being taught to listen all the time to what the teacher says. (Interview: Adi, female Ethnic Fijian teacher teaching classes 1 & 2, Natoa, 2001.)

A student can understand Maths by just looking at the example on the board and trying to solve another problem by following how the example is done. I for myself think that learning science is different. You do not understand science if you learn it that way. You understand science if you do the activity or experiments and working in groups will help students to discuss their work with others. They can always ask each other when they work together especially since students do not often ask questions in class. (Interview: Amena, male Ethnic Fijian teacher teaching classes 5 & 6 Natoa, 2001.)

Even though teachers mentioned some interesting ideas about how a teacher should go about teaching science, none of the things they mentioned were ever used in the teaching of science in their ethnic school classroom.

An Indo-Fijian teacher in stressing similar things mentioned by the two Ethnic Fijian teachers above explains the parallel between learning by touching the activities or doing experiments with learning how to drive by doing the practical:

...It does not matter how much driving I teach you with words, you will not understand or know driving unless you start to handle the gear and the wheel by yourself. This is called ‘practical’. The children should do the practical themselves. It is also how you motivate students in the lesson which is very important in teaching. The students will have their interests in the subject if they find that they touch and do the activities themselves. (Interview: Chandra, male Indo- Fijian Head teacher teaching classes 3 & 4, Kristi, 2001.)

Gallas, (1995) in her book entitled *Talking their way into science* creates a way in which students are involved in class discussion by trying to answer some open-ended questions dealing with some of their science topics during the lesson. Before the discussion on the question begins, the teacher has to make sure that students understand the meaning of the questions. She may rephrase the question if it is needed. Her role is
just to sit down and listen to the class discussion and to guide them along the topic of discussion whenever she finds that students fall off track. Gallas has found that this method tends to allow students to participate freely and come up with their own theories in class. When students come up with their own theories and discuss them with the rest of the class, it enables some students to correct their own pre-existing ideas so that they may arrive at some new scientific ideas which they may not have before. In this way, it is promoting their learning of science in the classroom. The other advantage of the method is that students are free from the authoritative approach often used by some teachers which do not allow democratic exchange of ideas in the classroom. In addition the method of letting students answer the open-ended question also helps the teacher to see the pre-existing ideas of the students which in a way should enable teachers to see the misconception of the students which can then be changed towards or even into the true scientific idea. This type of teaching is in fact the real constructivists' science teaching which is found to be absent from both ethnic classrooms observed.

6.1.1.3. Book and content teaching.

I was very interested to find out whether or not teachers of either or both ethnic groups use the method of teaching directly from the textbook, because I believe that if teachers are used to following instructions from the manual (directive approach), then they are not teaching science but instead 'coaching science' which may not be conducive to the understanding of the subject. In this situation, the student may be engaged in a kind of quasi-learning without actually understanding the subject and this can of course have an adverse effect on the achievement of students in science. Table 14 shows whether or not teachers of these two ethnic groups practice book and content teaching of science in their various classrooms.
Table 14. *Book and content teaching in the classroom*

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The table shows that nearly all the teaching done by the two ethnic teachers involves book and content teaching. My observation from the teaching of science at both ethnic schools showed that both Ethnic Fijian and Indo-Fijian teachers tended to over-rely or stick slavishly to instructions given in the teacher’s guide while conducting their teaching and there is no creative or constructive teaching done. A good example was shown when one of the Ethnic Fijian teachers teaching classes 5 & 6 tried to follow the instruction in the teacher’s guide to use bamboo tongs when it does not work properly in holding the paper during burning. Even though tongs, stopwatch, and burners were available at the school, he did not use these materials because it was not instructed so in the manual. Below is the extract of what I recorded during this teacher’s teaching of classes 5 & 6 Elementary Science on the topic “Burning”:

... No tongs, spirit burners or time watch was used. ... The teacher gave out green bamboo stems to be used as a tong to hold the paper during burning. The teacher moved around each group — lighting up their pieces of paper using a match stick. There was no stop watch to time the burning. Instead, the teacher asked the students to tell the time difference by counting until the paper is completely burned. I noticed that some groups had a fast rate of counting while some count at a slower rate. ... I earlier noticed that the school has tongs, Bunsen burners and a few stop watches which could be used in this experiment. I wonder why the teacher gave out bamboo-made tongs instead of the real tongs; why he asks pupils to time the burning by counting from 1 onwards instead of using the stop watch and why he has to move around each group lighting their papers with a match when he could have distributed a burner for each group for the lighting of the
groups’ papers (Classroom Teaching Observation: Amena, male Ethnic Fijian Classes 5 & 6 teacher Natoa, 2001.)

During my interview with this teacher, I asked him some of the questions which I thought of while observing his lesson. I asked him whether or not he was aware of the available apparatus at the school which he can use for the experiment. He told me that he was aware of the available apparatus but he used those things because it was stated in the teaching manual. An extract of my interview with him showed this.

Q: The head teacher was showing me all the available apparatus in the cupboard the other day. The school has some modern equipment. You have some tongs, burners, stopwatch etc. Are you aware of this equipment?
A: Yes, I am aware of it. I used them in other activities.
Q: I wonder why you did not use the tongs, stopwatch and burners during your last experiment.
A: Well, I am just following what is given in the teaching manual.
Q: Are those things stated in the teaching manual?
A: Yes they are.
Q: Ok, so you were following what was stated in the manual?
A: Yes.

(Interview, Amena, male Ethnic Fijian classes 5 & 6 teacher, Natoa, 2001.)

The teacher’s over-reliance on the teacher’s guide is further revealed when I asked him to tell me some of the things he did as a teacher of science which he remembered his teachers did during his primary days. He admitted that he used text book teaching to guide him. For example:

Q: Ok, what sort of things do you do as a teacher of science that you can remember your teachers did during your primary age?
A: …He used to teach from the text book — usually from the teacher’s guide and I am still using that today to guide me in my teaching of the subject. (Interview: Amena, male Ethnic Fijian Classes 5 & 6 teacher, Natoa, 2001.)

A glance at the copy of the teacher’s manual showed that the instructions followed by the teacher were laid out in the teaching manual. However, the use of simple materials stated in the teaching manual is intended to be used by schools which do not have such materials available. This clearly showed the over-reliance of teachers on the text book. Even though the materials are available which the teacher can use in the experiment, he still thinks that whatever is stated in the manual should be followed in teaching that lesson.
The practice of more book and content teaching by the majority of both ethnic teachers could be explained in terms of the type of instructions set by the Curriculum Development Unit in the teaching manual. A glance at the teaching manual reveals that the type of instructions given in the teaching manual is very prescriptive in nature and that teacher is therefore tempted to follow its content very closely when they teach the subject. Furthermore if teachers have the thought that their role is to teach whatever is given in the text or manual, prepared by the Ministry of Education, then there is no way in which they can stop themselves from practising that type of teaching in the classroom. In fact, the type of instructions given in the manual is what causes teachers to teach in the way they are teaching. To illustrate what I have mentioned in terms of the type of instruction given in the manual, I have copied a page from a class 5 Elementary Science teacher’s’ manual (see part of this copy below). One main observation found from this page is that most instructions which are given are very prescriptive. In addition, these instructions tend to inform the teacher on what actually should be done. Most of these instructions regularly introduce the activities with the phrase: “Tell the pupils”. This phrase is found in almost every other activity in the classes 5 & 6 teachers’ guide. For example, in looking at a particular page of the class 5 Elementary Science Teacher’s Guide on the topic “How do some animals breathe?” the following instructions were found:

2. Take the pupils to a place where earthworms are found in abundance — a place outside. (Survey the area in advance)
   - How does the soil look? Feel?
   - If damp, why do you think it is important for the soil to be damp?

3. Tell the pupils: (Taken outside)
   - To dig for their earthworms (4 per group)
     (Remind the pupils to handle the earthworms with care.)
     - To place two earthworms in a jar with water and cap it slightly, etc.
     - To place two other earthworms in a jar without soil or water.
     - To cap the second jars slightly.
     - To place both jars in a cool place (or in a refrigerator if it is possible)

4. Tell the pupils:
   - That they will observe their earthworms each morning for about two days.
   - That they will record their observations.
(Source: Ministry of Education Elementary Science Five Teacher’s Handbook 1978, p. 83.)

In looking at the type of instructions or phrases used here, it can be seen that it did not provide children with much practice in the development of critical thinking skills. Teachers are instructed to tell the students to dig for their earthworm in a place the teacher has already surveyed to ensure it has a lot of earthworms. Yet I would say that students should not be told to look for their earthworms in a damp place already surveyed by the teacher. They should be allowed to find out on their own the place where earthworms are likely to be found in abundance rather than following what is always instructed by the teacher. It is an investigation and they should find out for themselves rather than being directed to do everything at all times. In fact the manual is very limited in giving instructions on how to create investigative science lessons. The other thing is that the type of instructions given is like what (Taylor and Macpherson, 1992) mentioned: instructions that overly encourage teachers to stick slavishly to the book, delivering their lessons directly from the teacher’s guide. Whitehead (1986) in his report on the government policy on education in Fiji since independence points out that teaching of science in many Ethnic Fijian schools is still very bookish rather than based on independent experimentation by students and thus on discovery techniques. In addition, he also states that some classrooms still practise rote learning rather than arousing the natural curiosity of children and enhancing their capacity to think for themselves. Teachers rely heavily on the technique of telling students what to do all the time.

In fact in these types of instructions teachers are totally powerless because all the things they are supposed to do in teaching are already set up or directed in the curriculum prepared by the Ministry of Education. This can create feelings among teachers that to fulfil the needs of the Ministry of education is to teach according to what is provided for them in the manual. That is, to directly follow whatever is stated in the manual. So the fact that the majority of teachers in both ethnic schools stick quite slavishly to book and content teaching could be related to the type of instructions given in the teaching manual which is expected by the Curriculum Development Unit of the Ministry of Education to be practised or used by teachers.
6.1.1.4. Emphasis on note giving.

I want to find out whether or not the differential performance of Ethnic Fijian and Indo-Fijian students in science at school has something to do with teachers’ emphasis on note giving in the classroom. Some teachers believe that if students are given the main points of what is supposed to be covered in the topic in their notes and if students study or memorise their notes well, then they can pass examinations. This idea is also present in the minds of most students I interviewed who have the general feeling that to pass examinations, they need to study or memorise their notes.

In my teaching observation, I was keen to find out whether or not both ethnic teachers practice this in their various ethnic classrooms when they teach science. Table 15 shows the result of the analysis of my teaching observation to find out whether or not the two ethnic groups of teachers emphasise more note giving in their various classrooms.

Table 15. Teachers’ emphasis on note giving in the classroom

<table>
<thead>
<tr>
<th>Class</th>
<th>Loma</th>
<th>Dioka</th>
<th>Kristi</th>
<th>Natoa</th>
</tr>
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<tbody>
<tr>
<td>1</td>
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<td>2</td>
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<td>3</td>
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<tr>
<td>5</td>
<td>✓</td>
<td>✓</td>
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<td>6</td>
<td>✓</td>
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<tr>
<td>7</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<td>8</td>
<td>_</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

In looking at this table, it seems that the majority of both ethnic groups of teachers give notes to their various classes during their teaching of science in their various classrooms. There seems to be very little difference in terms of the two small ethnic schools (Kristi and Natoa) whereas for the two large ethnic schools, it seems that Indo-Fijian teachers of Dioka tend to engage their students in note taking more than the Ethnic Fijian teachers of Loma. The other clear trend found from this table is that lower class teachers of both ethnic schools do not mostly engage their students in note taking whereas the higher class teachers of both ethnic schools are in general found to be giving
notes to their students. This could be explained in terms of two reasons: the literacy skills of the students and the level in which students sit for the National Examinations. Giving more notes for students at lower level would be too much for the students to handle especially when their literacy skills are low as compared to when they reach higher level classes. The teaching of science at lower classes like 1 & 2 in Fiji is basically focused on observation, discussion and questioning. In addition, students are not assessed or examined at these two levels for science and social science subjects whereas at higher classes, students sit for examinations at the end of each term, apart from two National Examinations which are respectively sat by classes 6 and 8 levels — the Fiji Intermediate Examination and the Fiji Eighth Year Examination. These examinations are regarded as very important for the teachers to prepare their students and that is probably why a large proportion of both ethnic teachers give notes to their students at higher class level.

It is also evident from some students' interview that teachers mostly give notes to their students and that some teachers emphasised the learning or memorisation of the notes in order for students to pass examinations. Some students even mentioned that they tend to find science difficult because it is hard for them to memorise notes. Comments such as the following were common:

"...You know, it’s not like how you learn English. You are given notes, more notes and you have to study all your notes in order to pass very well in your tests. It is very difficult for me to memorise all my notes. This is one thing I do not like ... because if you do not do that, you will not pass your exam. (Interview: Salvin, male Indo-Fijian class 7 student, Kristi, 2001.)"

"...Most of the things which are asked in our exam are mainly taken from our notes. So if you do not learn your notes well, you cannot pass your exam. This is why I find this subject difficult too. You have to memorise your notes in order to pass. ...I do not like it because it requires us to learn all the things given in our notes. ...I find Elementary Science and also Social Science difficult. ...I think, it’s because I did not learn my notes well. (Interview: Solo, male Ethnic Fijian class 5 student, Natoa, 2001.)"

Teachers emphasise note giving and rote learning such as memorisation of facts by the students because they think that their own success is mainly determined by number of students passing external examinations such as Fiji Intermediate and Fiji Eighth Year Examinations. Parents and general public in Fiji today rate teachers and schools according to the number of students who pass in the external examinations. If a school or a teacher in an examination class helps more students to pass the National examination, then that school or that particular teacher is the best according to the
parents or the members of the public. This of course is one of the negative influences that examinations have on teaching and learning in Fiji schools. School education in Fiji is overly oriented to exams. There are a lot of examinations to be sat by students. There are two National examinations at Primary level, and three at secondary level. As a result, most teachers resort to transmitting factual knowledge rather than trying to provide teaching experiences that will encourage creative activities. In fact, the exam-driven curriculum tends to dictate what teachers and students need to learn. It happens that both Indo-Fijian and Ethnic Fijian teachers are sufficiently concerned with the passing of examinations that they may tend to teach facts and emphasise the learning of these facts by their students rather than facilitating students’ own development of ideas and concepts. Teachers’ comments such as the one given lend support to this argument:

... Parents nowadays only praise teachers who do well in making students pass examinations. Now in a way, this will only encourage teachers to try to concentrate only on ways of making students pass examinations. For example, in this school, you will see that examination classes have an extra class in the afternoon before the final examination commences. After the class 6 and class 8 National examinations, on the second term, there will be no more extra classes. Before these two examinations commence, students are often drilled to know or memorise some of the answers to exam questions. This is one of the bad effects of having more examinations. Students are just taught in a way to pass examinations. You will see that this practice of having afternoon classes and drilling students to remember or memorise facts or answers to questions is also practised at other schools and not only at this school. No teacher in Fiji schools today would like to be criticised by parents or the community about the bad examination results of their school or students. So you see teachers will use any means of teaching just to enable their students to pass the examination. (Interview: Mela, female Ethnic Fijian classes 3 & 4 teacher, Natao, 2001.)

The practice of drilling students to pass examinations is also practised at Indo-Fijian schools because of the pressure from the Indo-Fijian community. Mr Seta, (a male Ethnic Fijian teacher of Loma) made the point well when he said:

This practice of drilling students for examination is also practised at other Indian schools. I think there is more pressure for Indian teachers to practice these sorts of things with their students as compared to Fijian teachers because education is always in the minds of every Indian parent today. Indian teachers know that if they do not perform well in enabling their class to pass examinations, they are going to be criticised heavily by their Indian community. So they mostly rely on this practice to enable more students to pass their examinations. (Interview: Seta, male Ethnic Fijian class 5 teacher, Loma, 2001.)

The over-emphasis of teachers on examinations allowed teachers to concentrate only on the topics they think are going to appear for the examination and as a result,
other topics which may be important for the real life situation of the students are often neglected. As one of the Indo-Fijian teachers mentioned:

... The way our education system is going now is that it seems to be very exam-oriented. The other thing is if it is possible for questions to be taken from all the topics covered so that the children will also learn other topics also which they find important for them when they leave school. Since some topics are covered but are not examinable, teachers often do not bother to teach that topic because they know that it is not going to be examined. As a result, the topics are neglected and are not often covered with the students. (Interview: Ramesh, male Indo-Fijian classes 5 & 6 teacher Kristi, 2001.)

Report by the Fiji Islands Education Commission (2000) mentioned three areas of the current curriculum which people expressed their concern about. These areas include the high emphasis on rote learning; the excessively academic nature of the curriculum and the need for vocational skills and the low and declining emphasis on cultural aspects which are distinctive of Ethnic Fijian people.

6.1.1.5. Allowing no time for students to ask questions in class.

Students of both ethnic groups are given few opportunities by their teachers to ask questions in their various ethnic classrooms. The way I looked at it, it is a reflection of the authoritative and directive methods of teaching used by the two sets of teachers in teaching science at school. Since the teaching is always controlled by the teacher who in most cases is used to the method of asking closed ended and recall type questions, which they expect students to answer back during the course of the teaching, the approach however did not allow students to ask questions in class. Students have the type of thinking that this is how teaching and learning in the classroom should always be.

To illustrate what I mentioned here in terms of the authority of the teacher in controlling the class at most time during the lesson, it is better to look at the number of questions asked by the four class 8 teachers of each of the four schools studied and the number and percentage of the types of questions asked by the teachers during the Basic science lesson as shown in Table 16.
Table 16. Number and % of the types of questions asked by the teacher during a 1 hour class & lessons for each of the schools

<table>
<thead>
<tr>
<th>Type of Question Asked</th>
<th>Loma (Large Ethnic Fijian School)</th>
<th>Dioka (Large Indo-Fijian School)</th>
<th>Kristi (Small Indo-Fijian School)</th>
<th>Natoa (Small Ethnic-Fijian School)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
<td>No.</td>
</tr>
<tr>
<td>Closed</td>
<td>66</td>
<td>86.8</td>
<td>17</td>
<td>73.9</td>
</tr>
<tr>
<td>Open</td>
<td>9</td>
<td>11.8</td>
<td>4</td>
<td>17.4</td>
</tr>
<tr>
<td>Application</td>
<td>1</td>
<td>1.4</td>
<td>2</td>
<td>8.7</td>
</tr>
<tr>
<td>Total questions asked</td>
<td>76</td>
<td>100</td>
<td>23</td>
<td>100</td>
</tr>
</tbody>
</table>

Before looking at the trend in Table 16, it is better to define the three main types of questions and give an example for each in order to understand what they meant.

**Definitions and examples**

**Closed questions** — these are mainly observed as short questions which are mainly recall type and require only one correct answer. For example: "The three different food groups are: Body Building, Health and ...?" [The one correct answer here is: "Energy"]

**Open-ended questions** — These are questions which require more thinking and may have more than one answer. For example: "Why do leaves turn colour?" [There may be more than one answer to this question such as: "lack of water", or "seasonal changes", or "lack of some nutrients" etc].

**Application questions** — These are the types of questions for which students have to think creatively about some of the processes or things they already learnt in order to get the answer. For example: "A boy is living in an island where there is no fresh water or food left to live on. He has only a kettle, his cloth, some dried twigs, a match box and a 1 metre hose pipe with him. Describe how the boy can able to survive on the island for a few days by using the available things with him?" [If a student knows the process of collecting pure water from sea water by distillation, he or she should be able to answer the question using the simple materials listed].
Two clear trends can be seen from this table. One is the large number of questions asked by the four Ethnic groups of teachers during the lesson and secondly is the fact that a large proportion of these questions are mainly closed ended since they are mainly recall types and require only one correct answer.

In terms of the total number of questions asked by teachers, the table shows that two out of four teachers of both Ethnic schools asked more than 75 questions during their one-hour lesson — (about 76 for the Ethnic Fijian teacher of Loma and 150 for the Indo-Fijian teacher of Kristi) while the other two ethnic teachers asked not less than 20 questions, (38 for the Ethnic Fijian teacher of Natoa and 23 for the Indo-Fijian teacher of Dioka). These figures are high enough to show how much the two Ethnic teachers controlled the class throughout the science lesson especially in engaging the students mostly with the short recall questions — stressing short-answer type technique during their science teaching using closed questions and expecting the students to answer in unison during the course of the lesson.

Not much can be said about the ability of the two ethnic groups of teachers to ask questions from these figures because there seemed to be the same situation occurring at both Ethnic schools. Each Ethnic school has both high and low number of questions asked by their teachers. For example, whereas the Ethnic Fijian school of Loma has a higher number of questions asked by its class 8 teacher (about 76 questions), its corresponding large Indo Fijian school of Dioka has a lesser number of questions asked by its class 8 teacher (about 23 questions). On the other hand, whereas the Indo-Fijian school of Kristi has a greater number of questions asked by its teacher (about 150 questions), its corresponding small Ethnic Fijian school of Natoa has a lesser number of questions asked by its class 8 teacher (about 38 questions) during the one hour lesson.

It should also be remembered that the difference in the quantity of questions asked by the teachers will depend on the types of questions they asked during the lesson. Some questions asked may be just short recall or closed type which requires only one short answer while others may require some thinking. What is shown in Table 16 clearly illustrates the fact that the majority of the questions with which teachers engaged students during the science lessons are just short recall type questions and very few are open-ended and application type questions which mostly encouraged students to think and apply what they learnt are asked.
A short extract of two of the class 8 teaching to show how teachers of both ethnic groups engaged their students in asking most closed ended recall type questions and students answering at the same time is shown. The first extract involved an Ethnic Fijian classroom. The topic covered is “Earthquake” which is part of the Unit on “Rocks of the Earth”.

[Note: T stands for Teacher.]

T: “We’ll continue from last week’s work. What is an earthquake?”
Kelera: “Sudden shaking of the earth?”
T: “Good! Earthquake is caused by the movement of the...?”
All students: “Crust!”
T: “What instrument is used to measure Earthquake?”
All students: “Richter’s Scale!”
T: “If you are close to a building and there is an earthquake, what should you do?”
Some students: “Move away from the building!”
(Classroom teaching observation, 22/05/01: Taniela, male Ethnic Fijian Head teacher teaching classes 7 & 8, Natoa.)

In the second extract, it involved an Indo-Fijian classroom where the teacher was covering the topic: “Separating Mixtures”.

T: “Ok, class today we are going to separate mixtures. Separate what?”
All students: “Mixtures!”
T: “Can you tell me some of the methods of separation we have earlier done?”
Namrata: “Evaporation?”
T: “Good! Can we use that at home?”
Swastika: “Yes!”
T: “In what way?”
Swastika: “Separating a mixture of salt & water?”
T: “Ok, any other method?”
Namrata: “Decantation?”
T: “Good! Where can we use it? At home?”
Rhadika: “Yes.”
T: “In what way?”
Rhadika: “In separating rice from dirt using water.”
T: “Good, okay, today we will use another method called spinning.” What do we call it class?”
All students: “Spinning!”
T: “Do we use spinning at home?”
Some students: “Yes!”
T: Tell me one way we can use spinning at home?”
Sushil: “Washing machine?”
T: “Very good! Any other way?”
Swastika: “To separate milk from cream?”
T: “Very good!”

(Classroom teaching observation, 22/05/01: Kamal, male Indo-Fijian teacher teaching classes 8, Dioka.)

As seen from these two extracts, this approach to teaching does not emphasise more questioning from the students because of its authoritative and one-way mode. In addition, it only allows a few students in the class to participate while the rest of the students are not. This is mainly observed in the second extract where only three students seemed to be participating more during the lesson. The other disadvantage is that it only concentrated on asking more recall type questions for students with very little open ended and application type questions which require students to think critically. This approach will only allow students to memorise facts since they know that teachers will at any time during the lesson ask questions which require them to regurgitate the answers.

Memorising facts is not easy for some students as is explicitly lamented by some of them. Moreover, pure memorisation work is poor if not useless at helping students to understand the scientific concepts taught. In addition, if the teacher does most of the talking and asks only closed-ended questions to which the answers are already known, then work within the classroom in no way encourages students to think critically for themselves or thus to resemble in any way working scientists.

Gallas (1995) in her book “Talking their way into science” details a method that contrasts sharply with that used by the majority of Ethnic Fijian and Indo-Fijian science teachers as found in this study. That is, instead of having an authoritative role in class, she was instead careful to move out of the authoritative role and allow students to have discussions of at least one open-ended question each class. She found that this method ensured that all students participated and that they came to think for themselves more like the way in which scientists think, creating theories, critically discussing those theories, and devising ways to test them. Her own role was to sit down and listen to the class discussion and only ask questions for the purpose of bringing in some ideas for the students to extend their thinking from what is being discussed. Her role is to only coach
students on ways to make their science talk more effective in terms of how to use each other's ideas to support new theories. [Note, this is different from what is observed in the Ethnic Fijian and Indo-Fijian science classroom where teachers are found to coach and direct students on how to do the experiment.] In addition to this, Gallas did not give closed-ended questions to be discussed because she found that this did not create more discussions for the children for once the answer is revealed, the discussion ends there. There is more participation from the children because they feel free to talk with each other, learn more from each other’s theory and ideas which tend to promote students’ learning and understanding of the topic or the question discussed.

Science Talks enable new voices to emerge as authoritative because the hierarchy of the classroom is blurred when the teacher moves out of an authoritative role. I have found as I have worked with my own classes and with other teachers that the open ended format of the talks allows children who are not high achievers to show that they are keen observers of the world and powerful creative thinkers. In effect, the Science Talks by considering questions whose answers are not known invite every child to participate. As mentioned by Gallas, (1995: p. 23) “The process of constructing an answer with others, of using everything that’s been observed and imagined, stimulates more participation in science than a recitation of information from a book”.

I personally feel that the method of teaching science used by Gallas in her classroom has the potential to be very effective in enabling students to learn effectively and achieve well in science and that it might especially hold benefits for Ethnic Fijian students because the method of free discussion in class or in groups matches perfectly well with their way of being cooperative and working together in their homes or village. In addition, they will be able to help each other during the discussion and at the same time will not be shy to ask questions since the authority of the teacher is removed in this type of constructive teaching.

The type of teaching practised by the two ethnic groups of teachers in the four schools observed is in fact not seen to be a constructivist’s type of science teaching because the constructivist approach is to try and build into the minds of the children the way in which they can improve their understanding of the topic or subject covered.

In my view, the authoritative method does not help students to think on their own or to construct their own theories about the problem. Without looking at other children’s view or ideas, there is no way in which the child can modify his or her ideas from the
one which he or she already possessed. Thus, if the student’s idea is wrong, it will be very difficult to change it to the correct scientific idea because there are no other views or ideas seen by the child to which he or she can compare his or her own. It is probably the use of the authoritative teaching by both sets of Ethnic teachers which inhibit both sets of ethnic students (particularly with Ethnic Fijian students who are used to their culture of ‘silence’) to ask questions in class.

To enable students to think for themselves, or to think critically and come up with their own theory or ideas about the subject, engaging with the rest of the class by giving their views or ideas, it seems sufficient to base lessons on open-ended questions, discussion, and debate. This can also potentially enable teachers to recognise better the areas that most interest the students, so that the curriculum could be better adapted to the students’ own experience. In addition when students give their own theory or ideas about the question, the teacher can in a way see the child’s area of misconception which he or she can then correct during the course of the lesson.

6.1.1.6. Switching to own language.

All teachers of classes 1 to 8 of both ethnic schools used the method of switching from English to their own ethnic language mainly during their course of teaching science in their various classrooms as seen in Table 17.

Table 17. Teacher’s emphasis of switching to own language during teaching

<table>
<thead>
<tr>
<th>Class</th>
<th>School</th>
<th>Loma</th>
<th>Diko</th>
<th>Kristi</th>
<th>Natoa</th>
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<tbody>
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<td>1</td>
<td></td>
<td>✓</td>
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<tr>
<td>5</td>
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<td>✓</td>
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<td>6</td>
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<td>8</td>
<td></td>
<td>✓</td>
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</table>

Even though English is the main language of instruction, the use of Ethnic Fijian or Indo-Fijian language by the respective ethnic teachers help to promote a better
understanding of the subject or topic taught to students especially in schools with a rural background. As two ethnic teachers mentioned:

... At urban schools, we expect them (students) to better understand some simple English. But I tell you, that it is not the case at rural schools like this. There are always some who still do not understand some English even at classes 7 & 8. This is why you will find that I at times have to switch from English to Hindi language during my teaching. The Ministry encourages us to use English mainly at this level, but you know we have to also consider the background of the students and try to help them in every way to understand our teaching. So we cannot avoid switching to our own language. (Interview: Vijay, male Indo-Fijian Head teacher teaching class 5, Dioka, 2001.)

... Some of these students still do not understand English very well even at this level (classes 5 & 6) so that is why I sometimes talk in Fijian dialect — so that students can understand what I am trying to say or explain during the lesson. (Interview: Amena, male Ethnic Fijian teacher teaching classes 5 & 6, Natoa, 2001.)

Students of both ethnic groups were also found to mostly speak in their own dialect or language during the course of the lesson. So there is no difference found in terms of the language use by either teachers or students in the science classroom since both ethnic groups of teachers and students do the same thing. Switching to own language is also emphasised by the Ministry of Education to be used by teachers especially at lower class level where the level of English language literacy for students is low. By switching from English to own ethnic language or vice versa, students should able to eventually learn the English language which they will then continue to use further in their learning of other subjects at a higher level.

Because both ethnic teachers use both English and their own ethnic language at their respective ethnic schools in teaching science, one would not expect to see any difference in terms of how the two ethnic groups of students learn and perform in science at school. However, difference in performance of students can arise if one ethnic language has fewer words or a scientifically more limited vocabulary than the other ethnic language. This is due to the fact that whether teachers can express English words in their own language when they teach (thereby making it easy for the ethnic students to understand) depends on whether every English term or word they use has its respective term or word in their own language.

One of the problems observed with Ethnic Fijian language is the relatively small total vocabulary. Students are observed to face some difficulties in the classroom
especially in trying to relate the meaning of English words to their own especially when there is no corresponding word in their own language.

For example, an extract of classroom teaching recorded during my classroom teaching observation at an Ethnic Fijian school clearly illustrate this point. In both cases, both English and Ethnic Fijian language was used in the classroom by teachers and students and the students tend to have some difficulties in trying to translate some English terms to their own language because there is no such word in their language. In this case, classes 7 & 8 students worked in groups on the experiment, to see how igneous rock is formed when the molten magma (in this case the heated mixture of paint and sugar) is cooled.

T: Right class, pour the mixture on the foil and leave it to cool.
[Some group members were arguing whether or not to pour the mixture to the foil.]
S1: “Sega! kua ni sova. Wawa me waicala”. [Meaning: “No! Do not pour it. Wait until it melts”].
S2: “Io, sova, sova. Sa waicala qori.” [Meaning: “Yes, pour it, pour it. That has melted”].
T: “Hoi! Sova na nomudou mixture ena foil. Waraka me batabata” (Meaning: “Hey, pour your mixture to the foil. Wait until it cools”).
[After a while when the mixture cools the teacher continued.]
“Okay, I want you to break the hard mixture & see the inside. What type of rock do you think this one looks like? Vaka na vatu cava?” — [Meaning: “like what type of rock?”].
S3: “Igneous rock?”
S4: [asking another student]. “A cava na ‘igneous rock’?” [Meaning: “What is meant by ‘igneous rock’?”].
S5: “Na vatu” [meaning: “the stone”].
T: “Igneous rock? What type of igneous rock does it look like?”
S3: “Basalt?”
S3: [replying]. “Au Sega ni kila. Ya e dua beka ga na mataqali igneous rock.” [Meaning: “I do not know, probably it is a type of igneous rock”].
T: Good. What does the inside part look like?
S: [All calling out different answers:] “Like buns?”; “Like bread?”; “It has holes in it?”

T: Right…… So you see we have made some rocks by ourselves today. Igneous rock is formed in the same way as what we have seen today. That is, by molten magma when it cools.

(Classroom Teaching Observation, 20/09/01: Taniela, male Ethnic Fijian Head teacher teaching classes 7 & 8, Natoa.)

From this extract, it is clear that students 4 and 5 in trying to relate some of the English terms to their own Ethnic Fijian language asked other students in the group about the meaning of the English term “Igneous rock” and “Basalt”. Student 5 in trying to answer student 4’s question about the meaning of the term “igneous rock” mentioned what he thought but was not accepted by student 6 who thinks that the term mentioned by student 5 has a different meaning. The word “Basalt” which student 5 asks about its Ethnic Fijian translation or term was not able to be given the correct term by student 3 although he mentioned correctly that it is one type of igneous rock. In fact, some of these scientific words or terms do not have corresponding Ethnic Fijian words or terms.

I happened to interview student 5 after the lesson to find out whether or not she had difficulties in learning science when she cannot relate some of the English terms used to her own language. I noted down in my journal some of the things she told me. She mentioned the following things:

I find it difficult to think of the meaning of some of the English words used to try to translate it to our Fijian words. For example, I do not know what we called ‘basalt’ in Fijian. What do we called that in Fijian? (Journal 20/09/01: Fulori, Class 7 female Ethnic Fijian student, Loma.)

Another example of the situation in which students faced difficulties with their translation of English scientific terms to Ethnic Fijian terms is shown when a female teacher was teaching classes 3 & 4 the topic “What can you taste”. Three students were blindfolded and were given some substance on their tongue. They were asked to identify the type of substance with their taste. For example:

T: “Na cava qori Mere?” [Meaning: “What is that, Mere?” (After placing the substance on Mere’s tongue).]

S: (Mere): “Suka?” [Meaning: “Sugar?”.]

T: “Good! Now Misa, what is that?”

S: (Misa): “Wai moli?” [Meaning: “Lemon juice?”.]

T: “Good! What about this Vili?”

S: (Vili): “Masima?” [Meaning: “Salt?”.]
T: “Very good! Now what cause us to know the taste are the tiny pores in our tongue. Can anybody tell me what is it called?

(No response from the students.) Okay. Class what helps us to know the taste is called the ‘taste bud’. Say it altogether?”

Class (All): “Taste bud!”

T: “Once again?”

Class (All): “Taste bud!”

T: “We can taste different flavours such as sweet — sugar, sour — lemon, or salty — salt etc. using our taste buds.”

[Some student’s private conversation heard in the classroom]:

S1: “A cava na yacana vei keda na taste bud?” [Meaning: “What do we call ‘taste bud’ in our language?”]

S2: “Na yameda” [Meaning: “Our tongue”].

S3: “Sega, na yameda na — ‘tongue’. “Qo koya na ka lai lai e tu e yameda. Na cava ya?” [Meaning: “No, we called that tongue. What I mean is the small pores in our tongue. What do we call that?”]

S4: “Au sega ni kila na yacana vakaviti vei keda” [Meaning: “I do not know what we called that in Fijian”].

(Classroom Teaching Observation: 30/05/01: Mela, female Ethnic Fijian teacher teaching classes 3& 4, Natoa.)

In this extract, it is clear that students 1, 3 and 4 were having difficulties in trying to relate the meaning of the scientific term “taste bud” to the Ethnic Fijian language because it does not have any term in Ethnic Fijian language. There is an Ethnic Fijian word for the word “tongue” but there is none for the part of the tongue known as the “taste bud”.

In my other interview with one class 5 Ethnic Fijian student of Natoa; he said that he always finds it difficult to understand the meaning of some words when they are explained by the teacher because he cannot relate those words to the Fijian words he used at home. It was also evident from this student interview that students were sometimes asked by their teacher to just learn new words according to their meanings in the textbook whenever the teacher cannot find a proper word to explain the meaning of the word in Fijian. In other words, the problem of lack of Fijian words for some scientific terms has forced the teacher to use the approach of telling students to memorise the terms, which most students will do without real understanding. The extract from my interview with the student revealed this.

Q: ...How do you find your learning of these new words or terms at school? Do you understand them easily when they are explained to you by your teacher?
A: To me, I find it difficult to understand.

Q: Can you tell me why?

A: Because I cannot relate these words to our Fijian words. When I try to relate it to some Fijian words, I cannot. So in a way, it is very difficult for me to understand it.

Q: How does your teacher explain the meaning of some of these new words to the class?

A: Most often when we cover some new words like that, he just tells us to write down these words in our books and learn the words and what their meaning says in the book. Most of us just memorise their meanings without even understanding it.

Q: Is that what he often does?

A: Yes

(Interview: Solo, class 5 male Ethnic Fijian student, Natoa, 2001.)

Memorising of terms as mentioned by this student was commonly used by Ethnic Fijian teachers. Amena, a teacher of Natoa made the point well when he said:

... In some cases, where there is no such close word at all, we just have to tell them that there is no proper Fijian word or term for the given word or term and that they have to try to just remember the English words or terms. Most of us did this when we teach science. (Interview: Amena, male Ethnic Fijian teacher teaching classes 5 & 6, Natoa, 2001.)

The majority of Ethnic Fijian teachers interviewed mention the difficulty they faced in trying to explain the words and for students to understand the scientific words or terms used in the curriculum especially when they switched from English to Ethnic Fijian language during their course of teaching. The following comments are indicative of what both Ethnic Fijian teachers and students faced:

... It’s difficult to try and explain the meanings in Ethnic Fijian language to the students when there is no Fijian word for it. ... You know words like: transpiration, chlorophyll etc. They do not have a Fijian translation, so it is often very difficult for me to explain and also for students to understand when I tried to explain it to them. ... I can just explain what the words mean but to have the proper word in Fijian — No I can not find it. So sometimes, it’s sort of difficult for them to grab what I am trying to explain. ... Yes, this is one area I find difficult in teaching science. (Interview: Ema, female Ethnic Fijian teacher teaching class 8, Loma, 2001.)

... I realised that most scientific terms in the science curriculum do not have any translation into any Ethnic Fijian word. This often makes our task as a teacher difficult. I myself often find this very difficult to explain to students especially when there is no Ethnic Fijian word for the terms or words. What I always do is to try and look for a similar word which I think is very close in terms of its meaning to the given word or term. I mean, a word which I think can help to explain the given word or term. The word may not exactly mean the same thing but may be
very close to what the term or word means. (Interview: Vili, male Ethnic Fijian Head teacher teaching class 6, Loma, 2001.)

This same teacher further elaborated on the fact that students understand meanings better when they relate it to their real life situation like the use of their own language. However, if they cannot relate new words to their own language, then it is likely that they will not understand their meanings.

... Children understand things better if they try to relate the new things they learn to what they experience in their real life situation. Whenever they are given some new words or terms which they have never come across in their life, they will try to relate the meaning to their own word. However, if they find that the given terms or words do not have any relation with their own word or do not even have any translation in their word, then it will be very difficult for them to understand it. (Interview: Vili, male Ethnic Fijian Head teacher teaching class 6, Loma, 2001.)

I also interviewed a few Indo-Fijian teachers whom I asked whether or not they also faced similar problems faced by Ethnic Fijian teachers. The majority of them mentioned that they do not have problems because they found that there are Hindi terms or words which they used at times to explain the meaning of the words which enable students to understand what is taught. Comments such as the one below lend support to this:

... I do not have any difficulties in translating some of the scientific terms or words used in the curriculum to Hindi during my course of teaching. Terms like for example ‘photosynthesis’, ‘cells’, ‘chlorophyll’, etc. have some Hindi terms which we can use for some of these terms. Words for which I cannot get a Hindi term—what I often do is to use a word which has a similar meaning or concept to explain it and I found that it is always easy for the students to understand what is taught if we sometimes clarify what we mean by using their own dialect or language.

(Interview: Kamal, male Indo-Fijian teacher teaching class 8, Dioka, 2001.)

Some senior Indo-Fijian teachers mentioned that they did not face the same problem as those of Ethnic Fijian teachers but further added that the problem may be faced with young Indo-Fijian teachers who do not know some Hindi terms or words. The following Indo-Fijian teachers’ comments are highly informative.

... Well, there are Hindi words for most of the scientific terms used and translating English words to Hindi is no problem to some of us who know the Hindi words for it. However, it may be a problem only to young Indo-Fijian teachers who do not know some of these Hindi terms or words. (Interview: Chandra, male Indo-Fijian Head teacher teaching classes 3 & 4, Kristi, 2001.)

... We used our own language most of the time in our teaching to simplify things for the children. There are Indian translations for most of the words and some teachers use these Indian words to explain the English term or word. However, for
those who do not know the Hindi terms, especially young teachers today who have a mixture of language, they do not use the Hindi terms but instead use other Hindi words which can easily explain the terms or words. So to answer your questions, there are Hindi terms or words and some teachers use it while others who do not know it use other Hindi words to simplify the terms when they explain it to the students. (Interview: Vijay, male Indo-Fijian Head teacher teaching class 5, Dioka, 2001.)

When teachers were asked whether or not they found a similar problem in teaching other subjects too, the majority of them mentioned that they mainly found it in science due to its use of foreign words. Comments such as the following lend support to this:

... I do not see much of this problem in other subjects. Most often the terms or words used in other subjects are usually simple ones we are familiar with and that have their Ethnic Fijian translation. In science, it is different. Most of the terms or words used are new to the Ethnic Fijian dictionary and it is often very difficult to explain these terms or words in Fijian language especially when we try to clarify our explanation in Ethnic Fijian language. (Interview: Adi, female Ethnic Fijian teacher teaching classes 1 & 2, Natoa, 2001.)

... Well, I think not much in other subjects as compared to science because in other subjects like social studies, they deal mainly with words which we use in our social life whereas in science, we deal with words which are foreign to our village or community situation. (Interview: Taniela, male Ethnic Fijian Head teacher teaching classes 7 & 8, Natoa, 2001.)

Apart from the lack of Ethnic Fijian vocabulary to explain some scientific terms given in the curriculum, it was also found that some of the scientific terms or words if expressed in Ethnic Fijian language would have a meaning completely different from its scientific meaning. One example I thought of is the word “WATER” and “LIQUID”. In Ethnic Fijian term, they both mean the same thing which in Ethnic Fijian called “WAI”. In English or scientific terminology, the word “WATER” is an example of a liquid whereas the word “LIQUID” does not only mean water because there are other examples of liquids like kerosene, spirit, benzene etc. Indeed we say that water is not only a liquid: we talk of it having solid and gaseous forms as well (ice, water vapour). Another good example is the word “ANIMAL”. In Ethnic Fijian, a fish or man is not an animal whereas in scientific terminology, both of these come under the animal kingdom. As explained by one of the teachers interviewed:

...Looking at the word “animal” in scientific terminology, we can say that a cow, a dog, a sheep, a cat, a man etc. are all animals. However, sometimes when I asked them whether they also consider man as an animal, most of them say that man is not an animal because man does not eat grass or live outside like other animals do. Now this is the way Fijian students and even adults look at it when they consider the term “animal” in Fijian which to them means the word “manumanu”. In Fijian
term, we do not consider man as “animal” or “manumanu”. In other words, man is not a “manumanu”. This is difficult especially when students know the meaning of the term in their own language whereas in the scientific language it is contrary to its Fijian meaning. (Interview: Mela, female Ethnic Fijian teacher teaching classes 3 & 4, Natoa, 2001.)

The same teacher goes on to explain other difficult scientific words which students find difficult to understand and continued:

... Another good example is the word “mammal”. There is no translation of such word in Fijian and students have difficulties in understanding it when they have to learn all the characteristics of animals which belong to the category “mammal”. ... Another one is the word “matter”. ... I myself as a teacher always find it difficult to explain to my students what it means and it is always difficult for students to grasp when we say that “matter” is anything which occupies space and has weight. One time when I was going over the topic with the students in my class, they ask me whether to consider empty space as matter too and these are some of the questions teachers have to think about carefully before answering. Again if there is no such word with which we can easily explain the word in the students’ own language then it will be very hard for the students to understand it. (Interview: Mela, female Ethnic Fijian teacher teaching classes 3 & 4, Natoa, 2001.)

Other examples of scientific words I came across in the Primary science syllabus which do not have any Ethnic Fijian word are: evaporation, stomata, combustion, photosynthesis, cell, humus, osmosis, adaptation, corm, rhizome, bulb, transpiration, chlorophyll, diffusion, petal, stamen, stigma, ovary, ovules, pollination, fertilisation, aquarium, sepal, solution, etc. These are only a few to mention for there are many other scientific words or terms used in the primary and secondary science curriculum which do not have Ethnic Fijian translation.

From what I gathered from my classroom observations and interviews with teachers and students this is an area which seemed to cause a lot of difficulties to Ethnic Fijian students. Ethnic Fijian students are often confused with some of these scientific words or terms since there is no Ethnic Fijian translation for them and in some of the cases, their scientific meanings seemed to be completely different from their Ethnic Fijian meanings. Whenever Ethnic Fijian teachers switched language from English to Ethnic Fijian while explaining some of these scientific terms, it is difficult for both teachers in terms of explaining and for students in terms of understanding these terms because there are no proper words to express their meanings in Ethnic Fijian.

I was keen to find out whether or not the new Ethnic Fijian Dictionary which was about to be printed that time - December (2001) has additional Fijian words or terms for some of the scientific terms used in the science curriculum. I interviewed the Director of
Fijian Language and Culture but he mentioned that the new dictionary does not include new Ethnic Fijian words or terms.

... No, I do not think so. The new Ethnic Fijian Dictionary consists only of the old Fijian words and no new words are being currently introduced. Ethnic Fijian language is not rich in Ethnic Fijian words as compared to other languages like English, Hindi, Chinese, and Japanese etc. (Interview: Jemesa, Director of Fijian Language and Culture, 2001.)

What he mentioned was very similar to what my Dad said when I interviewed him.

... We (Ethnic Fijians) do not have any alphabet. These entire alphabets we used are European alphabets. Our elders do not write because as I have already said, we communicate verbally and that is how we get or pass information. We have different dialects but we do not have alphabets like the Europeans, Indians, Chinese and Japanese. (Interview: my father, Natoa, 2001.)

In Fiji, formal education was introduced in the 19th century by missionaries, whose aims were to train converts who would later spread the Gospel. The Bible was translated into indigenous language for teaching purposes. Unfortunately, other courses such as Geography, History, Science and Mathematics were not translated, but instead were taught in the European languages. This may also explain the success of Christianity in most Pacific Island countries like Fiji.

It is also reasonable to suspect that the very low pass rates of Ethnic Fijians at all school levels in science and science related courses is perhaps attributed to, among other things, the failure of students to grasp the scientific concepts that are explained in English. It has been observed that a student of science whose mother language has not been used in scientific discourse has “very special difficulties of cognition and understanding” if the language of instruction is English, because the student cannot “appeal to translation into the mother tongue for resolution of doubt or the dissipation of ignorance” (Strevens 1976, p 58). The argument that is usually advanced to justify this state of affairs is lack of scientific terms in the indigenous languages.

A study conducted in other developing countries like Africa agrees with this. For example, Dlodlo (1999) in his study and experience in Zimbabwe found that the only subject that children pass with ease is Bible studies and this is explained in terms of the fact that although it is examined in English, almost all children received religious instruction in their mother language, at home and in the local churches on Sundays.

The Fiji educational systems of the past and present do not acknowledge the incompatibility of the language of the home and immediate community and that of the
school. Nearly every village in Fiji has its own native dialect apart from the common "Bauan" language which is used nationally. Children learn their mother language or dialect first, and then they acquire the "Bauan" dialect through their early social relationships which are spoken by other children, community members and teachers at school. Thus, before children begin formal schooling, they may speak more than one dialect. What this means is that English which is the language of instruction at school may not truly even be the student's second language even after many years in the education system. It is more likely to be their third or fourth language. In addition, at most Ethnic Fijian schools, students do not normally speak English to one another or with their teachers outside the classroom. Often the concepts that students are meant to learn in the classroom do not relate to their everyday experiences.

Since the English words used had no relation to students' everyday experiences, students may have difficulty constructing the meanings of these new concepts. How can students be expected to reformulate ideas in their own words in a foreign language?

There is always the fear with parents and policy makers that if students are given instructions in their own native language, then they are at a disadvantage in their further academic development as compared to the children receiving instruction in English. However, some studies conducted on indigenous culture did not agree with this. For example a study by Bamgbose (1984) on the effect of the use of mother tongue (Yoruba) as the medium of instruction on academic achievement of Primary school pupils in Nigeria showed that the experimental groups performed better than the control groups and the likely reason for the enhanced achievement of the experimental groups was the use of Yoruba as a medium of instruction. In this same project, it was also found that the experimental groups performed better for the promotional examinations in subjects such as English, Mathematics, Yoruba and Sciences.

The problem of lack of students' understanding of scientific concepts because of lack of indigenous terms for the scientific terms used is quite evidently significant and will remain so until efforts are made to create and develop suitable scientific vocabularies so that the indigenous language can be used in teaching science and technology.

6.1.1.7. The use of composite and straight class teaching.

Composite class teaching involves the combining of two or more separate classes usually of different levels and with only one teacher involved for the teaching of the
combined class in one room at the same time, whereas straight class teaching is the teaching of only one class level by one teacher.

Both composite and straight class teaching are practised at the two ethnic schools studied. In Fiji, composite class teaching is mainly practised at schools with small class rolls whereas straight class teaching is mainly practised at schools with large class rolls.

One main area which some parents are always worried about is the effect of composite class teaching on the academic performance of their students at school. Some of them think that teachers who take more than one class in teaching will not teach effectively because of the extra work that they will be required to do especially in teaching the entire subject taught at primary level for the two classes. As a result, students' performance at school will be affected.

In trying to find out more about this, I interviewed teachers of both ethnic groups to find out whether or not they think composite class teaching has some influence on the differential performance of Ethnic Fijian and Indo-Fijian students in science at school. In addition, I also observed the learning situation of both ethnic groups in the classroom especially the effect of working together in groups like when two separate classes are combined.

In terms of my interview with teachers, I found that there were mixed reactions from both ethnic teachers on their views about the effect of composite class teaching on the performance of the two ethnic groups of students in science at school. Whereas the majority of them think that composite class teaching involves a lot of work for the teacher with the consequence that students' performance is undermined, a few of them think that composite class teaching is in fact better than straight class teaching for some reasons and would not affect the performance of Ethnic Fijian students in science.

For those who were against composite class teaching, their reasons were mainly based on the amount of work done by the teacher in preparing work and teaching the two combined classes with all the subjects at primary level. As a result, they seemed to think that since most Ethnic Fijian schools practised composite class teaching of science, Ethnic Fijian students' achievement in science will be affected. For example, an extract from my interview with one of the teacher showed this.

Q: Talking about composite class teaching, most Ethnic Fijian schools are small and practise composite class teaching as compared to the majority of Indo-Fijian schools which mostly have straight class teaching. Do you think this could have an effect on the general performance of Ethnic Fijian students in science at school?
A: Definitely, Yes. I have had an experience of teaching composite class for 12 years. To teach composite class — never mind that you have only 10 children in one class and 10 in the other, it is demanding in terms of preparation for the two classes. Teachers have to prepare for both classes and then the period for say 40 minutes for Mathematics has to be accommodated for both classes simultaneously likewise for the rest of the subjects taught. ... On the whole, I think Ethnic Fijian Schools lagged behind because of composite class teaching. (Interview: Chandra, male Indo-Fijian Head teacher teaching class 5, Dioka, 2001).

Another Indo-Fijian teacher tried to draw a parallel on the amount of work used by teachers in taking two classes with the overloading of a machine. He thinks that teachers who take two classes will become exhausted very quickly because their energy will drain out very easily as compared to teachers who practised straight class teaching. As a result, he thinks that Ethnic Fijian teachers in Ethnic Fijian schools practising composite teaching will be mostly affected which would also affect their students’ performance.

... I have taught for some time in a school which has the problem of shortage of teachers and I have to take two classes at one time. ... You know if anything has some amount of energy or effort with it and if you overload that thing, you will find that that thing will get exhausted in a short time — whether it is a machine, motor or a person, you will find that overloading will cause exhaustion faster. So you can imagine a teacher teaching one class and another teacher teaching two classes. For the one taking two classes, he has to prepare two sets of lessons at one time and surely he will get exhausted. He will not be able to devote that much attention to both the classes as he will if he is taking a straight class. So you will find that problem in most Ethnic Fijian schools because their schools are built to serve only one or two particular villages and the roll of the school is such that there cannot be straight classes — they have to be composite classes and that is the major drawback of Ethnic Fijian schools. (Interview: Sanjay, male Indo-Fijian Assistant Head teacher teaching class 6, Dioka, 2001.)

A similar view was given by two Ethnic Fijian teachers who mentioned that a huge task is always faced by the teachers in teaching two classes and they lamented that the only end result is that students will not be taught properly or effectively.

... It (composite class teaching) is not helping teachers to prepare their work well because of the two or more classes he or she will be taking for all the Primary school subjects. It is really a headache for us teachers. ... This will surely affect teachers’ teaching of the subject at school and thus students’ performance especially Ethnic Fijian schools which have more composite class teaching. (Interview: Adi, female Ethnic Fijian teacher teaching classes 3 & 4, Natoa, 2001.)

... If you look at our primary school here, there are eight classes altogether but there are only 4 teachers to teach all these eight classes. This means that each teacher has to teach two classes altogether. This is a big task for the teacher. You know, it does not mean that teaching cannot be done in cases like this. Teaching will also take place but you know, it will be a great task for the teacher. The only
result is that teaching will not be done properly or effectively. (Interview: Ana, female Ethnic Fijian teacher teaching classes 7 & 8, Kristi, 2001.)

Another Ethnic Fijian teacher lamented the big task it usually takes her to prepare two classes for all the various subjects taught at primary levels and how tired she usually is especially in doing the task of two teachers and how she feels at the end of the day.

... I have to spend a lot of work in preparing myself for the two separate classes for each day since I am taking the two classes with all the subjects taught at primary level. This involves a lot of preparation. I do not have enough spare time at school. In fact I am doing the task of what is supposed to be done by two teachers, and when it comes to the end of each day, I am usually very tired. (Interview: Adi, female Ethnic Fijian teacher teaching classes 1 & 2, Natoa, 2001.)

This type of difficulty or problem is not often faced by straight class teaching schools because:

... Teachers prepare themselves well for the lesson since there is only one class to take care of. (Interview: Amena, female Ethnic Fijian teacher teaching classes 5 & 6, Natoa, 2001.)

An Indo-Fijian teacher mentioned his dislike of composite class teaching as compared to straight class teaching which he thinks is much easier especially when he now realised the difference in terms of the load of the teacher when he now teaches at a composite class school.

... To be frank with you, I do not like composite class teaching. I like straight class teaching. ... For straight class teaching, there is only one class for you to look after and the syllabus is thoroughly covered. In composite class, you have to rush like you cannot take Maths for both the classes especially when they are at a different level. You have to cover the topic for the different classes separately. So time factor is always a problem. We have to really time ourselves on the activities or things we do whereas in straight class, you have only one class and it is simple and straight forward. ... I have experienced straight class teaching at my last two schools and I found that it is much easier than what I am doing now at this school. I am taking two classes here whereas in my last two schools, I took only one class. Now I realised the big difference in terms of the load of the teacher. (Interview: Ravi, male Indo-Fijian teacher-parent teaching class 1 & 2, Kristi, 2001.)

A class 7 & 8 Ethnic Fijian teacher mentioned that because of the difficult task of taking two classes at the same time and the demand to complete the examination syllabuses before examination time, he was forced to rush and thereby skip some experiments and thus some important practical aspects of the science teaching.

I experienced this with my teaching. Last year, I covered a topic with classes 7 and 8 on Natural Fertiliser where we are supposed to make our own compost. We did not do this practical experiment ... Because I was just rushing to complete my units, I did not have enough time to do this topic; and secondly, I did not prepare
myself well for the topic. As a result, I had to just explain all the things on the blackboard. (Interview: Taniela, male Ethnic Fijian Head teacher teaching classes 7 & 8, Natoa, 2001.)

There were a few teachers who thought that composite class teaching is much better than straight class teaching and it should not be blamed for the cause of underachievement of Ethnic Fijian students in science at school just because there were a lot of Ethnic Fijian schools which practise composite class teaching. Their reasons were based on the fact that composite class teaching gives the opportunity for teachers and students to use up their time effectively, gives the chance for students to revise work already covered in the previous year, and also enables students of lower level class to learn more from students of the higher level class especially when they work together and ask questions on areas of difficulties in class. Some of the comments made by these teachers were:

I did not find any problem with taking composite classes. To me, I find composite teaching to be much easier than straight class teaching. I started my teaching at a composite class teaching school before I moved here. One thing good about it is that it helps me to be occupied all the time in preparing for the school work. In a sense, it helps me to use up my time effectively. In straight class teaching, I realised that my work is kind of slacking because I have more free time and I do not use it properly for doing school work. In addition, I found that students who are brought up in composite classes tend to be aware of working with time especially in completing their tasks allocated to them because they are always involved with the teacher every time. ... So I do not see any reason why composite class teaching should be blamed for the problem of Ethnic Fijian students in science at school. (Interview: Ema, female Ethnic Fijian teacher teaching class 8, Loma, 2001.)

This is my first year of taking a straight class. The advantage is that I have only one class to concentrate on. But I think composite class teaching is better in the sense that students can always revise the same topic again when it is covered the following year. For example, if I am taking classes 5 & 6 this year, I will be teaching the combined class some class 6 topics. Next year, a new class 5 will come in and this year’s class 5 will move to class 6. Now when I cover class 6 topics again, next year for the combined classes, it will be just like a revision for class 6 because I have already covered that with them the previous year. So in this way, it is like each class is doing the topic twice each year. ... In fact, Ethnic Fijian students who undergo composite class teaching should not have any problem in their achievement in science because the system is like working in groups which is mostly liked by Ethnic Fijian students in the classroom. If Indo-Fijian students taught at composite schools do well in science, then I do not see any reason why Ethnic Fijian students having composite teaching should not do the same. (Interview: Seta, male Ethnic Fijian Assistant Head teacher teaching class 5, Loma, 2001.)
By combining two separate level classes and teaching them the same topic or syllabus, some may think that the lower level class may not be ready to learn such a topic at that early stage, basing this notion on Piaget’s theory of cognitive growth which advocated that concepts are acquired in a hierarchical order. However based on Vygotsky’s (1978) idea, it is also important to note that the formation of a child’s mind also depends very much on his or her social interaction, with others. So composite class teaching where two separate level classes are combined and taught together on the same topic is good in the sense that it will allow students to interact or work together with each other just like working together in a group and learning from each other.

Ethnic Fijian students were found to participate well when they worked in groups, as already mentioned by the majority of teachers in the previous section. Thus this finding suggested that they were not adversely affected by a composite class situation.

In looking at the classroom situation in terms of teaching and learning of science at both ethnic schools, there is no good evidence to support the assertion by the majority of teachers here. In fact, what I realised is that the majority of these teachers who think that composite class teaching is a problem at Ethnic Fijian schools are teachers who either teach at small schools where composite class teaching is practised or have previously taught in composite class teaching schools. They must have sensed and experienced the physical difficulties involved in using it in the classroom and that is why they dislike it or feel bad about it. They may not have realised the effect it can produce on Ethnic Fijian students in encouraging them to have social interaction with the others which can promote their learning of science.

6.1.1.8. Revision time.

I was keen to find out how long teachers of the two different ethnicities spend their time in revision work before their students finally sit for their National Examinations. Do Indo-Fijian teachers spend most of their time in revising examination work with their exam classes as compared to Ethnic Fijian teachers? A difference in the amount of time spent by teachers to revise students’ work can affect students’ performance in the subject at school. Table 18 shows the numbers of weeks in which Examination class teachers do their revision work before students sit for their final examinations.
Table 18. Number of Weeks Examination Class Teachers Spend on Revision before the National Examinations.

<table>
<thead>
<tr>
<th>School</th>
<th>Class 6</th>
<th></th>
<th></th>
<th></th>
<th>Class 8</th>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1-2</td>
<td>3-4</td>
<td>5-6</td>
<td>7-8</td>
<td>1-2</td>
<td>3-4</td>
<td>5-6</td>
<td>7-8</td>
</tr>
<tr>
<td>Loma (Ethnic Fijian large School)</td>
<td>√</td>
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<td></td>
<td></td>
<td>√</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dioka (Indo-Fijian large School)</td>
<td></td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td>√</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kristi (Indo-Fijian small School)</td>
<td>√</td>
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<td></td>
<td></td>
<td>√</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Natoa (Ethnic Fijian small School)</td>
<td></td>
<td></td>
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</tbody>
</table>

Again not much difference can be seen in terms of the number of weeks in which the two ethnic groups of teachers spend their time in revision for their final examination. Both sets of teachers spend considerable time on revision work with their students before the final examination. For the class 6 examination, while teachers of the respective ethnicities in the smaller schools (Kristi and Natoa) spend about 3 to 4 weeks of revision, teachers of the respective ethnicities in the larger schools (Loma and Dioka) spend about 5 to 6 weeks. The difference in the number of weeks spent by teachers for the small and big schools can be explained in terms of the time required by teachers to be involved with individual students during their revision. Small schools have a smaller number of students and therefore require fewer weeks for teachers to have spent time in revision with each individual student whereas for large schools, the numbers facing each teacher are usually larger, so that teachers have to spend more weeks in revision in order to meet the needs of each individual student.

In class 8, the same pattern is also seen where teachers of the respective ethnicities also spend more time for revision before the final examination is conducted. Two teachers (one from the large Ethnic Fijian school of Loma and one from the small Indo-Fijian school of Kristi) spent about 5 to 6 weeks of revision while two other teachers (one from the small Ethnic Fijian school of Natoa and one from the large Indo-Fijian school of Dioka) spent about 7 to 8 weeks of revision. The number of weeks which teachers spend on revision for exams tends to increase as the level of examination increases as seen from this table. For example, at class 6, the weeks of revision are between the ranges of 3 to 6 weeks whereas for class 8, the weeks of revision are between the ranges of 5 to 8 weeks. As the level of the class increases, students learn
more topics for examinations and this is why teachers require more time to revise the work for students before their final examination.

In general, there seemed to be no significant difference in terms of the number of weeks spent by both ethnic groups of teachers in doing their revision before the commencement of the final examinations. Thus one can not say that the difference in performance of the two ethnic groups of students in science at school is caused by teachers spending different amounts of time on revision. Overall, in looking at all these activities done by the two ethnic groups of teachers, it is clear that they both regard students’ preparation for examination as being very important. This is why trial test questions are set in a way very similar to the final examination; they make sure that all examinable topics are covered before they regularly conduct tests before the examination; and they spend more time with their examination classes for revision of tests. Some of them even conduct afternoon classes in order to catch up with their work and complete the syllabus before the examinations. As some of the teachers mentioned:

...The first thing I have to do is to try and cover all the examinable units for the allocated time given by the Ministry of Education. Secondly, I always try to spend more time in revising these examinable subjects at some evenings with the class. The faster I cover it, the better for me. I always try to cover most of my examinable topics during the first term so that most of the second term is covered only for revision. (Interview: Kamal, male Indo-Fijian teacher teaching class 8, Diocka, 2001.)

At the moment I am preparing class 6 for their external examination by giving them some extra afternoon classes from 7:00 pm to 9:00 pm. I make sure that I should complete all the topics well before exam. I also give them tests every 2 weeks. I revised the tests with them by giving them the correct answers. I also give them a lot of activity exercises to be done at home if there is not enough time available at school. (Interview: Amena, male Ethnic Fijian teacher teaching classes 5 & 6, Natoa, 2001.)

As the Primary External Examinations (Fiji Intermediate Examination and Fiji Eighth Year Examination) takes place in the month of July and August respectively, examination class teachers make sure that they finish teaching examination classes by May and June in order to allow a large block of time for coaching activities such as going over past examination papers, analysis of marking schemes, study of recent trends of examination questions and question spotting. Almost without exception, schools of both ethnicities run 'mock' in-school examinations for those who are about to sit for the 'real' examinations. Afterwards, there is time when the teachers show students the answers to the various examination papers. Schools of both ethnicities do this in order
to familiarise their students with the examination formats. Here is what an Indo-Fijian student says in praising his teacher for providing helpful points in successfully dealing with examination questions:

I hate writing down long notes. My teacher has the habit of giving us more notes. However I found the examination notes given by him to be very useful. They have a lot of points which I cannot find in my textbook. He must have spent a lot of time in preparing it. So if we want to pass, we just have to study this notes thoroughly because most examination questions come from this note. Furthermore, he spent more time with us in going over past examination papers with their solutions. He gave us more exercises based on these questions. This helps us to be exposed to different types of questions which may come during the examination. (Interview: Anita, class 6 female Indo-Fijian student, Dioka, 2001.)

Teachers’ beliefs and practices are in fact a reflection of the type of education system in Fiji which heavily relies on examinations. What teachers believe and practice is in fact controlled by the Ministry of Education and by what the general public expects teachers to do especially in making students pass examinations as earlier mentioned. The Ministry of Education sets the task expected of teachers mainly in the teaching manual, sets the topics to be covered and those that are not to be covered for the examination, and prepares a blueprint for the number and types of questions to be asked during examinations. Since teachers work under the Ministry of Education, they have very little to say except to follow what is expected of them to do. The views of the public in terms of what is expected of teachers to do and to achieve further strengthen teachers’ beliefs about their role being chiefly to make students pass tests and examinations.

6.1.1.9. Setting tests and examinations.

I wanted to find out how teachers of both ethnic groups go about setting their trial tests or examination questions. Is there any noticeable way in which teachers of either the one or the other ethnic group prepare their students for trial tests and National Examinations? Do teachers of either ethnicity have a similar or different way of setting tests for their students? What is the similarity or what is the difference if there is any?

Analysing the types of questions asked by teachers in trial tests (e.g. Mid-Year Examinations for 2001) and the two National Examinations mentioned for the year 2001 revealed the answers to my above questions.
Table 19 shows my analysis of the two examinations at class 6 and class 8 levels for the four schools. This was done by going over each school’s 2001 Mid-Year Examination Papers for classes 6 and 8 for each of the four schools together with the two National Examinations they later sat in that year.

Table 19. Comparison of the Number of the types of questions asked in each categories of Closed, Open and Application type questions for Trial Tests (Mid-year Examination) and National Examinations (FIE and FEYE) for the four different schools in 2001.

<table>
<thead>
<tr>
<th>School</th>
<th>Class 6</th>
<th></th>
<th>Class 8</th>
<th></th>
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<tbody>
<tr>
<td></td>
<td>C</td>
<td>O</td>
<td>A</td>
<td>C</td>
</tr>
<tr>
<td>Loma (Ethnic Fijian)</td>
<td>47</td>
<td>20</td>
<td>3</td>
<td>48</td>
</tr>
<tr>
<td>Dioka (Indo-Fijian)</td>
<td>49</td>
<td>17</td>
<td>4</td>
<td>48</td>
</tr>
<tr>
<td>Kristi (Indo-Fijian)</td>
<td>48</td>
<td>17</td>
<td>5</td>
<td>48</td>
</tr>
<tr>
<td>Natoa (Ethnic Fijian)</td>
<td>47</td>
<td>19</td>
<td>4</td>
<td>48</td>
</tr>
</tbody>
</table>

Note. C = Closed Questions; O = Open Questions; A = Application Questions. Definitions for these types of questions are given in Section 6.1.1.5. FEYE = Fijian Eighth Year Examination; FIE = Fiji Intermediate Examination.

The Blueprint for the year 2001 for FIE consists of 48 Closed questions, 18 Open ended questions and 4 Application questions whereas for FEYE, it consists of 52 closed questions, 16 Open ended questions and 2 Application questions.

In looking at the figures in Table 19, for the FIE, there is not much difference found in terms of the number of closed, open and application type questions asked by the four Ethnic teachers for their Mid-Year Examination as compared to the FIE that students sat that year. The number of closed questions asked by the four teachers in their Mid-Year examination lies very close to the FIE closed question number of 48. That is, Loma having 47, Dioka 49, Kristi 48 and Natoa 47. In the same way, the number of open ended questions asked by each teacher was also very close to the blueprint number of 18 with Loma having 20, Dioka 17, Kristi 17 and Natoa 19. For the Application type questions, all the four schools’ Mid-Year questions are very close to the FIE Application question blueprint number of 4 — with Loma having 3, Dioka 4, Kristi 5 and Natoa 4.

A similar trend is found for all the four schools by looking at the FEYE. The numbers of closed questions asked by each of the four teachers in their Mid-Year
examinations are: Loma 50, Dioka 51, Kristi 53, and Natoa 54 which are all very close to the number of closed questions asked in the FEYE — (about 52). For the Mid-Year open ended questions, Loma has 18, Dioka has 17, Kristi has 15 and Natoa has 15 which are all very close to 16 — the number of blue-print open ended questions for the FEYE. In terms of the application questions asked in the Mid-Year examination, Loma has 2, Dioka has 2, Kristi has 2 and Natoa has 1. Again these numbers are within the vicinity of 2 — the number of blueprint Application questions for the FEYE.

The closeness of the number of types of questions given by the two Ethnic teachers in their trial tests (like the Mid-Year examination) to those of the two National Examinations shows that both Ethnic teachers do the same thing in constructing their trial tests before the Final National Examinations. That is, both ethnic groups of teachers familiarise their students by giving them a similar examination set up (in terms of the number and types of questions asked) in their trial tests to that of the National Examinations such as the FIE and the FEYE. They both follow the blueprint set up by the Ministry of Education’s Curriculum Development Unit in constructing their test questions. The blueprint for the type of questions to be asked is already set by the Curriculum Development Unit, and teachers do not have any say except to closely follow the Ministry’s set up in constructing their tests. Any deviation of the number of types of questions asked from the blueprint set up by the Ministry of Education would be to the teacher mean that students can easily fail their examinations since differences may arise in the set up of their trial tests to that of the final National Examinations students are going to sit. So both sets of teachers are following a standard method of constructing tests questions as is expected of them by the Ministry of Education. This is shown in one of my interview extract with an Indo-Fijian teacher. For example:

Q: How do you prepare your test questions?

A: For the test questions, we have got a file for it where we do what we called the “KUA” part of it. That is: Knowledge, Understanding and Application. So when we construct our questions, we have to follow that pattern. We look at the amount of time we covered in a topic and figure out the number of questions which should be asked in that particular topic. We use the blueprint.

Q: So you do not just construct your questions any how?

A: No! No! We have to follow that pattern.

Q: Who prepares the Blueprint? Do you prepare it your self?
A: No, it is normally done by the CDU (Curriculum Development Unit) and they sent it out to Head Teachers who then instruct teachers on how to use it in preparing our tests.

(Interview: Ramesh, male Indo-Fijian teacher teaching classes 5 & 6, Kristi, 2001).

An Ethnic-Fijian Head teacher elaborated on the use of blueprint in setting test questions and said:

... Actually, our teachers have been trained and time and again we hold staff development sections and we tell them about the preparation of questions and for any test that we prepare, we have to refer to the blueprint and on the basis of the blueprint, we prepare the test questions. (Interview: Vili, male Ethnic Fijian Head teacher teaching class 6, Loma, 2001.)

Apart from using the blueprint, teachers of both Ethnic groups were using previous years’ External Examination question papers to guide them in constructing their trial tests before the National Examinations. The following teachers’ comments are indicative of this.

I always follow the FEYE format in terms of the number and type of questions asked. In most cases, I always use some previous year’s questions in my trial tests because what I found is that in most years, examiners repeat previous year’s questions and they rarely construct new sets of questions. (Interview: Ema, female Ethnic Fijian teacher teaching class 8, Loma, 2001.)

... The teacher must well prepare them (students) for the test and examinations. The right type of questions should be asked tested and should be very similar to the real exam questions that students are going to sit in the final exam. Teachers should give them a lot of practices in this area. It’s practice which will make them perfect. (Interview: Ravi, male Indo-Fijian teacher-parent teaching classes 1& 2, Kristi, 2001.)

... I see that the paper is a well balanced one, very close to the External Examination type questions and suitable for the level of the class. ... In addition, I mainly based my questions on previous years’ External Examinations. (Interview: Vijay, male Indo-Fijian Head teacher teaching class 5, Dioka, 2001.)

... For class 6 Intermediate Examination and class 8 Eighth Year Examination, a number of Trial tests are conducted so that the children get well trained for the final examination. ... In most cases we have to prepare questions very similar to external examination types by looking at previous years’ questions. (Interview: Mela, female Ethnic Fijian teacher teaching classes 3 & 4, Natoa, 2001.)

The use of previous years National Examination papers is mainly applied by teachers particularly those who take examination classes to familiarise their students with what is expected to come in the final National examinations. Mr Taniela of Natoa and Mr Ravi of Kristi made the point well when they said:

... I use the previous year’s examination questions as a guide in setting my test questions for my class. For each topic I covered, I usually go over the previous
years questions asked on that topic with the students and tell them that these are the type of questions which are likely to come in their examination. Sometimes when we go over previous years’ questions, we can predict the type of questions which the examiners are likely to ask in the coming examinations. (Interview: Taniela, male Ethnic Fijian Head teacher teaching classes 7 & 8, Natoa, 2001.)

... I use previous year’s’ examination papers (National Examinations) to construct my questions especially when I used to take classes 6 and 8 — the examination classes. ... I find that the system I used is good because it helps the students a lot to pass their examination because students usually taste the real type of questions which are often asked during the final examination. (Interview: Ravi, male Indo-Fijian teacher-parent teaching classes 1 & 2, Kristi, 2001).

Another Indo-Fijian teacher mentioned that in studying previous years’ National Examination papers thoroughly, he can easily predict the likely questions which is going to come in the National Examination and he use this as a basis in constructing his trial papers before the final examination. As he stated:

... I use the blueprint to prepare my test questions. The other thing is that I tend to study past years’ external exam questions thoroughly. That is, I might look at the last 10 years and study the pattern in which different types of questions are asked year after year and also which topic is commonly asked and which topics appear alternatively for each year etc. In doing this, you can easily predict the likely question which can come this year. So I am able to construct a Trial Paper which is very close to the real External Exam Paper for this year. (Interview: Kamal, male Indo-Fijian teacher teaching class 8, Dioka, 2001.)

In doing these activities of setting questions using the blueprint set by the Ministry of Education and using previous years’ questions as a guide in preparing trial examination questions, teachers of both Ethnic groups in a way are more like drilling their students on what is expected to come in the final National Examinations which students are going to sit during the year. It is evident from some of their interviews that after conducting tests, they drilled students to learn the correct answers. For example:

... During our revision time, I always go over the answers to the questions with my class before they have their examination. ... I have been using this system for all the years I have been taking examination classes like class 6 and class 8. ... It (referring to this system) works very well especially if the same questions given to them during our revision also appear in the final examination. (Interview: Taniela, male Ethnic Fijian Head teacher teaching classes 7 & 8, Natoa, 2001.)

... After Mid-Year, every week after that they (his class) will be given a full trial tests before the final examination begins. Papers are set with similar settings to the External Examination. I often take out questions asked in the previous year’s exam. In fact I set the paper according to External Examination format. I always mark these tests and give it back to the students and then in class, I will go over the correct answers with them so that they should able to improve on it next time if
they get it wrong in their first trial tests. ... That is done in every trial tests I give them. (Interview: Kamal, male Indo-Fijian teacher teaching class 8, Dioka, 2001.)

This system where students are drilled to know the Examination set up and the answers to examination questions will only encourage students to memorise facts. This is because if all we expect of the student is the ability to regurgitate large quantities of factual information according to the precepts of an examination routine, then the pupil’s preparation will almost entirely consist of studying for this type of exercise.

My interviews with focus groups of Indo-Fijian and Ethnic Fijian teachers in the urban schools confirmed the fact that they all use the blueprint set out by the Curriculum Development Unit to prepare their Examination questions and in the same way also rely on past years’ examination papers in constructing their tests for the purpose of familiarising students with the examination type of questions. As two members of two different focus groups of teacher stated:

... Yes, we also set our questions according to the blueprint set out by the Ministry of Education. We also use previous year’s questions in constructing our tests. ... The questions that a teacher prepares and the questions that come out at national examinations really play a role. If the two types of questions are completely different, then you will expect more failure from the students. If they are very similar, the students will score well because they must have revised it well during their internal examination. (Interview: Badur, male Indo-Fijian focus group teacher, urban Indo-Fijian school, 2001.)

...That is the way we use to set our tests, especially the Examinations such as the Mid-Year and Annual. We set the paper in a similar way as the real Examination paper is set. The number of questions and the type of questions asked are in most cases very similar. We sometimes use previous year’s questions in our trial tests to test how well students can attempt it. In this way, students are learning what they are going to get in the final examination. (Interview: Salome, female Ethnic-Fijian focus group teacher, urban Ethnic Fijian school, 2001.)

Since both sets of Ethnic teachers are found to be doing the same thing in preparing their tests, for their respective students in their schools, it is unlikely that this will cause any difference in the performance of the two ethnic groups of students in science at school.

6.1.1.10. Regularity of conducting tests.

Students’ science achievement can also be affected by how often teachers give their students tests before they sit for their final National Examinations. Table 20 shows how often examination class teachers (classes 6 and 8 teachers) of all the four schools
give their tests before their students finally sit for the final National Examinations such as the FIE and the FEYE.

Table 20. Classes 6 & 8 Teachers’ Regularity of Conducting Trial Tests before the External Examination.

<table>
<thead>
<tr>
<th>School</th>
<th>Class 6 Number of Times</th>
<th>Class 8 Number of Times</th>
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<tbody>
<tr>
<td></td>
<td>1-2 3-4 5-6 7-8</td>
<td>1-2 3-4 5-6 7-8</td>
</tr>
<tr>
<td>Loma (Ethnic Fijian large School)</td>
<td>√</td>
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</tr>
<tr>
<td>Dioka (Indo-Fijian large School)</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>Kristi (Indo-Fijian small School)</td>
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<td>√</td>
</tr>
<tr>
<td>Natoa (Ethnic Fijian small School)</td>
<td>√</td>
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</tbody>
</table>

Results within this table show the high number of trial tests given by both Ethnic group of teachers to their respective examination classes before students sit for their final National Examinations in class 6 (FIE) and class 8 (FEYE).

For class 6 who are going to sit for their FIE, three teachers (two Indo-Fijian teachers of Dioka and Kristi and one Ethnic Fijian teacher of Natoa) gave about 7 to 8 tests, whereas the Ethnic Fijian teacher of Loma gave about 5 to 6 tests before the final examination.

For the class 8 who are going to sit for their FEYE, three teachers (two Ethnic Fijian teachers of Loma and Natoa and one Indo-Fijian teacher of Kristi) gave about 5 to 6 tests while one Indo-Fijian teacher of Dioka gave about 7 to 8 tests before the final examination.

These figures showed that the majority of teachers in both Ethnic groups give tests to their classes within the range of 5 to 8 times before the final examination. This large number of trial tests given to students before the main examinations showed how much teachers of both Ethnic groups want their students to pass examinations. The more trial
tests students have the more familiar they will be in sitting examinations and knowing correct answers. So on the whole; there is no significant difference in terms of how regular tests are given by the two ethnic groups of teachers to their respective examination classes since they both give out more tests before the two National Examinations.

6.1.11. Analysing tests.

Although both groups of ethnic teachers use a standard system of setting their tests, by using the blueprint prepared by the Ministry of Education and they also based most of their questions on previous years National Examination questions, one slight difference found was the way in which they analyse their tests. While Indo-Fijian teachers have a proper system of analysing their tests, the same system was not found to be used by Ethnic Fijian teachers in their schools.

In both the Indo-Fijian schools studied, it was found that after teachers conduct and marked their tests, they have an analysis system where they thoroughly analysed the question paper to find out the number of students who get wrong and right in each number for the whole question paper. In doing this, they were able to find out the weak areas of students so that they can work out the reasons for diminished performance. For example, questions may not be very clear or teachers may not have covered the topic well with students, or the questions may be too difficult for the students. This system in fact helped class teachers to know both the weak topic areas covered and also the identities of students who do not do well in each question or topic. Teachers then have to look for the solutions to the problems identified. For example, if the cause of the problem is related to inadequate covering of the topic by the teacher, then the solution is to have remedial work on the weak area. The Indo-Fijian Head teacher of Dioka made the point well when he said:

... We would go over the question paper from question number one right up to the last question. Say for question number one, 30 children sat, and only 5 get it right and 25 get it wrong. Then we look at the question in terms of what is wrong with it or why do more students get wrong in this question. So we make a post-mortem on each question and we try our best to look at the solution or what can be done to improve from there. In some cases we try to reconstruct our question and give them another test. We would know that they are doing well if they improve their performance from the last tests and from the particular topic they have difficulties with in their previous tests. Sometimes we found that the topic was not covered properly so we have to go over it again. These are the sorts of things we often do
in our analysis system. ... We do this with all the examination subjects. (Interview: Vijay, male Indo-Fijian Head teacher teaching class 5, Dioka, 2001.)

The same teacher mentioned that they have proper Analysis sheets where teachers used to analyse class performance in tests noting down their weaknesses, remedial measures and people needing more attention.

... We have a proper analysis sheets kept in the office where we analysed students' tests in terms of the common errors found, the remedial work or exercises to be made to see that the children do not make the same mistake again. We also noted pupils needing more attention in this analysis sheet. (Interview: Vijay, male Indo-Fijian Head teacher teaching class 5, Dioka, 2001.)

The Indo-Fijian Assistant Head teacher of the same school mentioned that he always advised the teachers to use this system and it has been used by his school for a long time. In addition, he also mentioned that other Indo-Fijian schools have also been using a similar system.

... I always advise my teachers to follow this system. We do thorough analysis. I can say that it is a system which has been used by the school for a very long time. It is something which most other Indo-Fijian schools also practiced — not only this school. I know it because all the Indo-Fijian schools I taught use this system and when I became the Head teacher at this school, I introduce the same system. (Interview: Sanjay, male Indo-Fijian Assistant Head teacher teaching class 6, Dioka, 2001.)

The Head teacher of another Indo-Fijian school reiterated on the same point and said:

... After the examination, each subject sat is analysed in terms of the number of students sat, number passed, and number failed; what is the average mark, number of students getting average marks, above the average or below the average. If there are children who get below the average marks, we have to find the reasons. We have to go right to the bottom and find out from there. Where does the problem lie? Does the problem lie in the child, or in the teacher or at home? (Interview: Chandra, male Indo-Fijian Head teacher teaching classes 3 & 4, Kristi, 2001.)

The same teacher further mentioned that they have class files where all the analysis sheets are kept and given out to teachers during their analysis of tests. They also have files where all past year's' examination questions are kept for teachers' references.

...We have class files where we keep all the subject analysis for each student. We also have ready made analysis sheets kept in Files which are given out to each class teacher to do their tests and examination analysis. We also have Files for internal and external examinations. These files are kept in the cupboard for teacher's references in preparing tests or examinations. (Interview: Chandra, male Indo-Fijian Head teacher teaching classes 3 & 4, Kristi, 2001.)
The analysis sheets used by teachers are different from Report forms which are often given to students after the end of the school term. These analysis sheets are made only for the purpose of analysing students' weak areas and how to overcome the problem areas of students in the tests. In looking at the two Analysis sheets prepared by the two different Indo-Fijian schools, I found that the contents were very similar. In both the Analysis sheets, they include the total number of students in the class, the number who sat, the number who passed, the number who failed, the highest and lowest mark gained by students, and also comments, where class teachers point out the weaknesses noted, and the remedial measures taken. These analysis sheets after being filled out by class teachers are then passed to the Head teacher to check what has been done by the teacher to rectify the problem areas of students. (Refer to separate copies of these Analysis sheets for the two Indo-Fijian schools of Dioka and Kristi in Appendix H.)

However, it is evident from my interview with Ethnic Fijian teachers taking Examination classes for the two Ethnic Fijian rural schools studied that detailed analysis of tests and examinations such as the ones used by Indo-Fijian teachers in their schools was not carried out. They did not prepare analysis sheets for later checking by the Head teachers like the ones used by Indo-Fijian schools. Instead, teachers said that they only keep records of their own class test results after conducting tests. For example:

Q: How do you go about analysing your student's performances in tests?
A: After I marked the tests, I keep a record of all my class tests results by myself.
Q: Does the school have standard analysis sheets for analysing students' performance and remedial measures in tests or exams?
A: No, we do not have any sheets prepared to do our test analysis. The only standard system used here is for teachers to mark their own tests or examinations and keep a record of it in their own examination register. This will help teachers to work out the student's position at the end of each term.
Q: So you keep your own record of the tests or examination results with you?
A: Yes.
Q: Do you show your results to the Head Teacher or the Assistant Head Teacher for his comments?
A: No. The only time the Head Teacher gives his comment is when we give him the end of the term class report to be signed.

(Interview: Ema, female Ethnic Fijian teacher teaching class 8, Loma, 2001.)
A similar thing was mentioned by the Head teacher of Natoa when I interviewed him. For example:

Q: How do you analyse your tests? Do you have a set system to use?
A: We have a very simple way where each individual teacher set his or her own test questions for the class and the same teacher has to mark his or her tests and analyse it. After marking, teachers have to keep a record of their own tests and exams with them. It is up to each teacher whether or not to revise the subject again if the class has a need to by looking at student’s performance in their tests.

Q: So you do not look at the questions or analysis made by respective teachers?
A: No, that is the responsibility of each teacher. They set their own questions according to the topics they covered, they mark their own tests and they keep their own record of their class tests. I will only be informed about the results of tests or exams when the exam register comes to me at the end of each term. (Interview: Taniela, male Ethnic Fijian Head teacher teaching, classes 7 & 8, Natoa, 2001.)

There is no standard system set by the Ministry of Education to allow teachers to analyse their tests like the blueprint standard system for constructing tests. This is probably why the different ethnic schools use different systems for analysing their own tests and examinations. However, Indo-Fijian teachers might have seen the system they are using to work properly in enabling their students to pass examinations and that is why they continuously use it as their standard system of analysis.

As the two Indo-Fijian Head teachers mentioned:

... I know that this is the best system to improve the performance of students in tests and examinations. As a teacher, you have to find out the weak points of the students and that is why we are there, to help them in these weak areas in order to pass their tests and examinations. Some schools do not take much attention on this system of analysing and remedial work and that is why their students do not always perform well in external examinations. (Interview: Vijay, male Indo-Fijian Head teacher teaching class 5, Dioka, 2001.)

... We have found that in using this system, it works very well in getting most of our students to pass the external examinations — especially in doing remedial work. A lot of remedial work has to be done after the internal examination. The weaker areas have to be remedied: why did that problem occur, how can that problem be rectified and whether or not you can rectify that particular problem. I think schools which do not analyse their tests like this will not perform well in External Examinations. (Interview: Chandra, male Indo-Fijian Head teacher teaching classes 3 & 4, Kristi, 2001.)

In both these comments, the two Head teachers mentioned that they think that schools which do not use this system do not always perform well. My interview with Focus group of teachers in the urban school showed that both Indo-Fijian and Ethnic Fijian teachers in urban schools used similar method when they analysed their tests and
it helped to improve their results. As two members of different focus group of teachers mentioned:

... Yes, we have seen that we have been able to produce very good results and we have been consistent with our results by using this system. We found that the strategy that we used really helped and we have been able to continuously produce good results throughout and there has not been any drawback. (Interview: Satiya, male Indo-Fijian focus group teacher, urban Indo-Fijian school, 2001.)

After the exam, we carry out the analysis of the weaknesses and the children who need attention are dealt with in terms of their weaknesses. We also look at the areas which might require more teaching or remedial teaching. Data is then compiled and on the basis of the data, teachers do remedial teaching so that if there is any weakness in one test, it will be rectified and solved so that it is not repeated in the following test. The system works well in enabling our students to pass exams. (Interview: Salome, female Ethnic Fijian focus group teacher, urban Ethnic Fijian school, 2001.)

The administration of such an analysis system depends very much on whether or not the Head Teacher of the school has seen its beneficial effect in enabling students to pass examinations. However, it seems likely that the Head Teachers of the two Ethnic Fijian rural schools may not be aware of what the Indo-Fijian rural teachers have already seen in terms of the importance of doing thorough analysis of students' tests or examinations to enable more students to pass their examinations.

Ethnic Fijian teachers may not have seen the benefit of using this method of analysis because they do not work collaboratively with other teachers of other Ethnic Fijian schools and exchanging ideas especially on how to go about analysing students' trial tests or examinations like what the Indo-Fijian teachers do with other teachers of Indo-Fijian schools. My interview with Indo-Fijian teachers showed that they often collaboratively work with teachers of other Indo-Fijian schools especially in setting trial tests. Teachers exchange ideas in doing this practice and at the same time the idea helped to expose students' ways of answering different questions asked by different teachers. In addition, whenever teachers need improvement in some areas, they can always be assisted by other teachers during their collaborative work. As one of the Indo-Fijian teacher explained:

... Trial test is conducted with the cooperation of other schools. What we do is that we form an association of schools where teachers have to cooperate in preparing and analysing trial tests. So the workload is shared. Actually, when I was at another rural Indian school I was one of those teachers instrumental in forming this association. Even today, the teachers are reaping the benefit of this. It so happens that when you prepare a trial test, you are not only preparing it for your own school but for all schools in the association and your children are exposed to answering
questions prepared by various teachers. In addition, teachers learn more from each other. So students are not only accustomed to one type of answering questions from one teacher, but they are exposed to all the ideas of all the teachers. If certain areas I need improvements in, I get the help or assistance from other teachers in the association. In the same way, I also help out other teachers in some areas I have more knowledge about. So it was good cooperation and good way of helping each other to produce good result in external examinations. (Interview: Sanjay, male Indo-Fijian Assistant Head teacher teaching class 6, Dioka, 2001.)

The same teacher mentioned that other Indo-Fijian schools are using this system of collaborative work. As he stated:

... One thing I want to mention is that this (referring to the collaborative work of teachers) is not only done here. The majority of other Indo-Fijian schools in other districts are also using this method to get quality pass in their external examinations. (Interview: Sanjay, male Indo-Fijian Assistant Head teacher teaching class 6, Dioka, 2001.)

My interview with one of the Head teacher of the rural Ethnic Fijian School studied showed that his school did not use the system where teachers work cooperatively with other teachers of other Ethnic Fijian schools in either setting trial tests or in exchanging ideas like what is done at the Indo-Fijian schools. For example:

Q: Do you work with other teachers in other schools in setting trial tests and marking tests?
A: No, some schools used that, but not here.
Q: Why don’t you use that here?
A: Well, it involves a lot of work especially in preparing tests questions and model answers to be given to all the schools involved.
Q: So you do not use that system here?
A: No, here, we only prepare various trial tests for our students. It is easier to use it for our students rather than to many other students of various schools.

(Interview: Vili, male Ethnic Fijian Head teacher teaching class 6, Loma, 2001.)

The Ethnic Fijian Head teacher may have seen only one side of the coin without realising the beneficial effect of working cooperatively with other teachers. It could be the reason for their sticking to their own way of tests and examination analysis because they are not exposed to new situations viewed by other teachers especially in improving students’ performance in tests.

There is a slight difference in terms of how the two different Ethnic groups analyse their tests or examinations as seen here. Indo-Fijian schools tend to have a better tests analysis system as compared to the ones practised by the Ethnic Fijian schools. In an educational system which is basically exam-oriented like Fiji (exams at class 6, class 8,
Form 4, Form 6, and Form 7 levels), the success of the school or the teacher is always determined by the number of students who pass external exams. Passing an examination is highly regarded by Indo-Fijian schools and teachers and that is why they use the system of test analysis they used because it continuously gives them good exam results every year.

In my view, the difference in the way the two Ethnic groups of teachers analysed their tests could contribute to the differential achievement of the two ethnic groups of students in science at school.

6.1.2. Students' Relationship with Teachers

This covers how much students respect teachers, their fear of corporal punishment used by teachers and their fear of being ridiculed by teachers in class.

6.1.2.1. Students' respect and deference for teachers.

Apart from the authoritative teaching which may hinder both sets of students in asking questions, another consideration may be that Ethnic Fijian students are inhibited by their custom of respect for elders from asking questions in class. They respect teachers like they respect any elder at home. What they learned at home in terms of respecting elders is brought to the school situation where they think that if they do ask questions in class, they might be chided by teachers for being too clever and not respecting them. Whatever happens inside Ethnic Fijian classrooms mirrors traditional expectations about power and authority. This is mentioned by the majority of Ethnic Fijian students. For example three extracts from my interview with Ethnic Fijian students of Natoa clearly showed this.

Q: Have you ever made any effort to ask your teacher on the things you do not understand?
A: No, I am often afraid of asking the teacher back.
Q: Can you tell me why?
A: I am always scared of him because he is the Head teacher and we are supposed to respect him. We are not supposed to be inquisitive or speak boldly to him.
Q: So you think this is a problem you faced at school?
A: Yes, this is one problem I faced at school.
Q: You think this causes you not to understand some subjects well?
A: I think this is one of the reasons.
(Interview, Maku, class 7 male Ethnic Fijian student, Natoa, 2001.)

Q: If you do not understand any thing in class, whom do you turn to for help?
A: I sometimes ask my friends in my class and if they do not know the answer, I will ask some of my friends in classes 7 & 8.

Q: Why don’t you ask the teacher straight away?
A: No, sometimes it is very difficult to talk to him and that is why I always bring it to my friend.

Q: Can you tell me why it is difficult for you to talk to your teacher?
A: Because I am always scared of talking to him.

Q: What are you scared of?
A: I am scared because he is my teacher. We do not go around talking to him much.

Q: Okay, okay, just because he is your teacher that is why you do not go around talking to him much?
A: Yes, we have to respect him.

(Interview: Kelera, class 6 female Ethnic Fijian student, Natoa, 2001.)

Q: You told me that you found science, maths and social science difficult. Have you ever tried to bring up your difficulties to the teacher?
A: No, I am always ashamed of doing this.

Q: Can you tell me why?
A: I am always like that. You know at home, my dad always tells me not to be inquisitive.

Q: Why did he tell you that?
A: He often tells me that that is not a good manner.

Q: Not a good manner to ask questions?
A: Yes, because my father says that if you are inquisitive and try to ask questions, it will mean that you are not respecting the person.

Q: I see. Is this why you do not ask your teachers questions?
A: Yes, because I have to respect him too because he is our head teacher

(Interview: Vatisena, class 8 female Ethnic Fijian student, Natoa, 2001.)

Similar things were also lamented by some Ethnic Fijian students of Loma. For example:

... I am always shy of asking my teacher questions in the classroom because I always respect him. This is what my grandfather taught me at home. (Interview: Fulori, class 7 female Ethnic Fijian student, Loma, 2001.)
Sometimes I am shy of asking questions because the teacher might growl at me. He might think that I am not respecting him. This is why I often do not ask questions in class. (Interview: Vai, class 8 male Ethnic Fijian student, Loma, 2001.)

Students’ shyness of asking elder people questions was clearly shown from the dialogue I recorded when four students were working in groups by reading instructions from the book to do some measurement during my classroom teaching observation at Natoa. They were talking in Ethnic Fijian language. Student 1 was trying to ask the other four students in the group the meaning of the phrase “the palm of the hand”. Student 2 suggested the meaning but student 3 asked student 1 to ask the teacher for its meaning. However, student 1 asked student 3 to ask the question for him, for he was shy. When student 3 was about to ask the teacher, student 4 warned him not to do so. This of course showed the fear of students in asking elder people questions. For example:

S1: “A cava na ‘palm of your hand’?” (“What is meant by the ‘palm of your hand’?”)

S2: “O ya na qeteqete ni ligamu” (“That is the inside part of your hand”).

S3: “Tarogi Qasenivuli” (“Ask the teacher”)

S1: “Taroga mada o iko, au re” (“You ask him, I am shy”)

Student 3 was about to raise his hand when S4 warned him not to do so.

S4: “Aia, kua! Aia kua! qarauna”. (“Hey don’t! Hey don’t! Be careful,”.) (Classroom Teaching Observation, 29/05/01: Amena, male Ethnic Fijian teacher teaching classes 5 & 6, Natoa.)

A feature that is little understood and often ignored but which has great influence in the development of Ethnic Fijians is the culture of silence. For Ethnic Fijian tradition, being quiet or silent or not responding to conversation or orders is a sign of respect. In Ethnic Fijian society, children are asked to avoid conflict with their parents and teachers by obeying all the instructions. Some students keep silent in class, as keeping silent is considered polite. It is often difficult for teachers to encourage them to discuss matters or ask questions.

Looking at what all the Ethnic Fijian students mentioned from the interview, it seems that they are mostly shy of asking their teachers questions. Their shyness is due to their custom of respect for elders. At home, they are supposed to respect elders and asking them questions is something which is not regarded as good manners in an Ethnic
Fijian custom. Students may be chided by elders simply for being inquisitive. They come to believe that they may be growled at and told to keep quiet if they ask questions. Their traditional custom of respect and deference in fact taught them their culture of silence. Such factors were also mentioned by Ethnic Fijian teachers. For example:

... This is one of the weak areas I found with Ethnic Fijian students. I found that they rarely ask questions in class or even make an attempt to bring up their problem to us teachers. There may be a few reasons for this. One is that parents do not usually encourage them to ask questions at home and that is why they hardly ask questions at school. The other thing is that students are used to this at home so when they come to school, they tend to follow the same thing. I guess it is also because of our custom. That is, at home they are taught not to ask back because that is regarded as bad manners for them. You know the Fijian way is to say that everything is fine even though it is the other way round. We always try to be good to others or to show others that we do not have any problem. So by not asking questions in class students think that this is good for the teacher because the teachers are not disturbed in class. This is how students view it. (Interview: Adi, female Ethnic Fijian teacher teaching classes 1 & 2, Natoa, 2001.)

... They are always ashamed of asking questions in class. That is the behaviour I mostly find with Ethnic Fijian students. They probably do this to show respect for their teachers. (Interview: Bulou, female Ethnic Fijian teacher teaching class 4, Loma, 2001.)

... You may notice that this thing (referring to the problem of not asking questions) is happening in other classes too. They never ask questions. They are sort of ashamed or probably scared of asking questions. ... Probably they might think that we are going to growl at them if they ask questions. This is the same type of feeling I also experienced when I was young. I always thought that if I asked questions, the teacher might be angry at me. These two things - the feeling of being shy and being afraid seemed to be part of our Ethnic Fijian life. ... You know, we Ethnic Fijians have respect and to show respect for teachers in class, we often remain silent and asking teachers questions is not common because to us that is not considered good behaviour. I am telling you all the things I experienced during my years of schooling at primary and secondary level and I know, most Ethnic Fijian students today also have similar feelings too. (Interview: Taniela, male Ethnic Fijian Head teacher teaching classes 7 & 8, Natoa, 2001.)

Here, the reaction of Ethnic Fijian teachers is coloured by the use of their traditional customs which provide them with a framework for explaining their cultural background as related to the problems of Ethnic Fijian students not asking questions in class and not as a normal professional challenge.

Even community members think in the same way. For example, my father reiterated on the same issue and said:

Ethnic Fijians are like that. That is, we are often shy of asking questions openly especially in the presence of somebody in authority. We are not born like that but we are brought up like that. Our custom teaches us to be like that from when we
are young and that is why we are used to it. We have our traditional custom of silence whenever our chief or elders talk or give orders. We follow whatever things is told or asked by them without arguing because this is part of our tradition of respect and deference. This is why it is hard for Ethnic Fijian students to break this rule at school. ... Our children's life at school will also be like that. They will also treat their teachers like that. They will respect him and will avoid asking questions to him, even if they are not sure about anything, they will just keep it quiet amongst themselves. To us, that is important because it is a mark of good behaviour and showing deference. (Interview: my father, Natoa, 2001.)

Two Ethnic Fijian teachers interviewed have also taught at Indo-Fijian schools and I asked them whether or not they experienced any differences or similarities among the two ethnic groups of students in their ability to ask questions in class. Both of them mentioned that like Ethnic Fijian students, Indo-Fijian students did not often ask questions in class. However, they are always keen to know more and may bring up their questions individually to other teachers they have more confidence with if they are shy of asking their own classroom teachers. This is one thing which they did not find with Ethnic Fijian students.

I found that most of our Ethnic Fijian students are always shy of asking questions. Most of the time, they will just sit quietly in class and not often talk or participate unless you tell them to work with their friends. This is the only time you will see them talk and participate. I have also taught in Indo-Fijian schools but the difference I found is that Indo-Fijian students may sometimes ask other teachers during their spare time questions or problems if they are ashamed of asking me questions. This shows their keenness in wanting to know more about something which they do not know. This is something I found to be lacking among our Ethnic Fijian students. (Interview: Seta, male Ethnic Fijian teacher teaching class 5, Loma, 2001.)

... During my 5th year of teaching, I taught at an Indian school (rural) close to my village. ... I realised the same problem but not as bad as what I saw with Ethnic Fijian students. For Indians, they are always keen to know more about the things which is covered in class. When they do not ask questions in class, they sometimes bring the things they want to know to us or other teachers. I did not find this with Ethnic Fijian students. (Interview: Taniela, male Ethnic Fijian Head teacher teaching classes 7 & 8, Natoa, 2001.)

An Indo-Fijian teacher also agrees with what these Ethnic Fijian teachers stated but added that the ability of students to ask questions also depend on the environment from which the student comes. His experience is that students who have urban background with the influence of European culture often have the ability to ask questions in class. As he stated:

In some cases, I also noticed that Indo-Fijian students' attitude to ask questions is just like Ethnic Fijians. ... One thing which I noticed in my class [Indo-Fijian class
in this case] is that they may not ask when the teaching is in progress but once they are given the activities, they will then come up with their individual questions to the teachers when the class is over or when they found that I am free. ... They often do that not only with me but with other teachers too. ... It also depends on the background of where the students come from. Asking questions is more prevalent to European culture so those who have their culture which is very much westernised — especially those who stay close to urban areas because of the European influence are likely to have this practice of asking more questions in class. (Interview: Sanjay, male Indo-Fijian Assistant Head teacher, teaching class 6, Dioka, 2001.)

Some teachers may conclude that if children are silent or do not respond to questions, they are passive, unresponsive, withdrawn, un-cooperative, anti-social and stupid. In fact, these are problems of negative stereotypes. Tannen and Saville-Troike (1985), pointed out that silence is not purely negative and it is not a mere absence of speech but a positive and a complete world of itself. In some cases, it is often misjudged by teachers to mean that students have understood what is taught in class.

For Ethnic Fijian students both to become active in thinking about their own experience insofar as this can be illuminated by science, and to do better in science as measured by assessment achievement, there is a need to break out from the tradition of silence. Unless they are encouraged at school and at home to ask questions freely, they are liable to maintain silence out of respect and in this way lose opportunities to learn. Neither the home, nor the school is at present a site for the democratic exchange of ideas. At home, elders would at least need to be open to being asked to give reasons for what they say, or even to listening to children's ideas and discussing them in relation to the evidence rather than to personal authority, before the home would be a site for the democratic exchange of ideas. At school, both students and teachers would need to contribute during class time, again with the operative concern being about the evidence rather than simple personal authority, and students would need help learning to discuss ideas in this way among themselves, before the school would be a site for the democratic exchange of ideas. Potentially a science course could help establish this kind of exchange at school; not, of course, if the pupils must sit quietly with folded arms, but rather if the pupils are made to feel that they are taking part in an inquiry, in which the quality of an answer is measured by the evidence for it, not by anyone's personal authority. Because children are encultured at home as well as at school they may well need to be comfortable asking questions of their elders at home before they could be comfortable participating in an inquiry at school in the way just discussed.
6.1.2.2. Fear of corporal punishment and being ridiculed by teachers.

During my interview with Ethnic Fijian students, some of them said that one thing which also prevents them from asking questions is their fear of some teachers who still use corporal punishment at school. I did not come across any situation where teachers of both ethnic groups beat their ethnic students in the classroom during my field observation so I did not have any idea whether or not this claim by Ethnic Fijian students is true.

However, the fact that Head teachers in Fiji to date are still allowed to use corporal punishment for the purpose of disciplining students and it is also commonly used at Ethnic Fijian families as a measure of disciplining their children means that the claim made by these students can not be completely ruled out. For example when I was asking a class 7 male Ethnic Fijian students of Natoa about the teachers he liked at school, he mentioned that he did not like his previous head teacher because of his use of corporal punishment and his usual use of embarrassing comments whenever students do something wrong at school.

Q: Do you have some teachers whom you do not like at school?
A: No, only our previous Head Teacher who left.
Q: Why didn’t you like him?
A: He often beat us. I also do not like him because if one of us gets hurt while playing, he often does not bother about it. He often has comments like: “Yes, that is the effect of playing” and he may say “go and play some more”.
Q: Is that how he treats you?
A: Yes.

(Interview: Maku, class 7 male Ethnic Fijian student, Natoa, 2001.)

In another interview with a female class 5 Ethnic Fijian student of Loma, the student mentioned that she hates coming to school at times because of the use of corporal punishment by teachers in disciplining students at school. For example:

Q: What are some of the things you do not like about coming to school?
A: One thing I do not like about coming to school at times is that some teachers always punish us by beating us at school. I am always scared of that. I do not like them to beat us.
Q: Are the teachers still doing that at school?
A: Yes, some of them are doing it.
Q: Do they do it in class? Tell me what time teachers do that?
A: No, most of the time it is done by the teacher on duty after lunch and also in the afternoon. That is the time when prefects always give student's name to the teacher on duty.

Q: What sort of offences do these students commit for their names to be taken up?

A: They are the late comers, or they might be talking or playing during lunch time in the dining hall.

Q: So every time you commit offences like that you face the stick and no other form of punishment like detention or being held up to do some school work?

A: No, we do not have that. Teachers use stick only.

(Interview: Ana, class 5 female Ethnic Fijian student, Loma, 2001.)

Another class 7 Ethnic Fijian student interviewed mention similar things and commented:

Sometimes we get belted by the teacher on duty and sometimes we will have an extra hour of working in the school compound by weeding in the school garden or cleaning flower beds. ... I do not like some of the teachers at school because they always beat us when we are late, or if we do something wrong. I am always scared of being beaten by teachers at school. ... Some of them are still doing this. (Interview: Fulori, class 7 female Ethnic Fijian student, Loma, 2001.)

A class 5 male Ethnic Fijian student of Natoa mentioned that he did not like his class teacher because of his severe use of corporal punishment at school and that this creates fear and caused him not to ask questions whenever he did not know anything.

I do not like him. ... He sometimes beat us badly at school. ... He always tells us to remain in the classroom and do our study after lunch everyday. However, if he happened to catch us playing outside after lunch and not doing our study, we will get the consequences. If it is a Monday, then we will get 3 straps, if we do it again on Tuesday, we will get 4 straps, Wednesday, 5 and so on. ... He still practised that now. ... This is why I am also afraid of asking him questions on what I do not know. (Interview: Solo, class 5 male Ethnic Fijian student, Natoa 2001.)

Another class 8 female Ethnic Fijian student of Natoa mentioned the unfair treatment of male teachers in giving harsh punishment as compared to female teachers which always embarrased them especially when they are beaten in front of the whole class and this prevented her from asking her teacher questions.

... I am always afraid of male teachers. They sometimes beat us hard and give us harsh punishment as compared to female teachers. This is why I sometimes do not ask them questions in class too. They sometimes embarrased us by beating us in front of the class especially if we do something wrong or if we did not give correct answers on something he already covered with us in class. I prefer to ask my friend rather than asking my teacher. (Interview: Vatiseva, class 8 female Ethnic Fijian student, Natoa, 2001.)
During my interview with Indo-Fijian students, they never mention any thing of this sort to be happening in their classroom. One of the head teachers of the two Indo-Fijian schools studied mentioned during my interview with him that he never used corporal punishment in his classroom teaching but rather only for correcting behaviour within the wider school context. For example:

    ....For your information, I have never ever used corporal punishment in my teaching. I may use it as a Head Master in terms of correcting misbehaviour — like stealing, bullying, you know. ... Otherwise for actual classroom teaching — not at all. (Interview: Vijay, male Indo-Fijian Head teacher teaching class 5, Dioka, 2001.)

The same teacher further commented on the use of corporal punishment by Ethnic Fijian teachers and stressed the way in which teachers should treat their students in class and said:

    Some Ethnic Fijian teachers use harsh treatment like corporal punishment in their teaching and this cannot help students to learn and understand, you know! If they want students to understand things, they should treat them with love and care. Allow them to talk freely and to challenge some of your ideas in class. This will create their interest in the lesson. You should not be authoritative all the time. Teachers should be fair with the children and try to also hear their ideas and way of thinking. Our main role is to correct their ideas if it is wrong and not for us to tell them to follow whatever we say or think. This is what most teachers do not know. Gone are the days where students have to agree with whatever the teacher says or think (authoritative ways). We should now have a democratic type of approach in our teaching. (Interview: Vijay, male Indo-Fijian Head teacher teaching class 5, Dioka, 2001.)

    Ethnic Fijians in their villages use corporal punishment to discipline their children. Some parents believe that if this is not done, then children will not behave themselves or properly respect their elders. So in a sense, it is probably used as a way to keep their custom of respect and deference intact. As some of the Ethnic Fijian parents mentioned:

    ... At home we use corporal punishment to discipline children and to let them keep quiet and obey the rules of our culture. Corporal punishment is part of the Ethnic Fijian culture. (Interview: Sauna, male Ethnic Fijian parent, Loma, 2001.)

    I guess this is why most people regard us Ethnic Fijians as being respective and obedient people because we use corporal punishment at home to correct misbehaviour of our children. The children at young age knew this because they are treated in the same way at home and as they go up to Primary and Secondary school, this type of teaching goes with them. (Interview: my father, Natoa, 2001.)

    I used it at home mainly to discipline my children. The Bible says that to teach your children, you have to discipline them. Without disciplining, there is no teaching. So I guess our system is very similar to what the Bible teaches or says. (Interview: Seta, male parent, Loma, 2001.)
One of the parents further mentioned that the use of corporal punishment at home is necessary to create a barrier between the child and the elders. If children are not disciplined, then they will not obey instructions.

I think corporal punishment is necessary. ...There is a level or barrier between the teacher and student or the young and the old. Students should not be allowed to go past this barrier because if this barrier is broken, children will not be able to follow instructions given by teachers at school or the elder at home. They will think that they can do whatever they want to do if they are given the freedom or if they are not punished for their wrong doing. (Interview: Sailasa, male parent, Natoa, 2001.)

This could be an area in which the two ethnic groups are different. Yet, both sets of students are found not to ask questions regularly in class.

Ethnic Fijian students' ability to ask questions in class is also influenced by the behaviour of some teachers in ridiculing or embarrassing students whenever they give wrong answers in class. Some Ethnic Fijian students stated that they were reluctant to ask questions in class because of the fear of being humiliated by other students in class or their teacher if they do so. Some of their typical comments were:

... I am just scared of asking question because he (referring to his teacher) might talk back and say: "Why did you not listen?" ... You know, sometimes he always gets angry and embarrasses us. (Interview: Maku, class 7 male Ethnic Fijian student, Natoa, 2001.)

... Sometimes when the teacher asks some question and we give the wrong answer in class, they may say bad things about us and the rest of the class will laugh. ... I do not like that. I feel embarrassed when they laugh like that. ... Sometimes I think I know the answer but I do not want to say it because it might be wrong and the students might laugh at me again. (Interview: Kelera, class 6 female Ethnic Fijian student, Natoa, 2001.)

... I am always ashamed of doing that (i.e. asking questions) ... because sometimes when we bring up what we do not know, he always embarrasses us in class by saying that we were not listening to him during class. (Interview: Vai, class 8 male Ethnic Fijian student, Loma, 2001.)

Although I did not come across any of this situation during my classroom teaching observation, my interview with some of the teachers indicated that what Ethnic Fijian students told me during the interviews may have been happening. For example:

... Students do not ask questions in class because of fear. That is, fear of being humiliated by the teacher. You know some teachers do this in class. (Interview: Seta, male Ethnic-Fijian Assistant Head teacher teaching class 5, Loma, 2001.)

... I have come across situations at the Ethnic Fijian school when students ask some questions and the teacher would say things like: 'sit down' or they growl at the child - which is very wrong. (Interview: Ravi, male Indo-Fijian teacher-parent teaching classes 1 & 2, Kristi, 2001.)
My view is that if this phenomenon of using corporal punishment is brought to school like what is done in Ethnic Fijian children at home, then it may not help Ethnic Fijian students at school to ask questions freely. Instead of encouraging them to talk or ask questions, it will only discourage them. It will only create students’ feeling of fear for teachers and inhibit the development of a democratic classroom where both students and teachers participate to promote the learning of science.

6.1.3. Students’ Extra Activities at School

Both ethnic schools are found to give extra activities to their students in the morning when they arrive at school. These activities mainly include picking up rubbish around the school compound on various areas allocated for their houses, and doing other special duties such as sweeping their various classrooms or arranging desks, cleaning blackboards etc.

However, one difference I found between the two ethnic schools is that while Ethnic Fijian schools normally have a full extra hour of afternoon work for their students from 3:00 pm to 4:00 pm, Indo-Fijian schools send their students straight away to their homes when the school finishes at 3:00 pm. Ethnic Fijian schools mainly engaged their students in activities such as weeding the school garden, flower beds or school compound, cleaning school ablution block and classrooms, and collecting teachers’ fire wood or water or even helping teacher’s housework at home like cleaning the pot and dishes. Indo-Fijian schools, normally employed people to do most of these activities in the afternoon rather than letting students do it. As a result, Indo-Fijian students have the advantage of not having extra work at school in the afternoon. This gave them more time to arrive home early and do their extra school work as compared to Ethnic Fijian students who in most cases when they arrive home, are often very tired after doing these extra afternoon activities at school. With extra tasks expected by their parents to be done by them again at home, Ethnic Fijian children have very little time or opportunity to do their studies or homework when they arrive home in the afternoon. Most of them are often very tired after doing all these afternoon activities so that when night falls, they have their bath, dinner and go to sleep without even bothering to look at their homework or do some study at home.
6.2 Exosystem Influences on Teaching and Learning

A child’s development according to Bronfenbrenner (1979) can also be affected by settings which do not have a direct relationship with the child. At school, this includes the curriculum set by the Ministry of Education to be used by teachers in their teaching, teachers’ qualification levels and teaching experience and the interests of both teachers and students in science. Findings under this particular setting are summarised below.

SUMMARY OF THE FINDINGS

Exosystem Influences on Teaching and Learning

National Curriculum

- The National curriculum has a significantly academic focus with very little emphasis placed on vocational areas. These give rise to teaching towards the examinations, and thus to the sorts of academic aspects of science that can easily be assessed by examination questions. The response by the two ethnic groups of students to this significantly academic focus seems to have been quite different on average. Given the social difficulties such as poverty and expiring land leases faced by Indo-Fijians, Indo-Fijian students feel pressured to succeed at school. At the same time the pressures upon Indo-Fijian students can be unhealthy as evidenced by the problem of youth suicide. Indo-Fijian students are apt to consider a failure in an examination as a failure at life. Ethnic Fijian students by contrast do not face such pressure. They typically have the land to fall back on, so that a failure in an examination can seem to them to have little consequence.

- The curriculum is in some areas inflexible yet better suited to schools in urban or coastal areas than to schools in rural or inland areas. This means that in some ways it speaks better to the experiences on average of one ethnic group than to those of the other ethnic group. Perhaps because the writers of the curriculum are themselves more often from urban, coastal backgrounds and Indo-Fijian, the curriculum disadvantages students living in rural, inland areas who are mainly Ethnic Fijians.

- Although the curriculum content has been localised, it is still found to be removed from real life. There is a mismatch between the science learned at school and the real life situation of Ethnic Fijian students in the village whereas on the other hand, there seems to be a somewhat better match between what Indo-Fijian students learn at school and their real life situation at home.
Exosystem Influences on Teaching and Learning (Cont)

Teachers' Qualification Levels and Teaching Experience

- Although all the ethnic teachers for the two ethnic schools had teaching certificates, the majority of teachers in the Indo-Fijian schools possessed additional, higher qualifications and in general had more years of teaching experience than teachers in the intensively studied Ethnic Fijian schools.

- National figures also showed that there are significantly more qualified Indo-Fijian Primary teachers than Ethnic Fijian Primary teachers. The majority of Ethnic Fijian teachers who teach at primary levels are the ones having passed Form 6 and lower examinations whereas for the Indo-Fijians, most of them have qualifications at Form 7 or higher levels.

Teachers' and Students' levels of Interests in Science.

- It seems that in my sample more Ethnic Fijian teachers had little interest in science in the first place as compared to Indo-Fijian teachers. Whereas most of the Indo-Fijian teachers reported an especially high interest in science, Ethnic Fijian teachers reported that science was not a strong subject for them.

- The lack of confidence in science among Ethnic Fijian teachers probably relates to their own earlier development and education. They were liable to have been influenced by the way their own teachers taught them the subject, the confidence in science their own teachers had, the marks they gained and the opportunities provided to them as children to do experiments and participate in science-related discovery.

- That the problem about confidence in science among Ethnic Fijian teachers is liable to be self-perpetuating (unless firm steps are taken to correct it) can be seen in another way also. Ethnic Fijian students reported low levels of interest in and confidence in science like their teachers. The match is conspicuous. Likewise Indo-Fijian students reported relatively high levels of interest in and confidence in science, just like their teachers.

- Like their ethnic teachers, students' interest in science was also related to the marks they gained from it in their examinations together with their career aspirations. They were more interested in science when they scored high marks in it in their examinations and also when their career choice was towards some science-related field. According to my student interview data, the emphasis upon rote learning in science forced some students of both ethnicities to lose interest in the subject.
6.2.1. The National Curriculum

Fiji has been relatively successful in providing local curricula for use in schools. However, both the teachers and the students do not have the power to say anything about the curriculum set by the Ministry of Education for the teachers work under the Ministry and the students work under the teachers. Some of the characteristics of the Primary curriculum found are listed below.

6.2.1.1. More academic focus.

The Fiji curriculum as I see it is very academic and does not concentrate much on vocational education. It is overcrowded with factual content and is rigidly prescribed for all schools across all levels.

The existence of too many external examinations (two at primary and three at secondary level) probably also contributes to the more academic focus of the curriculum in Fiji today. This tends to ‘drive’ the teaching and learning process, allowing little scope for broadening into non-examinable areas. In fact, the testing and examination system in Fiji probably significantly diminishes creativity in the teaching and learning programmes of primary schools.

Through discussion with teachers, it became clear that they are well aware that their over-reliance on teacher-centred transmission of knowledge is not a good pedagogy and does not cater for the learning needs of many of their students. The perceived constraints imposed by the examinations make it difficult for them to develop a more creative and interactive teaching and learning environment.

The exam-oriented curriculum has forced most teachers to coach their students on how to tackle examinations in order to pass because they consider this to be the way they are going to be judged as successful teachers by the community as a whole. Little regard is given to the teaching for students to gain the skills and the understanding of the subject that students would need in order to apply what they learn at school in their real life situations.

There is little doubt that examinations are stressful for the students. Every year, Fiji newspapers carry reports of students’ suicides, coinciding with annual or external
school examinations. For example, in 2001 about four class 8 Indo-Fijian girls committed suicide (three by drinking weed-killer and one by hanging), following the release of exam results they are said to have found disappointing and unacceptable. According to family members, increasing poverty and a desire to get up in the world and succeed professionally put a lot of pressure on the young and this may have caused the tragedy.

Here is what one devastated Indo-Fijian parent says about his daughter in the newspaper (Fiji Post Wednesday, November 07, 2001):

... My daughter passed her exam and not just passed, but passed with good marks. She scored 427 marks out of 500. Yet she thought that was not enough to take her forward. Why did she kill herself? As her parents, we were happy with her marks. But we believe that she was not satisfied with her marks because when she received her results last week, she came home and she told her mother she had wanted to have the highest marks in her school.... Last Friday, after getting her marks and until the time she hanged herself, she looked very sad indeed, depressed and disturbed. She never smiled like she used to. She even went to the extent of telling her mother that she felt that it was the end of the world as she did not get the marks that she expected.

According to the newspaper, the girl's father said that his daughter had always wanted to be the best student in her class. Her daughter had told him that she wanted to score good marks and get a scholarship so that she can become an accountant. He and his wife had always told her that they would do everything that could make her dreams come true. But after receiving her result, his daughter became quiet and withdrawn.

Another class 8 Indo-Fijian female student according to the newspaper drank weed killer after being ridiculed by her classmate for failing her Fiji Eighth Year Examination. Here is an extract from the same newspaper detailing remarks about this girl by one of the family members:

... Rohini did not go to school on the day results were released. But a neighbour had told her that she had failed her test. She was fine that night but when she went to school last Friday, some mates of hers teased her that she was the only one to fail. So when Rohini came home, she looked upset. She was crying, saying that she was embarrassed. But I told her that she should not worry as this was just the Eighth Year Exam... no big deal. However, she could not take it and drank the weed killer on Sunday evening. (Fiji Post Wednesday, November 07, 2001.)

The system of education in Fiji is very exam oriented that it tend to become competitive and is putting more pressure on children especially those who live in poverty and have no other means of survival such as the availability of land. This is why
the majority of children who commit suicide are Indo-Fijians — because of the pressure on education and they do not own much land or in most cases, the lands they use are leased from Ethnic Fijians. In fact, the Indo-Fijian culture and value-system in the Indo-Fijian community in Fiji is such that they undergo extreme pressure when they feel that they have failed socially and financially in their lives. With education, both Indo-Fijian parents and children are equally pressured to have good results in schools. Because most of their leases are expiring and there is no intention for further extension by the Ethnic Fijian landowners, there is pressure on the household heads to look for alternative means of survival. As a result, most Indo-Fijian parents tend to put pressure on their children to perform at schools.

Committing suicide because of failing examinations or not achieving well at school is hardly done by Ethnic Fijian students because they are not facing the same pressure as those faced by Indo-Fijians. So the exam-oriented system tends to encourage Indo-Fijian students to become competitive and putting more pressure on them to work hard at school as compared to Ethnic Fijian students. The more academic focus has also resulted in some students costing their life when they failed or do not do well in examinations.

6.2.1.2. Not flexible.

It needs to be more fully recognised that centrally developed curricula are not always suitable for all parts of the country. Some curriculum which curriculum developers think suits both rural and urban schools in Fiji might not be the case because of factors such as the socio-economic differences of the communities living in the area and the different distribution of the two major ethnic races in urban and rural areas.

For example, in terms of the topics that are studied in the present Primary science curriculum, I found that some of them are either in part or in general foreign to the experiences of many rural Ethnic Fijian students. While the majority of children live in rural areas, the curriculum and emphasis of school has a predominantly urban orientation. A good example is a topic covered in class 5 called “Seashore Community”. In one of the classrooms that I observed, I found that when the teacher asked students some questions about the animals they expect to find along the seashore, there was very
little response from the students because most of them were not familiar with this community. For example:

T: Class, our topic today is to look at the seashore community. Can anybody tell me what seashore is?

S1: Sea?

T: Sea? Any other answers?

S2: Place near the sea?

T: Okay, seashore is the area near the sea. Today, we are going to talk about the organisms which live in the area near the sea. Can you tell me some of the animals you expect to see on the seashore?

[No response from the class]. Teacher continued. Okay, how many of you have ever been to the sea? [Only 3 out of 18 children raised their hands]. Can you give me some of the animals you expect to find on the seashore?

S2: Crab?

T: Good, any other animals?

[No response from the class]

(Classroom Teaching Observation: Amena, male Ethnic Fijian teacher teaching classes 5 & 6, Naitoa, 2001.)

It seems that the seashore community looks foreign to most of the students. Some of them have not even seen the sea. They have not come across this community in their life since they are brought up in a different environment and that is why there was no response from the students.

This showed that the science curriculum used speaks to examples and variety of experiences that are more familiar on average to one ethnic group than to the other. It will not favour the majority of Ethnic Fijian students since the majority stay in rural areas far from the sea as compared to Indo-Fijian students who mostly study in urban schools or urban centres which are mostly located near coastal areas.

Some may argue that rural schools can always pay a field trip for students to go and visit the seashore to know more about it. However, not all rural schools can afford to pay for a school field trip to the seashore. In addition, there is always the problem of access to roads in some of the remote schools in Fiji.

The lack of flexibility in the national curriculum means that teachers have little scope or freedom to localise content. There needs to be more built-in flexibility of the curriculum to allow for local input by teachers who are usually in the best position to modify the curriculum content to meet the specific needs and interests of their students.
For example, in studying such a topic, the curriculum should also include other optional Communities such as: "Forest Community" or "Grassland Community" or "River Community" etc. so that teachers can be flexible enough to teach the topic with which they think the students are most familiar. Rural students would have been more familiar with communities such as: ‘Forest community’, or ‘Grassland community’, or ‘River or Creek community’ and yet the curriculum includes only the ‘Seashore Community’ topic.

6.2.1.3. Mismatch between school curriculum and real life situation.

There appears to be little appreciation of rural life or indeed of traditional lifestyles and values in the curriculum. Although its content has been localised, it is still found to be removed from real life. It is seen by Ethnic Fijian students and dropouts as being irrelevant to their lives in the village. They did not see any link with the science they learn at school with their real life in the village community. As lamented by some Ethnic Fijian students:

... I do not see anything useful in what I learn about “flowers” at school to what I do in the village. ... For example in class 6 we are supposed to learn the different parts of the flowers. What is the purpose of learning parts of the flowers? In the village, we do not have to learn or memorise this parts in order to know its uses. Some traditional plants we use — for example to stop blood if you have a cut — are just shown to us and we know it? I just learn the traditional name of the tree from my Mum and I should able to get the right leaves. (Interview: Maku, male class 7 Ethnic Fijian student, Natoa, 2001.)

... To me, I found that not all the science topic we learn at school is useful to our life in the village. For example, topics like: matter, studying different types of rock, different type of clouds, studying the up-thrust force in liquids. I do not see any connection of these things to what we did in the village. (Interview: Vai, male class 8 Ethnic Fijian student, Loma, 2001.)

Even those who succeed Primary level and dropout at secondary level did not necessarily acquire a real understanding or leaving school feeling that learning science could be a life-long activity. As stated by one of the parent who dropout at secondary level:

... I saw very little connection between the things I learn in science at school with what is mostly done in the village situation. Probably because the science we learn during those days were not the same as what students learn today. I hardly see any of the dropout students in this village ever practised any commercial farming or other things they learn in science like agricultural science from school. They are probably not used to practising commercial farming because in the village, they do
not practise that. They may prefer to use only the traditional method of planting rather than commercial planting or cultivation because it is practically easier for them to do that. Furthermore, they may find that traditional ways help them to survive in the village or community by using local resources compared to commercial farming or cultivation where they have to use machineries which are very expensive for them to buy. (Interview: Maria, female Ethnic Fijian parent, Natoa, 2001.)

Another Ethnic Fijian parent who was also a dropout at secondary level said that what they learn in science at school teaches them to deny the value of their own cultural beliefs in favour of the school ways of viewing it.

Some of the topics we study at school are not supposed to be discussed at home. One good example is the topic which is widely debated today whether it should be included in the syllabus of lower Primary science level. That is - Sex Education. Now, in our Ethnic Fijian traditional custom, this topic is a taboo. We do not discuss it in the family. I know that during my days of schooling, this topic was used to be covered only above form 5 level but now, it has reached class 6 level and it might come down to lower primary level in the near future. Some of these things we learned at school are against our Ethnic Fijian custom and probably our children are not doing well in it because it is not discussed with them at home. (Interview: Joeli, male Ethnic Fijian parent, Loma, 2001).

A female Ethnic Fijian class 8 student elaborated on the above and said:

I think science is very important in our life. ... Science helps us to know how to protect the things around us apart from our own life. For example, it helps us not to become pregnant. ... We learn it a bit when we cover the topic “Nutrition and Our Bodies”. ... However, I find it uncomfortable and embarrassing when we discuss this at school because I know we do not discuss this at home or in the village. My Mum and Dad do not discuss this with us at home. (Interview: Sara, female class 8 Ethnic Fijian student, Dioka, 2001.)

This could be the reason why the majority of Ethnic Fijian dropouts when they left school did not even practice the art of science they learned at school in their own villages or community. The curriculum is seen by Ethnic Fijian students as being irrelevant to their lives in the village because it does not match some of their normal traditional work or practices they do in the village. As two Indo-Fijian teacher mentioned:

... I found that what Ethnic Fijian students learn at school does not go together with what they normally practice in the village. One example I would like to quote here, is the Navuso Agricultural School. [An Ethnic Fijian Agricultural school for boys]. When Mr Brown (a European) was the Principal of the school he made sure that Ethnic Fijians learn farming at school so that they can practice that in their own villages. After students study for 3 years, they are given 5 acres farm with a house and for one month groceries to start their life with. They were given the 5 acres farm to practise farming. They planted pineapples and Navuso Agricultural
School was supplying pineapples to all Coral Coasts Hotels. But now, those pineapple farms have turned into a jungle. Why? The curriculum no longer emphasised that system which work well for Ethnic Fijian students. The curriculum is now more academic rather than being vocational as before. (Interview: Chandra, male Indo-Fijian Head Teacher, teaching classes 3 & 4, Kristi, 2001.)

... It could be that they (Ethnic Fijian students) did not see any relevance of what they learn at school to their homes. Some topics or subjects which might be useful for the life of Ethnic Fijian children in their village are not examinable. They just study it but without any assessment done. For example, subject like Art & Craft, there is no assessment on this at school. Ethnic Fijian children are more artistic than Indo-Fijian children in their Art & Craft Work. Even picture drawings, skill writings etc. they are more gifted or they have more talents in it than the Indo-Fijian children. So the areas or subjects which most of them have their talent with are often neglected in the curriculum. (Interview: Ramesh, male Indo-Fijian teacher-parent teaching classes 5 & 6, Kristi, 2001.)

Another Ethnic Fijian parent elaborates on the same point and said:

... Some of the things Ethnic Fijians learn in science at school are relevant but I still feel that some part of it should be changed to suit the student’s real life in the village. This is probably another reason why our dropout Ethnic Fijian students do not practise what they learn from school at home because they do not see any connection. They cannot apply what they learn at school to enrich the existing village practices such as for example cooking, gardening, fishing etc. Some may still find the traditional ways easier to use because it is simple and does not need more money. A good example is the use of the shifting cultivation where “slash and burn” agriculture is practised. It does not involve more work and there is no need to buy fertilisers since crops will always remain healthy every year due to cultivation being shifted from one area for one year to the next area the following year. In this way, crops do not have any shortage of nutrients. As long as the fallow year is increased, soil nutrients will still be maintained. This sort of agricultural system works well because there is plenty of land available. So you see when students learn about the use of fertiliser at school, they do not practise that in the village because they use the fallow system to improve soil nutrients. Secondly, fertilisers cost a lot of money to buy. (Interview: Seta, male Ethnic Fijian parent, Loma, 2001.)

In fact, some of the knowledge that is marginalised in the curriculum is precisely what most Ethnic Fijian people would regard as basic to their social and cultural well-being. Some examples of subjects having this knowledge are: gardening, music, art & craft, local languages & literature, sports, religious and moral instructions. Although much Ethnic Fijian talent and interests exist in many of these fields, there is a general unwillingness to pursue them because in the hierarchy of school-based knowledge, they have a lower status. These subjects are not examinable and not considered worthy of classroom focus. In the curriculum, they are taken only from primary level but are often marginalised at higher school level. With the exception of local language and literature,
the rest of the above mentioned subjects are not examinable at primary, secondary and tertiary levels.

On the other hand, it seems that there is a match between what is learned at school to what Indo-Fijian students faced in their real life situation. As two Indo-Fijian teachers indicated:

... Most of the subjects taught at school like Maths, Economics, Accounting & part of Science seemed to match perfectly with what the Indo-Fijian students faced in their real life situation. For example, Indo-Fijians are well known for business in the country. We monopolised the business in the country and most of the subjects taught at school like the ones I mentioned above help us in this area. Our business runs well because most of the things we learn at school are used or applied in our real life situation. (Interview: Sanjay, male Indo-Fijian Assistant Head teacher teaching class 6, Dioka, 2001.)

... Take for example the Indo-Fijian community around this school; most of them are vegetable farmers and they cultivate their land for the whole year to earn their living. After ploughing their land, they may plant water melon, cucumber and cabbage. After harvesting, they plant it with beans and peanuts since these legumes return nutrients such as nitrogen into the soil. Now, students learn this at school especially in terms of how to maintain soil nutrients by crop rotation. So Indo-Fijian students easily apply what they learn at school in their home garden because these practices have already being done in their farm by their parents. What they learn at school is also practised at home whereas for Ethnic Fijians, these practices of crop rotation are hardly carried out in their villages because their traditional practice of farming is different from crop rotation which students learn at school. For them, instead of rotating crops, they shift from one land to another because they have more land but they plant the same crop throughout the year. (Interview: Ramesh, male Indo-Fijian teacher-parent teaching classes 5 & 6, Kristi, 2001.)

Some of the topics which students learn at school match well with what the Indo-Fijian community do in their homes. For instance, during my observation at one of the intensively studied schools (Dioka Primary School) a teacher was covering the topic “Separating Mixtures by Spinning and Decanting”. He asked students to mention some of the ways in which they can apply this at home. Students were very fast to mention that decantation is used at home while preparing dhal or rice to be cooked. Others mentioned that spinning is used in their dairy farm to separate milk from cream. For example:

T: Okay class, today we are going to study how to separate mixtures. Separate what?
All: Mixtures.
T: We are going to study two methods of separation called “Spinning and Decantation”. You can separate mixtures by using these processes. Decantation is
used to separate light substance from heavier ones especially if the mixture is in liquid form. The lighter substance will be on top and can be poured off leaving the lighter ones at the bottom. Spinning a mixture can also separate it from one another. Now, can you tell me some of the ways in which we can use the process of decantation at home?

[Students all calling out different answers].

Rhadika: Separating rice from light dirt?
Ashika: Separating dhal mixed with dirt?
Swastika: Separating cream from milk?

T: Okay! Okay! One by one. Yes Rhadika, can you explain how you can do that at home?

Rhadika: When we wash rice with water, the dirt will float on top and rice will be at the bottom. So we just have to pour out the dirty water on top leaving rice at the bottom.

T: Very good. Ashika?

Ashika: Same thing we do to wash dhal.

T: Okay. Now what about spinning? Can you tell me how this is applied at home?

Shusil: Washing machine?

T: Very good! Any other ways in which this method can be used at home?

Swastika: Milk separator. To separate milk from cream.

T: Very good, do you use that at home?

Swastika: Yes, in our dairy farm.

(Classroom Teaching Observation 08/06/01: Kamal, male Indo-Fijian teacher teaching class 8, Dioka.)

These are some of the things Indo-Fijian students really faced in their real life situation. Dahl and rice is the common food for Indo-Fijians. In addition, majority of dairy farmers in Fiji are Indo-Fijians. No wonder they are quick to respond to the teacher’s question because they experienced what they learn at school with what they did at home or in their real life situation. On the other hand, it would be a different situation if the same question is asked to rural Ethnic Fijian students since they eat mainly root crops rather than rice or dhal. In addition, they would not know anything about the process of separating cream from milk since they have not experienced that in their life. The majority of rural Ethnic Fijians are subsistence farmers rather than dairy farmers.

Certainly if the curriculum has a predominantly urban or ethnic orientation like a few examples which I found, then it will have some profound effect on the academic performance of rural and urban children and towards the different academic performance of Ethnic Fijian and Indo-Fijian students at school. More attention needs to be given to
the teaching of the science that will contribute to the full development of the student's personality. This includes developing in students an awareness of how the thing they learn in science at school can individually and collectively contribute to the development of their local communities and to the nation as a whole. It should also provide them with the knowledge and skills required to enable them to practice what they learn from school in their own environment or life situation. Delivering science concepts processes and tasks which are quite often foreign to students in non-Western settings will not be meaningful to the students. Students find it difficult to believe things that do not make sense to them. What they learn and do in science should be meaningful and have some relevance to their everyday lives.

6.2.2. Teacher’s Qualification Levels and Years of Teaching Experience

Students’ performance in science can be affected by the teachers’ qualification levels and years of teaching experience. Teachers who are more qualified and have many years of teaching experiences in fact are more confident, creative and more flexible in their teaching of the subject. This of course helps to create students’ interests in the subject and thus their performance in it.

For the four schools intensively studied, I found that the majority of teachers in the Indo-Fijian schools intensively studied have much higher qualification levels and in general have more years of teaching experience than teachers in the intensively studied Ethnic Fijian schools. This is illustrated in Table 21.

Table 21. Number and % of Ethnic Teachers with Qualifications and Years of Teaching Experience for the Intensively Studied Schools

<table>
<thead>
<tr>
<th>Qualification</th>
<th>Ethnic Fijian School</th>
<th>Indo-Fijian School</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Natoa</td>
<td>Loma</td>
</tr>
<tr>
<td>No.</td>
<td>%</td>
<td>No.</td>
</tr>
<tr>
<td>Diploma and higher</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Teaching Certificate</td>
<td>4</td>
<td>100</td>
</tr>
<tr>
<td>Teaching Experience</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; 15 years</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>10 - 15 years</td>
<td>1</td>
<td>25</td>
</tr>
<tr>
<td>5 - 9 years</td>
<td>2</td>
<td>50</td>
</tr>
<tr>
<td>&lt; 5 years</td>
<td>1</td>
<td>25</td>
</tr>
</tbody>
</table>
In terms of teachers having more than 15 years of teaching experience, there is none at Natoa and only about 37.5% at Loma whereas the percentage is much more for the two Indo-Fijian schools — about 75% for Kristi and 50% for Dioka. Schools of the two ethnicities have a comparable number of teachers between 5 to 9 and 10 to 15 years of teaching experience while there is a significant difference in terms of the number of teachers with less than 5 years of teaching experience for the two ethnic schools with a larger percentage found at both Ethnic Fijian schools (Natoa = 25%, Loma = 25%) as compared to the two Indo-Fijian schools (Kristi = 0%, Dioka = 12.5%).

The minimum qualification for teachers to teach in any Primary schools in Fiji is a Teaching Certificate which is gained after successfully completing a two-year course at the Teacher’s College. From the above table, it can be seen that all the teachers of both Ethnic schools have teaching Certificates which shows that they are all trained teachers. However, the table shows that none of the teachers of both Ethnic Fijian schools of Natoa and Loma ever gain Diploma or higher qualification where as both Indo-Fijian schools have certain percentage of teachers having Diploma and Higher qualifications — (Kristi = 50 % and Dioka = 25 %). This shows that the two Indo-Fijian schools studied have higher qualified teachers than the two Ethnic Fijian schools.

To find out whether what I found in my four intensively studied schools about ethnic teachers’ qualifications is also the case for Ethnic Fijian and Indo-Fijian Primary schools around the country, I gathered data derived from the Ministry of Education Annual Report for the year 2001. This is shown in Table 22.
<table>
<thead>
<tr>
<th>QUALIFICATION</th>
<th>TOTAL</th>
<th>GRAND TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fijian</td>
<td>Indian</td>
</tr>
<tr>
<td>GRADUATES</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trained</td>
<td>50</td>
<td>43</td>
</tr>
<tr>
<td>Untrained</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>DIPLOMATS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trained</td>
<td>68</td>
<td>214</td>
</tr>
<tr>
<td>Untrained</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>COMPLETED FORM 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trained</td>
<td>636</td>
<td>796</td>
</tr>
<tr>
<td>Untrained</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>COMPLETED FORM 6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trained</td>
<td>979</td>
<td>458</td>
</tr>
<tr>
<td>Untrained</td>
<td>28</td>
<td>15</td>
</tr>
<tr>
<td>COMPLETED FORM 5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trained</td>
<td>671</td>
<td>452</td>
</tr>
<tr>
<td>Untrained</td>
<td>8</td>
<td>16</td>
</tr>
<tr>
<td>COMPLETED FORM 4 &amp; LOWER</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trained</td>
<td>312</td>
<td>148</td>
</tr>
<tr>
<td>Untrained</td>
<td>9</td>
<td>32</td>
</tr>
<tr>
<td>TOTAL</td>
<td>2770</td>
<td>2186</td>
</tr>
<tr>
<td>GRAND TOTAL</td>
<td>5111</td>
<td>5111</td>
</tr>
</tbody>
</table>

*Note.* Data from “Ministry of Education Annual Report”, 2001. A dash in the table means data was not available from this source.

National Figures obtained from the Ministry of Education (Table 22) showed that there seems to be more qualified Indo-Fijian Primary teachers as compared to Ethnic Fijian Primary teachers. The majority of Ethnic Fijian teachers who teach at primary levels are the ones having passed Form 6 and lower examinations whereas for the Indo-Fijians, most of them have qualifications at Form 7 or higher levels.

Surely, this could be one of the reasons for the poor performance of Ethnic Fijian students in science at school as compared to their Indo-Fijian students’ counterparts.
The fact that most Ethnic Fijian teachers are not well qualified means that they will not have the confidence and creativity in teaching the subject effectively to their students. This in effect can cause students to lose their interests in the subject which may lead to their poor performance in it.

Primary teachers have no choice but to teach all the subjects at Primary level — even if the subject is not their field. Some teachers feel that teachers at Primary levels should only teach subjects according to their field of study like what is done at secondary level. Those who are in the science field should only teach science subjects and those who are in the social science or arts field should only teach social science or arts subjects etc.

One of the Indo-Fijian teachers did not like the present procedure of teaching all the subjects at Primary level and suggested the following:

... I feel that this present system of teaching all the subjects should change. Teachers should be more confident in their area or subject they teach. They should have a much broader knowledge of the area they teach in order for them to have their confidence in their teaching. It is better if trainee teachers are selected according to their best subject fields and that they should concentrate their teaching only in their best subject areas like teaching at secondary level. In this way, teachers will not be forced to teach in subject areas they are not good at or are not interested in. (Interview: Kamal, male Indo-Fijian teacher teaching class 8, Dioka, 2001.)

Another teacher elaborated on the same issue and said:

There is a need for teachers to teach in their own subject areas only. I think this present system will have some effect on the teaching of the subject especially at the primary level because at secondary level, you teach only in your subject area or field rather than teaching all the subjects. Some of my fellow primary teachers even told me that sometimes they will just use their science period in doing other subjects because they do not have very good background in the subject. (Interview: Vili, male Ethnic Fijian Head teacher teaching class 6, Loma, 2001.)

One Indo-Fijian teacher mentioned that Indo-Fijian students are doing well in science because they are often taught by teachers who have very good background in science. So a pool of good science teacher background will give rise to a pool of good science achievers and when these good science achievers are trained as teachers, the prosperous cycle will continue.

... Now because there are more qualified Indo-Fijian teachers than their Ethnic Fijian counterparts; the result is that there will always be more qualified Indo-Fijian students who go to Teacher’s College after high school. When they graduated from Teacher’s College, they go back and teach in their respective
schools, i.e. Indo-Fijian teachers mostly at their Indo-Fijian schools and likewise Ethnic Fijian teachers at their Ethnic Fijian schools. So there will always be more Indo-Fijian teachers who are good in science as compared to Ethnic Fijian teachers who graduate from Teacher's College. So if the distribution of teachers is like what I have already stated earlier (Indo-Fijian teachers to Indo-Fijian schools and Ethnic Fijian teachers to Ethnic Fijian schools) then you should able to see why Ethnic Fijian children's performance in science are not as good as Indo-Fijian students at Indo-Fijian schools. If Ethnic Fijian teachers do not have a very good background in science, how can you expect them to teach the subject well to their students at their various schools? They will just teach the subject as if it is just there in the school syllabus to be taught. It will not be taught in a way to create any interests or understanding for the students. (Interview: Kamal, male Indo-Fijian teacher teaching class 8, Dioka, 2001.)

Surely, this situation of having less qualified or experienced teachers with good background in science at Ethnic Fijian Primary schools as compared to Indo-Fijian schools will have some effect on the differential performance of the two ethnic groups of students in science at school.

6.2.3. Attitude Towards Science

During my interview with students and teachers of both ethnic groups, I wanted to find out whether or not there is a general tendency of the two ethnic groups to like science in the first place. The number of teachers and students interviewed who like and do not like sciences are given in Tables 23 and 24 respectively.

6.2.3.1. Teachers' interests in science.

<table>
<thead>
<tr>
<th>Table 23. Number and Percentage of teachers interviewed who like or do not like science</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loma (Large Ethnic Fijian School)</td>
</tr>
<tr>
<td>Like</td>
</tr>
<tr>
<td>Teachers</td>
</tr>
<tr>
<td>Total</td>
</tr>
<tr>
<td>Interviewed</td>
</tr>
</tbody>
</table>

Data from this table showed that for both Ethnic Fijian schools, the majority of their Ethnic Fijian teachers interviewed (75% Loma and 75% Natoa) did not like or have
no interests in science in the first place as compared to the Indo-Fijian teachers of the two Indo-Fijian schools who in most cases like or have their interests in science (75% of Kristi teachers and 75% of Dioka teachers).

Most of these Ethnic Fijian teachers instead had their interests in other subjects like Mathematics, or English rather than in Science. Some of them explained their reasons for not liking science and said:

I do not have much interest in science as compared to Mathematics. ... I think, during the time I attend school, we did not have time to take science. I did not like the way science was taught to us. For me, it was boring because most of the time, the teacher just explains things and we just listen to his explanation as if he is telling a story to us. There was very little experiment done because rural schools in small islands like where I was brought up do not have materials to help in the teaching of science. Even if some experiments were done, it is always demonstrated by the teacher and we will sit down and watch. This is why I did not have any interest in Science as compared to Mathematics. I tend to lose my interest in science. (Interview: Taniela, male Ethnic Fijian Head teacher, teaching classes 7 & 8, Natoa, 2001.)

... I like language subjects better than science because I always score good marks in English and Fijian as compared to Science at both primary and secondary level. I did not take science at Forms 5, 6 and 7 levels because of this reason. ... When I went to Teacher's College, I did not have a very good background in Science. However, I could not avoid teaching science because at Primary level, teachers are expected to take all the subjects rather than concentrating on only one subject like at Secondary level. (Interview: Vili, male Ethnic Fijian Head teacher, teaching class 6, Loma, 2001.)

... I do not have any interests in science. It was always like that when I was a student at primary and secondary level. ... I guess the way teachers teach the subject during those days was the main reason I did not have the interests in the subject. The way they teach the subject makes it very difficult for me to understand it. They did not give us any chance to ask questions or to do activities by ourselves. They give us a lot of notes to copy from the board and most often they will tell us to memorise some of the terms given in the notes. So it does not create any interests for me. It is like trying to learn the things or the ideas they already have in mind without giving any chance for us to give our views or our own ideas. This kept my interests away from the subject. (Interview: Ema, female Ethnic Fijian teacher teaching classes 8, Loma, 2001.)

On the other hand, the majority of Indo-Fijian teachers interviewed mentioned that they like teaching science more than other subjects. For example:

My favourite subjects at teaching are Mathematics and Science as compared to other subjects. ... I have my interest in these two subjects because I used to score marks in Maths and Science from 90 to 100 during my Primary and Secondary school days. In fact when I sat for my Secondary Entrance Examination, I topped the District in Mathematics and Science. (Interview: Vijay, male Indo-Fijian Head teacher teaching class 5, Dioka, 2001.)
... I have my interests in science. ... While I was at Primary and later on when I went to Secondary school level, I found science more interesting than other subjects and I still have the same interest in it now. (Interview: Chandra, male Indo-Fijian Head teacher teaching classes 3 & 4, Kristi, 2001.)

I actually developed my interests in science during my Primary school days because I have a very good teacher who was able to create a lot of interests in us whenever he teaches these subjects. (Interview: Vijay, male Indo-Fijian Assistant Head teacher teaching class 6, Dioka, 2001.)

My favourite subject at Primary and Secondary level is science because I always like doing experiments, exploring and discovering new things. I also score very good marks in science but it is not only the marks which create my interests, it is what I do in science which really creates most of my interests in it. (Interview: Ravi, male Indo-Fijian teacher teaching classes 1 & 2, Kristi, 2001.)

It is evident from what both sets of ethnic teachers stated that their ability to like science depends very much on the development of their interests at lower class level which is influenced by various factors such as: the way teachers teach the subject; the marks they gain for the subject and their likes of doing experiments or discovering new things. In fact, it is hard to teach any subject including science if the interest is not there in the first place. Most people switch to Arts subjects at secondary level when they find that they do not have the interests in science. It is the interests which often drive most people along to continue to study the subject. As one Ethnic Fijian teacher mentioned:

I took science only at lower secondary level but quit it at higher secondary level because I no longer have the interests in it. I started taking Arts subject at form 6 level because my marks in Science were not as good as my marks in Arts subjects. Doing science without the interest in it is like trying to force somebody to eat the food he or she does not want to eat. (Interview: Mela, female Ethnic Fijian teacher teaching classes 3 & 4, Natoa, 2001.)

The above excerpts from teachers’ interviews point to the fact that a teacher’s level of interest in science is related to how well they scored in the subject themselves at school. This suggests that differential performance in science at school between the two ethnic groups can easily become self-perpetuating. While students may not need to have a teacher every year that is well qualified in science, interested in it and confident about presenting it, it is potentially a very bad thing for their development if they never or only rarely encounter such a teacher. If by a concerted effort to recruit science-strong Ethnic Fijian primary school teachers, the percentage of Ethnic Fijian primary school teachers were increased even just by a few per cent, the percentage of Ethnic Fijian children who at some time in their primary school years encountered a science-strong teacher would increase very much more. This potentially could break the cycle above-mentioned.
For the present situation in Fiji to be rectified, there is a need to look back at how Primary teachers trainees are recruited, and how, once trained, they are selected for work in schools. Ethnic Fijian schools especially need a pool of appropriately qualified teachers, to overcome the present shortage of teachers who are comfortable with science.

6.2.3.2. Students’ interests in science.

Students’ interests in science can also affect their performance in it. Table 24 shows the number and percentage of Ethnic students interviewed who like or dislike science in the first place.

Table 24. Number and Percentage of students interviewed who like or do not like science.

<table>
<thead>
<tr>
<th></th>
<th>Loma (Large Ethnic Fijian School)</th>
<th>Dioka (Large Indo-Fijian School)</th>
<th>Kristi (Small Indo-Fijian School)</th>
<th>Natoa (Small Ethnic Fijian School)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Like</td>
<td>No 1</td>
<td>3</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Dislike</td>
<td>3</td>
<td>25</td>
<td>100</td>
<td>75</td>
</tr>
<tr>
<td>Students %</td>
<td>25</td>
<td>75</td>
<td>100</td>
<td>75</td>
</tr>
<tr>
<td>Total Interviewed</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>

Like their Ethnic teachers, it seems that the majority of Ethnic Fijian students do not much like science (about 75% at Loma and 75% at Natoa) whereas for Indo-Fijian students, the majority very much like science (about 100% at Dioka and 50% at Kristi) as compared to other subjects they studied at school.

Students have their own reasons for liking and not liking science. For those who like science, their reasons are mainly based on scoring high marks and having their career aspiration in science. The following comments indicate this:

I like Mathematics and Science because they will help me to get my ambition. ... That is, I want to become a doctor. ... I like these subjects because I score good marks from them in my exams. This is why I like them and I love to do activities with these subjects at school. I like Maths too because if I get something to calculate I can do it easily. (Interview: Sara, female classes 8 Ethnic-Fijian student, Dioka, 2001.)

I like Elementary science the best. I heard people say that if you want to be a doctor, you have to take science, and that is why I want to take science because I
want to be a doctor. My interest is there. ... In my first term exam, I got the highest in Elementary Science. I scored 98 out of 100. ... I do not score very well in other subjects like Science. (Interview: Anita, female classes 6 Indo-Fijian student, Dioka, 2001.)

First of all, this is the subject I always score good marks at so that is why I like this subject. I score good marks in science because my interest is in it. ... I think if you have your interests in it, you will be more involved with it most of the time and also score good marks in it. (Interview: Ravina, female classes 6 Indo-Fijian student, Kristi, 2001.)

For those who do not like science much as compared to other subjects, their reasons were mainly based on the fact that they do not score good marks in it and because they think that it is hard to learn the subject by studying their notes. They have the notion that to do well in science, notes should be thoroughly memorised or studied unlike Language subjects such as English or Fijian or Hindi where studying notes is not required. As some of them mentioned:

... I do not like Basic Science much like English. ... I did not score well in Basic Science. I scored 54/100. ... I feel that that is not good enough and this is one reason why I did not have much interest in Basic Science. The other reason is that it is very hard for me to learn it. ... You know, it's not like learning English. In science, we are given notes, more notes and you have to study all your notes in order to pass very well in your tests. (Interview: Vai, male class 8 Ethnic-Fijian student, Loma, 2001.)

I always like Maths and English as compared to other subjects. Maths helps me to know how to count and this can also help me to know the change when I go shopping. ... I also like English. This is important because I want to be a teacher later on. When I am going to be a teacher, I am supposed to know how to speak English and if I go overseas, I should know the language. ... Science is difficult for me and I do not like it much because I did not gain good marks in it. I guess because I did not study my notes well because if we study the notes properly we can pass our exams. (Interview: Salvin, male class 7 Indo-Fijian student, Kristi, 2001.)

... My favourite subject at school is English. ... I like English because I score very good marks in it. ... Last term I scored 70/100 in English. ... I managed to do well in Fijian but I did not score good marks in Basic Science, and Maths. ... I tend to find these subjects difficult to learn as compared to English and Fijian. ... In these subjects, you know you have to study your notes well in order to pass whereas in English and Fijian, you do not have to study your notes because you can just be asked to write an essay or read a passage and try to answer questions from that passage, like that. In Basic Science, and subject like Maths, it's different. You have to try to learn some of the definitions and equations by heart. I mean, you have to learn your notes by heart. (Interview: Vatiseva, female class 8 Ethnic-Fijian student, Natoa, 2001.)

The notion of learning notes in order to pass examination which is the result of the exam-oriented system characteristics of the Fiji Education system has even reached the
minds of students because of its more emphasis by teachers in their classroom teaching practices. This of course has caused some students to lose their interests in science because some of them find it hard to memorise their notes especially when their mind is painted with the type of thinking that to pass exam, there is a need to memorise notes in order to regurgitate the correct answers during examination time. Again, this speaks to further disadvantage of the exam-oriented system as earlier discussed in section 6.2.1.1.

6.3. Direct Interaction between the Child and Parents at Home –
(a Microsystem)

One of the popular impressions among Ethnic Fijian parents is that learning at school proceeds purely by teachers and what students do at school. They measure the quality of science education for example by what can be done at school, and in particular by the school’s wherewithal to run experiments for the students. In fact, students’ learning and achievement in any subject including science at school is conditioned by various factors, not all of them concerned exclusively with the school.

Since there is not much difference found in terms of what is happening inside the classroom situation for both ethnic schools, apparently the differential achievement seems therefore to implicate what the child is directly involve with at home (home microsystem). One example of the setting which the child is directly involved with is the type of activities or task done by the students at home. This of course can affect the child’s development especially in the areas of learning at home. Another area is the child’s relationship with parents or members of the community in terms of the roles played by parents in caring about the child and the types of activities they involved themselves with and the child at home. Findings under this setting are first summarised and then discussed.
SUMMARY OF THE FINDINGS

Direct Interactions between the Child and Parents at Home – (a microsystem)

Students’ Activities and Expected Tasks

- Indo-Fijian children were not often given hard manual work tasks to do upon returning home from school and thus they had more time to do their school work as compared to Ethnic Fijian students who apart from doing extra outside activities at school were often further given significant, physically demanding activities to do at home, meaning that they did not have enough time or remaining energy to do their homework or study.

Parental Roles

- In most cases when Indo-Fijian children arrived home from school a parent was there to meet them. By contrast, many Ethnic Fijian children arrived home when both their parents were still involved in the communal activities so that they had neither the opportunity, nor it would seem the inclination to supervise their children in their after-school activities and school work.

- The Indo-Fijian parents who were at home when the children arrive home from school typically encouraged the children to do their school work. This practice was not followed by Ethnic Fijian parents because of their absence from home when their children arrived back from school.

- It seems that Ethnic Fijian parents because they were often committed to village necessities and obligations, allocated their parental tasks at home to be done by their children when they returned home from school. This was not the case with Indo-Fijian parents who in most cases only gave a few light tasks to be done by their children at home.
6.3.1. Children' Activities and Expected Tasks at Home

During my six month observation of the home life of the two ethnic groups, I found a few differences in terms of the types of activities done by the two ethnic children and what is expected of them by their parents when they arrived home from school. Whereas Indo-Fijian students are mostly given simple tasks at home, Ethnic Fijian children are often given and expected to do tougher tasks which are supposed to be mainly done by parents such as fetching firewood in the forest or bush, weeding in the garden, pulling root crops from the garden and preparing it for dinner for the whole family, washing family clothes and looking after the young at home. In addition, Indo-Fijian students are found to do their tasks only for a shorter while until they are told to have their bath and do their homework or studies, whereas Ethnic Fijian students may spend the whole afternoon in doing the expected activities they are told to do and thus have very little time to spend in doing their school work at home.

Since Ethnic Fijian parents do not often care much about being at home to supervise their children when they arrived home from school, Ethnic Fijian students are often attracted to wonder around aimlessly and doing other activities not related to schoolwork such as playing until very late in the afternoon that no or very little school work such as doing home work or studying is done. This is also evident from my interview with the two ethnic groups of students as mentioned in section 6.3.2 below.

There is no doubt that the differences in the amount of activities given to the two ethnic groups of students play an important part in their differential performance at school. A part from not doing extra outside work at school in the afternoon, Indo-Fijian children are also not given more hard work at home and thus have more time to do their school work compared to Ethnic Fijian students who already have extra activities at school and are given further tougher activities at home that they did not have enough time to do their school work.

6.3.2. Role of Parents

There are differences observed in terms of the role of parents for the two ethnic groups of people which may contribute to the differential achievement of their children at school. Differences are mainly found in terms of the supervision of children by parents at home when children arrived home from school, and the amount of time parents spared mainly for their children to do their school work at home.
As I have already described above, in most cases when Indo-Fijian students arrived home from school, at least one of the parents or elders is always at home to prepare some tea for the children, give their children certain amount of time to do some light activities or play before they allow them more time to do their school work at home. Very important is the fact that their children are supervised whenever they do these activities at home. My observation is supported by what most Indo-Fijian parents said. For example:

... When our child arrives home, she will leave her books, change her clothes, and then her mother prepares her tea. That is a must and is normal everyday. We have a farm also. She might be pulling out grasses from the vegetable plots after her tea or she may prefer to stay with her mother at home. She will tell the mother that she got this homework etc. and the mother will give some time for her to do the homework. The mother will sit there with her and try to help her with her homework if she can. This might take 1 hour. Then she will have her bath, then dinner, and then she will get down with her books again for some time. That is normal everyday. Apart from that we will make sure that after dinner she does some study before she goes to sleep. Sometimes she will bring things to me or to her mother and sometimes she will also bring things up to her grandfather for questioning. (Interview: Ramesh, male Indo-Fijian parent, Kristi, 2001.)

...It is a normal practice for me to be always home to see my children returning from school in the afternoon. They know what they are supposed to do when they return because this is what they do all the time. The first thing they do is to change into their normal clothes and tea will be readily prepared for them by their mother. Then they will rest for a while and we give them time to do their home work before they have their bath in the afternoon and have our dinner. After dinner, if they want to continue with their study then we allow them time for that. The other thing I want to mention is that we are always there with them when they do their work. (Interview: Pushpa, female Indo-Fijian parent, Dioka, 2001.)

... My children know that whenever they come home, food is always prepared for them. What they normally do is put their bags in their rooms and change. They would then have their tea before they have some little work to do like helping me in washing the pot or dishes. If the dishes are already washed then I will give them some time to play around the house. But this does not take long. I would then call them to have their bath. While they wait for their dinner, they do their homework in their rooms. If they do not complete their home work, then there is always time after dinner for that. (Interview: Mohini, female Indo-Fijian parent, Kristi, 2001.)

One Indo-Fijian teacher recalled what his sons used to do when they returned home in the afternoon during their days of attending Primary school and said:

... I have four sons. After school, my children used to come with me and go home on foot and when they reached home, my wife always had some food prepared for us. She normally does this everyday when we return home. After we have tea or bread, I will take them to our vegetable farm. There are two schools beside our home and we are the immediate neighbour of those High schools and there are two
big grounds or playing fields. My children would say, "Daddy we would like to go and play soccer there". I said to them, "look children, you will have your whole life for playing soccer, you help me in the farm, for a while, you study at home, and a time will come when you will go to play". My children were very fast to say that other children are also playing. I told them, not to worry about them. Those children who were playing in the ground today have become road kids, heavy grogger, heavy crooks and they are also smoking marijuana. I have seen that and now I tell my children, "look what have you got and what have those children got now". My four sons all passed their primary and secondary examinations well. They all entered the University and are now all working with two as a teacher like me, one lawyer and one as a computer technician. (Interview: Chandra, male Indo-Fijian Head teacher teaching classes 3 & 4, Kristi, 2001.)

Another Indo-Fijian parent mentioned similar things and further elaborated on the importance of emphasising to their children to study hard and to use their time effectively in their school work in order to pass the examination and gain a job later.

... Actually when my children arrive home after school, one of us must be at home to meet them. We allow them to have some time for refreshment and eating and also some time for playing around our compound. But in the afternoon after dinner time, we sit down together with our two sons and we talk about their day’s work at school. We always emphasised to them to study and use their time well at home. Before they went to secondary school, we always advised them at the beginning from Primary level that it is important that they work hard to earn good results in their Fiji Eighth Year Examination so that they can do well at secondary level. They finally passed very well at class 8 level and attended secondary school but our advice was never absent. We kept on reminding them to work hard and try to pass their External examinations ahead of them. Whenever they return home, we always have talks with them emphasising the importance of working hard to achieve better results and gain a job later. They passed their primary examinations and were able to successfully complete their years at secondary school and both of them got through their Form 7 Examination and both are now at the University. (Interview: Harjit, male Indo-Fijian parent, Dioka, 2001.)

In fact it’s these Indo-Fijian parents’ supervision, advice, and motivation that have paid off for their children for all of them succeed in their various examinations at Primary and higher school level while some of them now hold very good jobs.

The practice of Indo-Fijian parents being at home to prepare tea and help to supervise their children in their task and school work is also mentioned by most Indo-Fijian students when I asked them to describe the things they do at home when they return home from school. Comments such as the following lend support to this:

When I reach home, the first thing is that my Mum always gives me a kiss. She will then prepare some tea for me. After that, she will then ask me for the things I did at school and whether or not school is good. She will then give me some tea. After that she will give me some simple work to do like collecting grass from the lawn mown or pull weeds from our flower beds. After that, she will then tell me to
go and have my bath and do my study. I will have my study from 6 pm to 7 pm in my room. After that, we will have our dinner, and I will have some rest. If I am not tired, I will do some more study and would go to sleep at 9 pm. (Interview: Ravina, female class 6 Indo-Fijian student, Kristi, 2001.)

When I arrive home, I wash my legs then go inside, put my bag on the shelf where I usually put it, change my clothes and have my tea. ... My mother always prepares tea for me. ... I will then help my mother with some kitchen work, before I have my bath, and take my bag and books with me to my desk and revise what I did at school. ... I will do some revision and then if there is some homework I will do the homework. ... Sometimes my mother will help me with my home work if she knows the answer. After that, we will have our dinner and I may, watch TV news or continue with my home work if it is not complete and I will go to bed after that. (Interview: Anita, female class 6 Indo-Fijian student, Dioka, 2001.)

... After school, when I return home, I will change my clothes, and have some food. I might play around for a while with my brother or sister for about 10 to 15 minutes before my Mum will call us to go and have our bath. She will then tell me to do some homework for a while. This might take 1 hour before dinner. After dinner, if I have not finished my homework, I will complete it before I go to bed. ... My mum and Dad always encourage and tell me to do my homework and study. (Interview: Salvin, male class 7 Indo-Fijian student, Kristi, 2001.)

... I mostly arrive home at 3:10 pm. The first thing, I will do is to take off my shoes and put it in a box and take my bag and put it in my room. After that I will have some tea and biscuit before my mother will tell me to go out and play with by brother for a while. Sometimes she may ask me to clean the pot before I have my bath and do my home work or study before dinner. After dinner, I will rest for a while before I continue doing my home work or study. Most time I will go to bed at 9:00 pm. (Interview: Mahend, male class 4 Indo-Fijian student Dioka, 2001.)

However, most of what Indo-Fijian parents do is not observed to be the case for Ethnic Fijian parents. Firstly, Ethnic Fijian Parents are rarely present at home to meet their children when they arrived home from school. Tea or food is not always prepared for the children and they are more involved with other traditional village activities that they neglect the important task of being with the children and motivate them with their school work at home. As a result, Ethnic Fijian children are often left unsupervised and left to do whatever activities they do like playing or roaming around and not using their spare time effectively in doing extra school work at home. It is because of Ethnic Fijian parents’ involvement with other communal village activities that they mostly allocate the tasks which are supposed to be done by them to their children when they arrived home from school. These parental activities include pulling root crops from the garden and cooking it for dinner, fetching fire wood from the forest or bush and in some cases wash the whole family clothes. As a result, there is always less opportunity for their children
to do their school work at home because of their involvement in these extra parental activities again at home apart from the extra activities they already done at school.

My interview with Ethnic Fijian students to find out the type of activities they do at home after school further support my observation. As some Ethnic Fijian students mentioned:

... After school, when I arrive home and if my parents are not there, I will change my clothes and go out to the playground to play touch rugby. ... Sometimes we play from 4:00 pm to 5:00 pm or 5:30 pm if it is not dark before we have our bath in the creek and return home. But if they are at home, they will give me some work like washing the dishes, pull some cassava from the garden for our dinner, fetch water for our toilet, weeding our cassava patch or go out and fetch some firewood. Sometimes when they know that they are going to be late in the afternoon from the garden or go to some function, they will tell me in the morning to do the cooking when I returned home from school. (Interview: Solo, male class 5 Ethnic Fijian student, Natoa, 2001.)

When I further asked the same child whether he has a schedule time to do his study at home, and whether his parents emphasised or encourage him to study at home, he said:

... No, I do not have a schedule time. Only sometimes I do my study or homework if I have some work given at school. Sometimes I do my home work too if my parents are at home because they might be angry if I play and do not do my homework. (Interview: Solo, male class 5 Ethnic Fijian student, Natoa, 2001.)

Other Ethnic Fijian students mentioned similar things and said:

After school, when I arrive home, I have to cook our dinner because you know sometimes my father is late from the garden or my mother may be doing some other things. Sometimes, she may ask me to wash our clothes or bath my small sister and look after the rest of my small brothers while she is not at home. (Interview: Fulori, female class 7 Ethnic Fijian student, Loma, 2001.)

... I have to hurry home when we break off from school because I have to do some work like cutting firewood or pulling cassava from the garden. My father is not always at home when I return home from school. ... He knows that I have to do this work in the afternoon to help my mother if he is not present because I am the eldest. (Interview: Vai, male class 8 Ethnic Fijian student, Loma, 2001.)

During my interview with my father, he elaborated similar things to what I found with the two Ethnic Fijian communities and said:

... One thing I want to mention is that parents still do not consider their being at home when students arrived from school in the afternoon to be very important. This is very important because the kids need some tea or food when they returned because they are often very tired. Children also need to be supervised on what to do at home. They should not be released to roam around aimlessly after school. This is what is going to happen if parents are not at home after school. Children
will just throw their bags on the door way and disappear or go out and play or swim. They should be supervised at play and they should also be given some time to rest. Very important is the fact that they should also be supervised in their study or when they do their homework at home. Parents should try to find out from the child what he or she learned at school that day and whether or not he or she found any problem or difficulties with what he or she learned at school. These are all the things which should be done by parents when their children arrived home from school. Indo-Fijian students are doing well at school because their parents are doing all these things to their children when they return home from school. We always did the same thing too with all of you when you were attending this primary school. This is what most parents in the village still do not realised or practised. (Interview: my father, Natoa, 2001.)

My mother emphasised the importance of giving less task to students at home and said:

... Most parents in the village tend to allocate more tasks to their children at home after school. They should realise that these children also do extra outside work for one hour at school in the afternoon so children should not be given more task again at home when they returned home. This is very important because the child also needs some time to rest. You might have observed this during your stay here that some of the things supposed to be done by parents are done by their children like fetching firewood, pulling root crops from the garden and weeding in their plantation in the afternoon or washing clothes. It is no wonder that you hardly see them doing their studies in the afternoon. They are mostly tired and will fall asleep as soon as they have their dinner without even bothering to do their homework or study. (Interview: my mother, Natoa, 2001.)

One Indo-Fijian teacher saw the differences between parents of the two respective ethnicities and commented:

... Ethnic Fijian Parents are not involved in their children's education. Even in the Ethnic Fijian villages, you will hardly see parents sitting down with their children for at least an hour helping out with the homework or asking the child to read a story from the book etc. Now for the Indo-Fijian parents, you will see that the mother is going to take up some time with the children definitely. (Interview: Ramesh, male Indo-Fijian teacher-parent teaching classes 5 & 6, Kristi, 2001.)

Another Indo-Fijian teacher-parent saw how strict Indo-Fijian parents are with their children's schoolwork and commented:

... I think, what actually happens with Indo-Fijian families is that the father or the elders are a bit strict with their children. I did not see this with Ethnic Fijian parents. They are not strict and do not care much about their children's school work. When Indo-Fijian families send their children to school, they mean business. I have experienced in most Indo-Fijian families that whenever the children returned home, parents check their children's books. It has happened with me at one time when I was at an Indo-Fijian school where I over-looked a spelling. Some spelling errors were there and the parents came to the Head teacher and he
threw the book on his table and he told him that this is what the teacher has been
doing at school. That shows how much Indo-Fijian parents care about their
children’s work at school. The parents are really concerned about their child’s work.
(Interview: Ravi, male Indo-Fijian teacher-parent teaching classes 1 & 2, Kristi,
2001.)

An Indo-Fijian teacher mentioned how Ethnic Fijian students used up their time in
the afternoon in sports and other activities and blamed Ethnic Fijian parents for it.

... One main difference I found is that Ethnic Fijian students do not use their time
properly at home to do their school work. They are more involved in playing and
doing other social activities than using up this time to do their school work. As
soon as they break off from school, you will see them playing and they do not
bother to go straight home from school. Some of them might arrive home late in
the afternoon. They do these things because of the negligence of parents on their
roles or part at home. (Interview: Kamal, male Indo-Fijian teacher teaching class 8,
Dioka, 2001.)

The same Indo-Fijian teacher re-iterated the above remarks about the slackness of
Ethnic Fijian parents in their role of looking after their children and continued:

... The other thing is that when they are late like this, parents do not even bother to
ask them where they have been. Now, for us Indo-Fijians, you hardly see this
amongst our children. As soon as the school ends in the afternoon, students will go
straight home and parents are always very keen to see that their children arrives
home in time they expected them to arrive. They are very strict in releasing their
children to go out and play in their neighbourhood. So children mainly stay at their
various homes and more time is given for the children to do their school work at
home. So it is the effective use of spare time in doing school work and the lack of
parental care which is lacking amongst the Ethnic Fijians as compared to Indo-
Fijians. That is how I see it. If only the attitude of all Ethnic Fijian parents is like
that of Indo-Fijian parents, then Ethnic Fijian student’s performance at school will
be just like any other Indo-Fijian student’s performance or even better. (Interview:
Kamal, male Indo-Fijian teacher teaching class 8, Dioka, 2001.)

Some Ethnic Fijian parents even think that schooling ends when the child return
home from school and will begin again the next morning when the child goes to school.
Their role as parents in doing their teaching at home is seen as having no connection
with the development of what the children learn at school and they seemed to think that
since schooling is done at school, it is the responsibility of the teacher and not the
parents if students fail at school.

... When children go to school in the morning, school begins there and it ends in
the afternoon when they return home. The teacher teaches them at school about
their school subjects or school work. The school teacher is responsible for that so
if students fail at school, parents should not be blamed for that because we do not
teach them at school. (Interview: Saula, male Ethnic Fijian parent, Loma, 2001.)
I think of schooling as what is done at school. What is done at home is different from what is done at school and that is why I think schooling only deals with what the children learn at school. It is what the teachers teach the children at school that they are being tested for. Some people tend to blame us for the weaknesses of our children at school. Why should they blame us when we only teach them the things they learn at home? (Interview: Vani, female Ethnic Fijian parent, Loma, 2001.)

... Schooling is something which is new to us. It is the teaching of children at school rather than at home. Our system involves the teaching of children at home whereas the new system of schooling involves the classroom teaching by teachers at school. It starts in the morning when the child goes to school and ends in the afternoon when they finish off from school. So the teacher is responsible for the teaching at school, not us. (Interview: Josese, male Ethnic Fijian parent, Natoa, 2001.)

This is probably why most Ethnic Fijian parents do not care much about their role of being at home to supervise and encourage their children in the effective use of their time in doing their school work when their children arrive home from school in the afternoon. Parents who think in this direction do not actually visualise the importance of the relationship between these two micro-systems of the home and the school in the development of the children’s learning at school. They treat these two settings as a disconnected entity and assume that the development of a child’s learning at school should only be involved with what is done at school — separated from what is supposed to be done at home in terms of the roles they play.

Some members of the Indo-Fijian community of the two schools studied gave their views and mentioned:

... It is their communal system of living together which is affecting them. They cannot move forward if they continue to live together like that. They cannot be at home in time to see what their children do because they are so involved with a lot of communal activities. (Interview: Ramesh, male Indo-Fijian parent teacher, Kristi, 2001.)

... I think for us, it is easy because we do not have anything to stop us from our work. We do not listen to somebody else’s authority like the chief in the village. We do whatever we want to do independently. Our role of looking after the children is not affected by the work we do everyday. ... Their communal system of relying on each other will not help them to live independently for they will always have the feeling that somebody should always be around to help them. Once this help is not there, they cannot support themselves. (Interview: Pushpa, female Indo-Fijian parent, Dioka, 2001.)

It seems that the politics of Ethnic Fijian communal village life where authoritative type of leadership is mainly emphasised and practised tend to affect both the Ethnic Fijian parental roles in caring about their children and their desire to live independently as compared to the independent life of Indo-Fijians. Ethnic Fijians’ communal system
tends to prevent parents from being at home in time to meet their children to find out from them about what they learn at school and to supervise them in their extra school work and other activities they do at home. In addition, the involvement of Ethnic Fijians with a lot of communal activities and obligations in the village has enabled them to divert some of their parental tasks to their children in the afternoon that very little time is spared by their children to do their school work at home. Furthermore, the type of thinking by some Ethnic Fijian parents that schooling is separate from the home — that what is supposed to be done by children at home is not related to the development of what the children learns at school may also be the cause of their no care attitude about being with their children at home when they returned home from school.

Children in fact obey whatever their parents say or emphasise. If parents do not emphasise study at home as part of their role, then children will not bother to do their study after school. If parents do not care much about being at home to meet their children and ask them about their school work when they return from school, then the children will in the same way not bother about their school work. Since they are still young, they need some supervision, guidance and encouragement at home so that they can use their time effectively in doing their school work. This can change their attitude in their school work and help them to work hard. As one Indo-Fijian Assistant Head teacher stated:

... Even if parents are not well educated, their advice and encouragement everyday is very important and it can change the attitude of students to work hard and achieve better at school. As the saying goes: “if you want to build a strong house, you have to build a strong base”. So you have to set the base strongly or you have to begin with your advice, motivation and encouragement right from the early stage of your children's learning. Set them right at the beginning then they will continue to follow this in their stages of development or in their different levels of education as they move along from one level to the next. (Interview: Sanjay, male Assistant Head teacher teaching class 6, Dioka, 2001.)

It is clear that the above fact could explain the differential academic achievement of the two different ethnic groups in science at school. Indo-Fijian students probably do well at school due to the much available time their parents are available at home to supervise, and guide them in the type of activities they do and giving them more time to do their school work. Indo-Fijian parents have all the freedom to do this at home because they live independently whereas Ethnic Fijian parents find it hard to do this to their children because of their communal system of 'leader-follower' relationship mainly practised in their villages.
6.4. Exosystemic, Macrosystemic and Chronosystemic Influences on Home Life and Learning of Children

This covers settings which have an indirect effect on the development of the child at home and thus can affect the child's performance at school. Here, I have included the socio-cultural background of the child; the geographical and political factors; and the thought structure (difference between oral culture and scientific oriented culture) because they seem to have indirect influence on the performance of the two ethnic groups at school. A summary of the findings under this particular setting in relation to the two ethnic groups is first presented followed by interpretation and discussion.

SUMMARY OF FINDINGS

Exosystemic, Macrosystemic and Chronosystemic Influences on Home Experiences of Children

Socio-Cultural Factors

- Indo-Fijian students are more adapted to the system of competition always emphasized at school as compared to Ethnic Fijian students because Indo-Fijian students are faced with a life situation generally in which competition is the key. On the other hand, Ethnic Fijian students are liable to be unused to the system of competition at school because their life situation is more defined by cooperation rather than competition.

- The privatised or independent nature of the Indo-Fijian family structure in comparison with the communal nature of Ethnic Fijian family reinforces the difference mentioned above.

- The Ethnic Fijian communal system of living together in villages and obeying orders from higher authorities significantly worked against Ethnic Fijian children’s flourishing at school or cottoning on to science. This is because Ethnic Fijians adults were so concerned with doing the communal activities that they did not concentrate much upon caring about and supervising their children’s after-school activities and school work at home. On the other hand, the independent system of Indo-Fijians enabled them to live independently and thus for the parents to concentrate their thinking onto their children’s after-school activities and school work at home.

- The Indo-Fijians’ independent system also enabled them to be successful in businesses whereas the Ethnic Fijian system of relying on each other by “kerekere” (borrowing without return) is what causes the downfall of their businesses. The significance of this for education is that education (increasingly in science in particular) is salient for the survival and flourishing of a business as it is not for the traditional livelihoods of Ethnic Fijians.
Exosystemic, Macrosystemic and Chronosystemic Influences on Home Experiences of Children (Cont)

Socio-Cultural Factors (Cont)

- It seems that Ethnic Fijians tended to put church or their religion first in their life rather than education as compared to Indo-Fijians who even though also emphasising their religion often placed education as their first priority.

- The physical set-up of the homes of Indo-Fijians with the presence of individual rooms inside, being fenced outside and located further away from their neighbours gave more opportunities for Indo-Fijian students to easily carry out their homework and private studies at home. On the other hand, the characteristics of Ethnic Fijian homes of being open and having no individual compartments or rooms inside, no fence outside and being built very close to each other did not provide sufficient opportunities for Ethnic Fijian students to do their studies independently particularly when socialisation is part of their life in the evening.

Geographical Factors

- Because of the distribution of the majority of Ethnic Fijians in rural areas, the science performance of their students at school is bound to be affected by the relative unavailability in rural areas of good teachers, ample equipment, and transport services favourable to giving students educationally relevant field trip experiences. On the other hand since the majority of Indo-Fijians live in urban centres where all these things are readily available, the performance of their students in science at school is bound to be better.

Political Factors

- It seems that the greater availability of land to Ethnic Fijians has caused them not to work hard to achieve in science at school because they know that they can always fall back on their land if they are not successful at school whereas the unavailability of land among Indo-Fijians has caused them to strive for better academic performance at school in order to gain an employment opportunity to earn their living.

- The easy access of Ethnic Fijians to resources provided by the government such as scholarships, funds to assist particularly Ethnic Fijian schools etc., causes Ethnic Fijians not to work so hard because they know that they are liable to be assisted anyway. On the other hand, it seems that the unavailability of such resources provided by the government to assist Indo-Fijians contributes to the reasons that they have for working hard at school in order to achieve the best.

- In light of these points, I am inclined to believe that not all affirmative action in support of Ethnic Fijians actually works (Education Commission Report, 2000.) Clearly, this is a very sensitive issue, and I am by no means suggesting that all affirmative actions fail.
Exosystemic, Macrosystemic and Chronosystemic Influences on Home Experiences of Children (Cont)

Thought Structure of Oral Culture versus Scientific Culture

* The Ethnic Fijian thought structure is based on oral tradition where everything told by the elder is taken as authoritative because elders are taken to have lived longer and thus know more. However, precisely because belief is based on personal authority rather than evidence there is no way to tell whether or not something that is passed on by elders is literally true. The Ethnic Fijian custom of silence ensures that the younger generation normally receives the messages from the older generation quite without reflecting about its literal truth. On the other hand, the thought structure of Indo-Fijians better respects the distinction between what is thought or said and whether what is thought or said is literally true.

* The Indo-Fijian way of thinking and the scientific way of thinking tend to resemble each other relatively speaking, whereas on the other hand there is a vast difference between the traditional Ethnic Fijian way of thinking and the scientific way of thinking where something is meant to be accepted only when it is proved or at least strongly evidenced by facts.

* Each type of belief or thought system that is inherited by the two separate ethnic groups is part of the life or culture which students bring to the classroom and thus becomes reflected in the way they think about science at school.

* It seems that Ethnic Fijians may not do well in science at school as compared to Indo-Fijian students because there is a mismatch between on the one hand how the scientific knowledge system is obtained, believed and practised, and on the other hand how Ethnic Fijians secure and propagate their own traditional knowledge system. By contrast there is a much better match between how the scientific knowledge system is obtained, believed and practised at school with how knowledge generally is secured and propagated in the Indo-Fijian culture. Indo-Fijians are more apt to ask for evidence when they hear something and require evidence before they believe something. They are less apt to base belief on trust in the personal authority of someone, even that of a close relation and elder.
6.4.1. Socio-Cultural Background

Differences are found in the two different cultures in terms of: competition; their different systems of authoritative and being independent; emphasis placed on religion or church; and their home physical build-up. These influences can be clearly observed in a multiracial society like Fiji where there are two dominant cultures with well-defined characteristics. Thus the differences could explain the differential achievement of the two different ethnic groups at any institution including Primary level education.

6.4.1.1. Competition.

One major difference observed between the two major races is to do with one facet of personality fostered and promoted by each race, and that has to do with each groups’ concept of competition. The majority of the two ethnic groups interviewed feel that Indo-Fijians do well at school because they are more adapted to the system of competition practised at school than Ethnic Fijian students. In fact, the privatised nature of the Indo-Fijian family in comparison with the communal nature of Ethnic Fijian family reinforces this characteristic. As some of them stated:

Indo-Fijians are very independent and competitive people. They mostly work alone and will always try to compete with each other in whatever work they do, whether it is at home or at school. Now their children tend to adapt well in the classroom situation because the principles of independence and competition is also emphasised there. That is, children have to work on their own. They are very competitive people. They always compete for their living. Now in the classroom situation, you will see that competition is also emphasised. So in a way, I see that their cultural upbringing is very similar to or perfectly matches the school system. (Interview: Sailasa, male Ethnic Fijian parent, Natoa, 2001.)

... If you look at the Ethnic Fijian way of life, you can see that the two things, independence and competition are not usually part of their life or culture. Instead of being independent, they tend to live together, depending on each other and sharing things together. They tend to help each other. Competition is not part of their life. There is no purpose of competing with each other too in their village system because they always rely or help each other in times of difficulty. They have all the resources they want in the community. For example, they have a lot of land which they own it collectively. So you see this is why they do not often compete like us (Indo-Fijians.) Now you see when it comes to the classroom situation, their children (Ethnic Fijians) are not usually adapted to the system of competition and being independent because they do not practise such thing in their community. ... I think, this is why our children (Indo-Fijians) may do well at
school. Independence and competition is taught early to our children at home. (Interview: Raju, male Indo-Fijian parent, Dioka 2001.)

The Indo-Fijian way of life is more independent or more individualistic than Ethnic Fijians who mostly share things together. As one Indo-Fijian Assistant Head Teacher describes it clearly:

The Indo-Fijian family set up is such that once a child grows up, he must be independent. He must learn in order to one day earn his own living. On the other hand, in the Ethnic Fijian set up you will find that there are relatives who are even prepared to help the child when he grows up or even when he does not get a job, he goes back to the village and there are relatives or family members who will help him continuously whereas in the Indo-Fijian society or family, you do not help others so much like what is seen or practised by the Ethnic Fijian community. An Ethnic Fijian child when he grows up, expect his relatives and family members to help him for some times or even for a long time but in the Indo-Fijian set up, you will find that when the child grows up, he has to earn his own living and get his own income because if he is not, he will bother the whole family. Indo-Fijians think or feel it that way. Parents are very concerned about that attitude, and they tried to develop or instil the idea to the child so that the child can really strive for his education and be able to earn his living later in life. (Interview: Sanjay, male Indo-Fijian Assistant Head teacher teaching class 6, Dioka, 2001.)

My father gave his view about the problem faced by Ethnic Fijian students and stated:

... I think the problem here is that the idea of schooling is very new to us. This is taken from another culture. For us, our system is completely different from the school system. Some of the things which are emphasised at school are not emphasised in our culture. For example, in our culture, we work together and share things together. Now at school, a test is one thing, which is done to evaluate student’s performance. So, individual performance of students is judged by their tests. In tests, you do your own work and you do not share answers. So competition is mainly emphasised at school. This is one thing which is not seen in our Ethnic Fijian culture because we live together and share things rather than competing with each other. This is why I think our children are not adapted to the Western style of school system. (Interview: my father, Natoa, 2001.)

An Ethnic Fijian teacher elaborated on the same issue and said:

... Indo-Fijians tend to adapt well to the Western school system because it matches well with their way of living. There is competition in their culture as well as the Western school culture. They are very independent and this is also part of the school culture. The Indo-Fijians are well adapted to this Western school system because it is the same as their culture and also they have been using this system for a very long time as compared to Ethnic Fijians who just recently got involved in education about two or three generations ago. (Interview: Vili, male Ethnic Fijian Head teacher, teaching class 6, Loma, 2001.)

An Ethnic Fijian parent who dropped out at secondary level mentioned his difficulty in trying to adapt to the Western school system and said:
... One thing which we do not often realise is that our students are trying to adapt themselves to two different environments and this, according to my experience is quite a tough situation. ... I think Ethnic Fijian children are not adapted to this system of competing with each other at school. Certainly, competition is new to us. We do not compete at home. Instead we do the opposite - that is we work together. (Interview: Maria, female Ethnic Fijian parent, Natoa, 2001.)

One Ethnic Fijian parent of Loma expressed what he thinks about the difference between the two ethnic groups and said:

... I think this type of school system we are using is all derived from Western Culture. It is completely new to us especially Ethnic Fijians because we just recently involved in education when the Missionaries spread Christianity to us in the late 1800s. The young generation we have now is probably just only the 2nd and 3rd generation of educated Ethnic Fijian people. Some of us are just the 1st generation in our family to be educated. So you see education is still very new to us. It has just recently been introduced to us. For Indo-Fijians, before they come to Fiji from India, they already knew what education is all about and the good things about it because India was one of the oldest civilised countries in the world if we look back at the History of Civilisation. ... Some of them probably do not have any chance to be educated there (India) because of their position as being a low caste, probably because of many social problems and the uneven distribution of wealth there. So when they get any chance to come to Fiji and find that it has a much better situation and opportunity than what they faced back in India, they are quick to introduce and emphasise education in their life because of the experience they observed back home. This is probably why nearly every Indo-Fijian generation from that time until now regard education as part of their life and means of survival - because they have practised it and experienced the good thing about it in their life. (Interview: Joeli, male parent, Loma, 2001.)

Some Indo-Fijians mentioned that Indo-Fijian students are always competitive in the classroom because of the need to gain a scholarship to later gain a white collar job in order to survive.

... Actually most of them (Indo-Fijian students) do not want to come back to the farm. Some of them regard working in the farm as dirty work so seriously they always try to have competition in the class to try and gain a scholarship so that they will able to gain a white collar job somewhere. ... Without working hard to get a job, they cannot survive. (Interview: Jay, male Indo-Fijian parent, Kristi, 2001.)

... They are very competitive at school. I will give you one good example of what I mean about Indo-Fijian students being very competitive at school. Labasa College, one of the High Schools in Vanua Levu is dominated by Indo-Fijians. You will see the amount of competition in Forms 4, 6 and 7 in that school. Everybody is striving to get high marks and the result of the school is always at the top. This shows how much these Indo-Fijian students are struggling to achieve the best so that they can get a job and be successful later in their life. (Interview: Chandra, male Indo-Fijian Head teacher teaching classes 3 & 4, Kristi, 2001.)
There is no doubt that Indo-Fijians’ competitive lifestyle is a reflection of what is found at school with their children. They are more adapted to competition at school because in their real life at home, they face a similar situation. On the other hand, Ethnic Fijian students may not be used to the system of competition at school because the system they are brought up at home where they share things is different from competitive system used at school.

6.4.1.2. Authoritative versus independent system.

Most members of the two ethnic communities think that the communal authoritative system of Ethnic Fijians is what drags them backwards unlike the Indo-Fijians who have an independent system. Being independent drives people to work hard. Some think that living together caused other children to copy the bad influence of others while some think that the Ethnic Fijian system does not match well with the Western school system where independence and competition are emphasised and this is why Ethnic Fijians do not do well at school as compared to their Indo-Fijian counterparts. Comments such as the following lend support to the argument:

... Look at us (Indo-Fijians); we are doing well because we do not stay together like Ethnic Fijians. We live individually and we do our own. We are independent and do not have anyone around to help us. This drives us to work hard because we know that if we do not work hard we will not survive. We do not hear calls every morning from the village headman like what people in the village do. In the village, they cannot do their private work or business properly because of the amount of tasks that they are allocated and expected to do. They are bound by the rules of the village and nobody can break out from it. These are some of the difficulties Ethnic Fijians faced which I think contribute to their problem in education. (Interview: Rago, male Indo-Fijian parent, Dioka, 2001.)

... You people (Ethnic Fijians) stay in villages and you have your chief to listen to, that is part of your life. You obey what is coming from the chief. For us, it is not like that. We can do whatever we want to do. I think this is the main difference between us. This is also your problem. Parents do not look after their children well at home because of the village way you follow. (Interview: Anita, female Indo-Fijian focus group teacher, urban Indo-Fijian school, 2001.)

... Indo-Fijians do not live together like us (Ethnic Fijians). As a result, there is nothing else to stop them from individual work. They do not do communal work in the village like us. These are some of the things which hinder us from moving forward. We are tied together and therefore cannot do our individual work because of the tasks allocated to us in the village. Our living together as a group also has some bad influence on our children. Even if I teach you all the good things, as soon as you go out and play with the rest of the children in the village, you are likely to follow some of their bad behaviour. This is not the case for Indo-Fijians.
Since they live as individual families, their children will only follow the advice from their parents since they rarely mixed around with each other. (Interview: Manoa, male Ethnic Fijian focus group teacher, urban Ethnic Fijian school, 2001.)

One Ethnic Fijian parent lamented the fact that Ethnic Fijians parental role at home is not usually done due to social commitment in the village community. In addition, the system of living together and having a common land shared by the people prevent them from living independently and from advancing forward. This is evident from my interview with him. For example:

Q: How often do you help your children in their school work at home?
A: Not every day, you know because most of the time, we are committed to the village or community work and most of the time when they returned home from school, we are not often there.

Q: Sometimes when you are at home, what sort of things do you tell them to do when they returned home from school?
A: If I am at home, I will ask them if they have any homework. If there is some, then I will tell them to do it first. If they do not have any homework, then I will tell them to weed in our cassava plantation or go and fetch some water for the toilet, or go and fetch some firewood. These are the tasks I always give them when I am at home but if I am not at home, Oh! — they will just wonder around doing nothing. You may have noticed that during your stay here. It’s a common practice for these children in the village.

Q: Yes, I noticed that. Is it because parents are usually not at home?
A: Yes, my brother, I have already told you. It’s the village commitment. I think it would be better off if we do not live together like this.

Q: But what is stopping you people from moving out to your own land and living independently?
A: We can always do that, but on the other hand, if we look at it, who is going to take care of the village chores if we all move out? We are bound together as a family with one chief to listen to when we stay in the village. If we have no village, we will have no origin. Government will not provide assistance for us if we live as an individual because most of this Government assistance comes through the Province to the villages rather than as an individual. The other thing is that, our land is owned communally. We do not have individual land. So we cannot just move out and develop our own life since the land belongs to the whole community. We cannot start up our own individual businesses from our land of the same reason too. These are some of the things I think which is affecting us. (Interview: Josese, male Ethnic Fijian parent, Natoa, 2001.)

In view of this, I can conclude that the communal system of Ethnic Fijians tends to really drag them back not only in terms of their role of caring for their children’s education at home but also in other areas of individual development. On the other hand,
Indo-Fijians do not face the same life situation as is faced by Ethnic Fijians in the villages and that is why they do well in education and in other areas such as businesses.

Some people may think that to solve the problem mentioned here with Ethnic Fijians is to move away from the communal system of authoritative living to independent living. However, it is often not that simple as it is thought of for Ethnic Fijians to try to move away from this system of communal authoritative living to independent living due to some present government policies which only favours communal living rather than independent living. A good example is what the above Ethnic Fijian parent mentioned in terms of funds being distributed by the government for rural development only through Provinces to villages rather than to individual person who lives independently. The other thing is that the system of communal land ownership by the village clan will make it hard for people to move out and live independently.

6.4.1.3. Emphasis placed on religion or church.

Another important difference found between the two major ethnic groups is the emphasis they placed on their religion or church. From what I observed during my field observation within the two different communities, and supported by what most of them said in their interviews, it is clear that the majority of Ethnic Fijians tend to put church or their religion first in their life rather than education as compared to Indo-Fijians. Whatever the denomination, the church takes a central place in many Ethnic Fijian families. As some parents mentioned:

... Education or whatever we want to achieve, it is important that we should always put God first. The first priority is God. All the things will be achieved if we rely on God. (Interview: Joeli, male Ethnic Fijian parent, Loma, 2001.)

... To be successful at school, we should heavily emphasise Christian teaching to our children. Without this, they will not be successful. I always emphasised this to my children. (Interview: Vani, female Ethnic Fijian parent, Loma, 2001.)

... I think these two things schooling and church should go together and without one, we cannot move forward. I believe that if a child is brought up in a Christian way, his behaviour and manner will be good. He will care about others and because of this; he will try to follow instructions or whatever thing is ask of him to do. ... You know, we Ethnic Fijians, are always brought up in the Christian way. We love and care much about others. We tend to help each other, we share things and we also give way to others and respect elders. All these things are in the Bible. In fact, the Christian way of teaching is very similar to our traditional Ethnic Fijian customs I mentioned. (Interview: Livai, male Ethnic Fijian parent, Natoa, 2001.)
One parent even proposed that there is no place for education now since ‘God is about to return’.

... Lord Jesus Christ is about to return. Where will that education go if he comes and takes us today? (Interview: Saula, male Ethnic Fijian parent 1, Loma, 2001.)

Some think that they can achieve all the things they want if they pray or continuously go to church. For example:

...I think church is more important than education because if church is there than everything will be possible - money, food, education etc. (Interview: Varisila, female Ethnic Fijian parent, Loma, 2001.)

...Church should come first than everything else. This is a common saying amongst our elders. You can achieve anything you want if you put church first in your life. (Interview: Josese, male Ethnic Fijian parent, Natoa, 2001.)

This shows how much emphasis Ethnic Fijians place on church in their lives. Church is quite often the most important thing in their life. This is also shown by how much they contribute to church activities. They mostly contribute to church in a big way and in many cases more than they would for their own family’s needs and education. It is a well known fact that Ethnic Fijians always give beyond their means to build big churches. A good example is the communal church fund raising held at one of the intensively studied Ethnic Fijian school during the time I was conducting my field work, in which a large sum of money was collected. An extract from my personal journal mentioned the amount of money collected.

... The head teacher’s community group won the fund raising competition which collected a total of about $3,500. The total money collected for this fund raising was about $8,000. This amount is huge considering the economic status of the people in this rural area. (Personal Journal, 01/06/01.)

One of the parents commented that the amount of money collected is liable to be nowhere near as much if it were for the school fund-raising.

...This is the largest amount of money I have ever known to be collected in the fund raising for the village. If we can also do the same thing to collect more money like this for the school, then I think it would be much better for us. At least we know that we are giving money for something which is important for us in our future and that is, for the education of our children. ... I do not actually see the importance of collecting this money for the church because it is only for the repairing of the building which is something we do not gain anything from. That is how I look at it. (Interview: Elia, male Ethnic Fijian parent, Loma, 2001.)

Most Ethnic Fijian parents do not actually value education as being very important to them. A good illustration for this is what happens in 2nd term 2002 when a few schools in Suva sent students home since their school fees were not paid by parents. The
Fiji Times Newspaper (Wednesday, May 22, 2002) reported that about 80% of children sent home by these schools were Ethnic Fijians. This was a reflection of Ethnic Fijian’s poor perspective and value for education. As reported in the paper, one of the senior education officers said:

...Some parents cannot afford to pay fees yet they can afford to give and spend money at family and church gatherings every week. Serving the Lord starts at home and if these parents bypass their children, I do not know what or who they are trying to impress. Our lack of value for education is one of the biggest obstacles we Fijians face. (Fiji Times Wednesday, May 22, 2002.)

Indo-Fijian communities also have their own religion but I found that they do not use up as much time in attending to it as what I found with Ethnic Fijians. As some Indo-Fijian parents mentioned:

... We have our own religion too which we attend to at times. But you know, we do not waste most of our time in attending to this as what I saw with Ethnic Fijians. For us, our first priority is always education and our religion and other activities may come after that. (Interview: Raju, Indo-Fijian Parent, Dioka, 2001.)

You know, one thing I found mostly with Ethnic Fijian parents today is that they do not care much about education of their children like how they care for their church obligations and activities. If only they can change their attitude around, they should be able to do well in education. (Interview: Ramesh, Indo-Fijian teacher-parent teaching classes 5 & 6, Kristi, 2001.)

My mother who has some Indo-Fijian origin has a similar view to this and mentioned some of the things she saw with the Ethnic Fijian village community and said:

... I found them (Ethnic Fijian village community) to be more involved and committed to the Church activities than to their children’s education. I am not saying this to go against the church, no! What I am trying to say is that parents are not prioritising their work properly or correctly. They think that they will be accepted by the eyes of God if they do all the work for the church or by going to church everyday. These people or parents are receiving the wrong advice or wrong interpretation of what the Bible says. For them, it does not matter whether their child is not looked after properly at home. The only important thing for them is to do their task for the church. This is contrary to what the bible actually says. The Bible says “Woman look after your child”. This means that the woman’s or parent’s responsibility is the child. The children should be their first priority. (Interview: my mother, Natoa, 2001.)

Indeed, from what I observed, experienced and got whole of from my interviews, I can argue that the church influences, and in some instances, dictates the way many Ethnic Fijian people live. Ethnic Fijians are known to respect and follow whatever is
directed by the church in terms of their religious obligations, their moral beliefs and learning, family commitments and other undertakings. I found that in most cases, contributions for a new church or preacher’s home will always take precedence over paying their children’s school fees, the raising of funds for school text books, school buildings or even their children’s exercise and text books. Ethnic Fijians tend to spend more time on church business than with their children. As a result, they actually value church as being very important than education.

On the other hand, Indo-Fijians also have their own religion; but their first priority is education and all other activities like religion is also part of their life but is not always considered as their first priority. This, I think could be one of the reasons for the differential achievement of the two ethnic groups in any school subjects, including science at school.

6.4.1.4. Home physical build up

The living situation of the two ethnic groups of people is the first difference which is immediately apparent. As already described in Chapter 5, Indo-Fijians live in scattered homesteads, usually separated from their neighbours. As a result, they live independently and tend to have more privacy. The interior of their home is always divided up into compartments or individual rooms. Whenever there is social activities for the family in the afternoon, opportunity for their children’s study is frequent since they have individual rooms to do their private study.

Such is not the case with Ethnic Fijians. Living in a communal or village situation where social interaction is part and parcel of their life, privacy is totally absent. In addition, since their homes are mainly open without any compartments or rooms, privacy is totally absent and opportunity for private study is very meagre due to easy access to social interactions amongst the community. There might be a few exceptions where parents would provide adequate space for their students to do their study but more often the open compartment homes are shelters for anyone passing by.

My above observation is supported by my interview with members of the two ethnic communities and students who in most cases mention similar things. Some of their comments were:

... Sometimes when my Mum brings her friends home, I cannot do my study because they will just talk and talk. It might take hours for their talk. ...
Sometimes I do my home work at school when I am free but to study at home, it is very difficult. There is more distraction too from other kids in the village especially when we go out playing and swimming in the river. (Interview: Maku, male class 7 Ethnic Fijian student, Natoa, 2001.)

It is very difficult to do my study at home in the afternoon especially when there is kava drinking in the afternoon. Our house does not have rooms so I just have to do my home work or study in some space in our living room. ... But I am often distracted by their conversation. (Interview: Fulori, female class 7 Ethnic Fijian student, Loma, 2001.)

I encouraged my children to do their homework at school during their free time because one, it will be easy for them to see the teacher if they find some problem and two, they might not able to do that at home due to peer pressure and also because you know we Ethnic Fijians mostly spend more time at home in getting together around a bowl of kava and tell stories. They might not able to do their studies properly especially when the house is full since most of our houses do not have rooms for students to do their study. (Interview: Siva, male Ethnic Fijian parent, Loma, 2001.)

... Our children (Ethnic Fijians) do not often do their study in the afternoon because there is no private place for them to do their study at home like Indo-Fijians where they have separate rooms for sitting, dinning, and bedroom where their children also have a desk or table to do their own private study or homework. Our Ethnic Fijian homes are just open ones. So the opportunity for our students to have their private study is very little especially where there is always social gathering in the afternoon. ... For us, we have seen that and that is why we divided up our house into separate rooms so that all of you can have your private room for study whenever there is a function at home. This is another thing which needs to be emphasised by parents in the village. You will still see that only about 5 or 6 houses in the village have rooms. The rest are just open ones. (Interview: my Father, Natoa, 2001.)

... We Indo-Fijians are different; our children have their own rooms where they do their studies in the afternoon especially if there are visitors or social gathering at home. (Interview: Harjit, male Indo-Fijian Parent, Dioka, 2001.)

... I have my own room where there is a desk and a chair to do my study every afternoon. (Interview: Anita, female class 6 Indo-Fijian student, Dioka, 2001.)

... Firstly, the Ethnic Fijian home set up is very different from Indo-Fijians. Ethnic Fijian homes are mainly open and do not have rooms like us. As a result, there is no privacy when Ethnic Fijian students do their study at home like our children. The other thing is that, when there is a grog session at the Ethnic Fijian home, where do you think the children will do their home work or study when there is no private room for them to do their school work? For us, even if there is no table at home for the children to do their school work; at least they can do some studies privately in their own room away from the visitors. (Interview: Ravi, male Indo-Fijian teacher-parent teaching classes 1 & 2, Kristi, 2001.)

In fact there is nothing wrong with the physical set-up of the homes of Ethnic Fijians. However in looking at what is expected of students to be successful at school, an Indo-Fijian home is more advantageous than an Ethnic Fijian home. An Indo-Fijian
home with individual rooms give more opportunities for Indo-Fijian children to do their private studies at home in the afternoon whereas an Ethnic Fijian home do not give the best opportunities for an Ethnic Fijian student to do his or her own private study at home in the afternoon or evening especially when a person's home is like a home for everybody and socialisation is part of the village life in the evening. I have no doubt that the physical set-up of the homes of the two different ethnic groups is a factor significantly contributing to the differential performance of the two groups of children at school.

6.4.2. Geographical Factors

This covers how the two different ethnic groups are located around the country today. This factor is found to have some indirect influence on the differential performance of the two ethnic groups at school.

6.4.2.1. Rural and urban demographic spread

I found little variation in the availability of school resources for the four rural ethnic schools studied. Both sets of ethnic schools have available science equipment and chemicals necessary for teaching Primary science. In both cases, students buy their own text and activity books. Both ethnic schools have other resources such as tap water and electricity. Electricity in fact helps teachers to use equipment such as photocopying machines especially in preparing for their question papers for examinations. The availability of electricity to these rural schools has also enabled two of the intensively studied schools — the Ethnic Fijian school of Natoa and the Indo-Fijian school of Dioka — to move ahead and each purchase a school video which at times is used as a teaching aid by the two ethnic sets of teachers.

All the four schools do not have computers, so that manual typewriters are still used for typing examination papers and other school related work. Both sets of ethnic schools do not have a proper library at school and not many science related books are available for students to read. Instead of having a proper library room or building, the available books are just stored in cartons or stacked in an old cupboard not in order and are rarely given out by teachers for students to take home for the reason that there are only a limited number of books available and students might lose them if they are
allowed to take them home. Thus, I found no significant difference by ethnicity in terms of the availability of school resources for the schools studied.

However, the majority of elders of both ethnicities stated to me that there is always a gap between the performance of rural and urban schools due to the fact that most good teachers work in urban schools, and that those schools typically enjoy better availability of good library resources and other teaching resources such as computers. These differences are compounded by the relatively easy access by transport to schools in urban areas. Since the majority of Ethnic Fijian schools are rural, whereas the majority of Indo-Fijian schools are urban, these differences are likely to result in diminished performance on average by Ethnic Fijian students. Comments which supported this argument were:

... Firstly, the facilities that most urban schools have are not available in most rural schools. What they have in urban schools such as good libraries and computers, we do not have it in rural schools yet. Secondly, most quality teachers are in urban schools than in rural schools. If you look at the number of rural schools in the country, there are more Ethnic Fijian schools than Indo-Fijian schools. Now, these are some of the things which may also affect the differential performance of rural and urban students at school which may also have some effect on the overall performance of the two ethnic groups at school. (Interview: Vijay, male Indo-Fijian Head Teacher teaching class 5, Dioka, 2001.)

... There are more Ethnic Fijian schools in rural areas than Indo-Fijian schools. Urban schools are richer than rural schools. They have very good and modern school materials. This attracts most good teachers to urban schools rather than rural schools. If you look at all these, whom do you think is going to do well at school, the Indo-Fijians or the Ethnic Fijians? ... Certainly it is the Ethnic Fijians who are going to be affected the most since there are more rural Ethnic Fijian schools as compared to Indo-Fijian rural schools. (Interview: Vili, male Ethnic Fijian Head Teacher teaching class 6, Loma, 2001.)

... We (referring to Ethnic Fijians) have more rural schools than Indo-Fijians. On the other hand, they have more urban schools than we have. So if urban schools have more qualified teachers, better facilities than rural schools have which is most likely to be the situation at present, then we will always expect to see the differential performance within the two ethnic groups of students at school. (Interview: Ema, female Ethnic Fijian teacher teaching class 8, Loma, 2001.)

...It is the rural-urban difference between the two ethnic groups which plays a very important part in the differential achievement of the two groups at school. There are not enough good teachers and resources in rural areas as compared to urban areas. So you see Ethnic Fijian will be affected mostly because they mainly live in rural areas as compared to Indo-Fijians. (Interview: Amena, male Ethnic Fijian teacher teaching classes 5 & 6, Natoa.)

Ethnic Fijians live mainly in villages which are mainly located in rural areas of the main islands and also in the out lying small islands far away from the urban
centres. Transport is one main difficulties faced by these rural areas. Secondly, the types of schools they have are always poor with not many resources available for teachers to assist in their teaching as compared to urban schools. Thirdly, good teachers today are mainly attracted to the urban areas rather than to the rural areas. All these will affect the academic performance of Ethnic Fijian students as compared to Indo-Fijian students at school. (Interview: Ben, male Indo-Fijian focus group parent, urban Ethnic Fijian school, 2001.)

...One thing which we do not always consider is the geographical distribution of the two ethnic groups. While Ethnic Fijians today mostly live in rural areas, Indo-Fijians on the other hand mostly live in urban centres with very good schools, teachers and resources. A student who is brought up in the environment where all these things are available will no doubt do well at school. This is probably why Indo-Fijians are doing well as compared to rural Ethnic Fijian. So it is their distribution either in urban or rural areas which can also influence their performance at school. (Interview: Sanjay, male Indo-Fijian Assistant Head teacher teaching class 6, Dioka, 2001.)

.... Indo-Fijians have their schools located mainly in towns so they have good transport for children compared to most Ethnic Fijian village schools where students have to walk for a long distance to arrive at school. In some cases, it is very difficult to bring school resources to these schools due to transport difficulties. So these are some of the things which can affect the performance of ethnic Fijian students as compared to Indo-Fijian students at school. (Interview: Josesse, male Ethnic Fijian parent, Natoa, 2001.)

Certainly, the wide gap in terms of the resources between rural and urban areas will have some influence on the performance of the two ethnic schools because of their different locations. Ethnic Fijian schools which are mainly located in rural areas will be mainly affected as compared to Indo-Fijian schools which are mostly located in urban areas.

6.4.3. Political Factors
This covers two main areas: the land ownership and the policy of the government in providing easy access to Ethnic Fijians in terms of assistance in other resources.

6.4.3.1. Land ownership
As already stated in Chapter 2, Ethnic Fijians own the majority of the land in Fiji whereas the majority of land occupied by Indo-Fijians is mainly leased from Ethnic Fijians or from the government. One of the main land policies introduced during the Colonial days and still in use today is that Ethnic Fijian land is not allowed to be sold. This of course has caused a lot of debate between the two main races and has also caused a lot of difficulties among Indo-Fijians today especially with their growing population.
The majority of people interviewed mentioned that land is one of the major causes of the differences in the academic performance of the two ethnic groups of people at school. The availability of land for Ethnic Fijians in fact has caused them not to bother much about academic excellence at school because they know they can always fall back on their land if they are not successful academically. On the other hand, the shortage of land for Indo-Fijians has motivated them to compete and work hard at school to gain a better job in order to earn their living. This is evident from what both sets of ethnic people mentioned in their interviews. For example:

... I am a father. I have four children. When they were born, I had a plan and as the children were growing, I told them my plan. I told them: “look, I do not have land”. So I told them that they will have nothing to do if they do not study hard and pass to become something. This encourages them to work hard and that is why they are successful now. My plan for them worked because I motivate and encourage them to work hard to try and get a job to earn their living. So this is the difference between Indo-Fijians and Ethnic Fijians. It is the incentives. That is, a plan has to be drawn up when the child is born. The Ethnic Fijians say: “this is my land”. But the Indo-Fijians say: “this piece of land is mine”. So if Indo-Fijians has got a block to build his house only, he has no land for his children whereas for Ethnic Fijians, they have got the vanua (large area of land). The whole vanua is theirs so Ethnic Fijian children are not worried. Why worry when there is a lot of land available? This is the major cause of their (Ethnic Fijian) dropouts too because parents know that even if their children do not do well at school, they can always come back and work on their land. There is always something left behind for them to earn their living. (Interview: Chandra, male Indo-Fijian Head Teacher teaching classes 3 & 4, Kristi, 2001.)

... I think the availability of land to Ethnic Fijians causes them not to bother much about education or schooling whereas if we look at it on the Indo-Fijian side, the unavailability of land for them causes them to work hard at school because they think they will have no other means of survival if they do not work hard at school. So education is always on their mind whereas for us, we do not care much about education because of the thinking that we can always return to our own village and use the land if we failed at school. This is the type of thinking which is present in the minds of most rural Ethnic Fijian parents today. (Interview: Livai, male Ethnic Fijian parent, Natoa, 2001.)

... The driving force is the unavailability of land amongst us Indo-Fijians. You will find that the security about the land is a sort of our threat and that is kept in the heart. People feel that they should be prepared to look for other avenues if they cannot come back to the land so those farmers who have the land, if they have the security about the tenure of the land, that is good enough but they know that time will come when the lease will expire and they may not be able to get the renewal of the lease so before hand they prepare the children for other jobs where they will able to survive. (Interview: Ramesh, male Indo-Fijian parent-teacher, teaching classes 5 & 6, Kristi, 2001.)
... Ethnic Fijians have a lot of land and they should be millionaires now if they use it well. However if you compare an Indo-Fijian Farm to an Ethnic Fijian farm, you will see the differences. ... Mostly Indo-Fijian farmers produce more in their farm compared to Ethnic Fijians. Indo-Fijian farmers usually have quality crops in their farms. What causes the difference is the amount of labour they put in their farm. Ethnic Fijians are not working very hard whereas Indo-Fijians work very hard all day to improve the quality of their crops in order to sell more and earn more money from it. So you see, they have got the land but they are not working very hard and they do not sweat like the Indo-Fijians. I have seen an example in my neighbourhood. Before, one Indo-Fijian man used to lease that farm and now the Ethnic Fijian owner is there and the crops have almost all gone. I no longer see the amount of crops that used to be planted by the previous Indo-Fijian on this piece of land when the Ethnic Fijian owner moved in to take the land after the lease expired. (Interview: Raju, male Indo-Fijian Parent, Dioka, 2001.)

... Well, traditionally you know for those settling in Fiji most of them are betting on the land. At that time the land was big; with the big piece of land to work, the family started to produce more children so that they would not need to hire any people from outside. They did not want to hire others because everybody wanted to work their own land and the high production became a problem because of shortage of the land. There is not enough land to expand the production further for the lease given is fixed and to ask for more requires landowners’ permission which in most cases may not be given because of the political situation after the coup. Everybody just gets their share and moves their own way especially if you have more children and there is less land, so parents started thinking in other ways to survive. Now this land is enough for only one person the others should find job outside. To get a good job outside, the only means is to get academic excellence. (Interview: Rago, Indo-Fijian parent, Dioka, 2001.)

... For the Indo-Fijians whether it is a parent or teacher or any other occupation particularly, their every wish is to educate their children so that they can get a good job later and earn money to live successfully because most of us do not have enough land to earn their living like what Ethnic Fijians have. (Interview: Ravi, male Indo-Fijian teacher-parent teaching classes 1 & 2, Kristi, 2001.)

... Ethnic Fijians do not want to work hard because they have the land which they can always rely upon if they do not do well at school. Indo-Fijians on the other hand do not have much land and this is why they have to work hard to achieve better at school so that they can get a job later and support their own family. (Interview: Ramesh, male Indo-Fijian teacher-parent teaching classes 5 & 6, Kristi, 2001.)

One Indo-Fijian focus group teacher mentioned that because of the problem of the shortage of land among Indo-Fijians, parents have now turned the attention of their children in doing other subjects rather than Agricultural Science.

... That is also another reason you will see that Indo-Fijians students today hardly take Agricultural Science as a subject at school. Indo-Fijian Parents realised that there is no purpose of their children taking Agricultural Science because they will not use it at home because there is not enough land for them; their leases are expiring and they are no longer being renewed. They are now focusing their
attention on academic subjects such as Economics, Accounting, Maths and other Science subjects because these are practical subjects which they think they can able to get a job to earn their living. (Interview: Satiya, male Indo-Fijian focus group teacher, urban Indo-Fijian school, 2001).

In fact, Indo-Fijians’ situation about land shortage in Fiji and their striving to achieve well in education is very similar to what Ethnic Fijians in smaller Islands do. As one Ethnic Fijian teacher who also came from the smaller islands lamented:

... People here have a lot of land and other resources derived from it such as for example, timber, root crops, vegetables etc. since you have huge land. This may be the reason why most people here are not pushing for education because all the means of your survival are available. ... I guess this is why we Island people are sometimes called ‘Fijian Indians’ because we do not have much land. When we come to the main island, we encourage our children in education because that is the way we look at it as our means of survival. Our population has grown and there is not enough land for us to live and earn our living back in the small islands. This is why you will see that the majority of Ethnic Fijian people working in the government and private sectors today are mainly the ones who come from small islands of the Fiji group. The same situation is for the Indo-Fijians. They do not have much land and that is why they are pushing hard for education. (Interview: Mela, female Ethnic Fijian teacher teaching classes 3 & 4, Natoa, 2001.)

One Ethnic Fijian parent looked at the situation of Indo-Fijians in Fiji in another direction and said:

The way I look at it, Indo-Fijians emphasised mainly three things: business, land and education. This is what they stressed to their family most of the time. They now dominate the business and education arena. The only thing left for them to get now is the land. The only way in which they can get the land now is for most of them to be well educated so that they can move up and take many high positions in the government and also dominate in politics because once they do that, they can change the land policy to have their equal share of the land. We have not seen that but that’s where they are heading to and that is why they always motivate their children to work hard at school. (Interview: Vili, male Ethnic Fijian Head Teacher teaching class 6, Loma, 2001.)

Money is part of the life of Indo-Fijians. It is also needed for them because they do not have enough land to earn their living. A good result in school examination would mean gaining a good job later on in life. This is probably another reason for their striving to do well at school. As some Indo-Fijians mentioned:

... I send my children to school for the purpose of getting a job to earn money. That is important because there are certain things that we need money to buy, so money is important. Money is very important for survival especially for us Indo-Fijians in the country today because of our situation. Every Indo-Fijian parent has that view and in order to achieve that today, there is a need to be well educated. This is why we pushed for the better educational achievement of our children at
school. (Interview: Vijay, male Indo-Fijian Head Teacher teaching class 5, Dioka, 2001.)

... I don't want my children to be like us. I don't want my kids to struggle like us. I want them to have money and live a happy life. Money plays a very big role. Really, I don't have enough money to do the shopping. When I see other people doing their shopping, I always say that my kids will one day be doing the shopping like them. So that is why I always emphasise them to work hard at school so that they can get more money later to earn their living. (Interview: Pushpa, female Indo-Fijian Parent, Dioka, 2001.)

...Actually I come from a farming community. My father was a farmer and I have seven other brothers. Now only one could be at the farm and all the seven brothers could not share that farm so what our father did right from the beginning, was that he kept on advising us and he put that in our head that we should try to get our own jobs because only one of us will be able to get that farm. We have that in our head right from the beginning so out of the seven, six of us found jobs here and there. I became a teacher, one of us became an Accountant, the other one became a District Officer, another one became a Businessman, one became a Motor Mechanic, the sixth one became a Shopkeeper and the seventh one got the farm. From there on, I kept on telling similar things to my next generation. I kept on telling my son that I am a wage earner — a teacher and I do not have any business or anything like that so I told my son: 'you get educated and if you want to start a business, may be I will be able to help you out with some security and funds I have; but if you are not able to get any business, then get educated in order to find a good job to earn money in order to live.' (Interview: Sanjay, male Indo-Fijian Assistant Head Teacher teaching class 6, Dioka, 2001.)

On the other hand, some members of both ethnic communities mentioned that money is not part of the traditional Ethnic Fijian life in the village. They do not mainly rely on money to survive because of the readily available resources in the village and their traditional custom of kerekere (borrowing without replacement) can still allow them to live without money.

... I think Ethnic Fijians do not care about whether they have money or not. We Indo-Fijians think of money as our means of survival. Without it, we cannot survive in Fiji or even in any other place. Ethnic Fijians do not bother much about the importance of money because in the village, they can still survive without money. You can kerekere (borrow) from others and you can plant a lot of crops and get free food from the forests and waters around it without using any single cent. I think, this is why most Ethnic Fijian students do not even bother to use or apply what they learn at school in their villages or homes. For us Indo-Fijians, borrowing is something which we do not often practise. Even if we borrow something, we have to pay it back. We try to be very independent so that is why most of our students struggle to earn a living after they dropout from school. There is no choice for them whereas Ethnic Fijian dropout students always have a choice. (Interview: Ravi, male Indo-Fijian teacher-parent, teaching classes 1 & 2, Kristi, 2001.)
One Indo-Fijian teacher mentioned that even dropout Indo-Fijian students are able to start off with their own businesses after they left school because money is part of the Indo-Fijian lifestyle and parents save money for the future of their children. This is why they mainly flourish in business as compared to Ethnic Fijians.

... Indo-Fijian dropout students are able to kick off with their small businesses because they are usually supported financially by their parents. Saving money is part of their life. Parents save money for the education and support of their children. I know that Ethnic Fijians mostly do not have such a system of saving money for the future of their children because first, money is not part of their life and secondly business too is not part of their life. To be frank with you and I think you will also agree with me that most of the business they run failed. (Interview: Ramesh, male Indo-Fijian teacher-parent, teaching classes 5 & 6, Kristi, 2001.)

Another Indo-Fijian teacher mentioned the reason for the failure of Ethnic Fijian businesses and their not working hard at school and said:

... Ethnic Fijians are mostly spoon-fed by the government financially in most of the projects in villages and other areas. This will allow them to think that they will always be getting financial assistance and support from the government even if they do not do well at school or in education. The government is trying to help them in this way but on the other hand, they are taking advantage of this help that they do not want to work hard at school. This is why they also failed in business because once the government stop helping them, they cannot rely on their own. (Interview: Kamal, male Indo-Fijian teacher teaching class 8, Dioka, 2001.)

An Indo-Fijian parent elaborated on this and said:

Most Ethnic Fijian owned businesses failed because they do not know how to manage their businesses and this is the problem. They do not practice this in their culture. I mean business is not part of their culture. The “kererere system” which they use in their village is the cause of the downfall of their businesses. (Interview: Rajju, male Indo-Fijian parent, Dioka, 2001.)

Comments given by my father and mother were very similar to what these Indo-Fijians thought about the reason for the failure of Ethnic Fijian businesses. As my father said:

... Business or money is not our (Ethnic Fijian) treasure. For us, it is the person which is our treasure because we rely on other people to live. We work together, share things together and we survive by helping each other. (Interview: my father, Natoa, 2001.)

My mother elaborates on the same issue and said:

I agree with your father that business is not part of our life. Look at most of the businesses started up by Ethnic Fijian people today. Most of them fall or go bankrupt. Look at what happened to the Rewa Bus Company, the Cautata Bus Company, the Fijian Holdings, the National Bank of Fiji and many other businesses started up by Ethnic Fijian people. They all fall. Now the question is
why do they fail? The answer is that we are trying to mix up business with our traditional culture of borrowing without return. Whenever a relative has not got a bus fare, the Ethnic Fijian driver will say "Okay, you can have a free ride because you are my relative" or whenever somebody needs money, he can borrow it from the relative who runs the business without paying it back. These are some of the things which cause the downfall of most Ethnic Fijian businesses today. (Interview: my mother, Natoa, 2001.)

My mother suggested ways in which some of these issues can be overcome and continued:

... We should not treat them together. For business to be successful, it should run alone or we should not bring in our traditional culture to mingle with its running because once this happened, the business will not continue to run for a very long time like what happened to some of the Ethnic Fijian businesses I have already mentioned. It is still new to us, just like education. It might take some time for these things to be used to our system and run properly because most of these things are still new to us. It is not our system and we are forced to go with it and that is why it is not sinking properly into our system. The only thing is for us to try and learn from them (Indo-Fijians). It will take some time for education and business to sink into our Ethnic Fijian system and I tell you it is beginning to show up slowly. (Interview: my mother, Natoa, 2001.)

It is clear from what the two ethnic groups of people mentioned, that education has always been a subject very close to the Indo-Fijian heart. In fact, education is to Indo-Fijians what land is to Ethnic Fijians — the very source of their existence (Ali, 1977). Within the Indo-Fijian culture, education is given a very high status and the need to survive by one's own efforts further encourages parents to encourage children to do well at school. Ethnic Fijians on the other hand do not mainly take education seriously because of the availability of land which they can rely upon to earn their living. Within the Ethnic Fijian society, the importance of educational success is not often emphasised to the same degree as Indo-Fijians. In addition, within the Ethnic Fijian culture, there is the customary expectation that the community will help you in times of need. This is why there is not much emphasis placed on individual achievement. Thus, the availability of land for Ethnic Fijians as compared to Indo-Fijians could explain the differential performance of the two ethnic groups at school.

6.4.3.2. Easy access to resources.

Some elders of both ethnicities interviewed gave their personal opinion about what the government is trying to do to help Ethnic Fijians today and said:
My personal view (I am not saying this thing to criticise the government) is that if we look at the funding system in education, we can see that Ethnic Fijian students are given a lot of assistance financially whereas the Indo-Fijian children are not. This could be one area which causes Indo-Fijians to work hard too. They are suffering so they are more keen to work hard whereas on the other hand, Ethnic Fijian students do not work hard because they know all the assistance are provided for them from the government. They are more or less being spoon-fed by the government. (Interview: Ravi, male Indo-Fijian teacher-parent teaching classes 1 & 2, Kristi, 2001).

The affirmative action plan established by the government to help Ethnic Fijians is in fact affecting Ethnic Fijians because it was not given a good thought by the government. Look at how the Government allocate funding to schools now. More funds are being allocated to assists Ethnic Fijian schools and not much is given to Indo-Fijian schools. What will happen to Ethnic Fijian students who are attending Indo-Fijian schools? They will also suffer because of this policy. The other thing is that this affirmative action plan will not help Ethnic Fijians to work hard. (Interview: Raju, male Indo-Fijian parent, Dioka, 2001.)

I think the government in helping Ethnic Fijians in most ways such as giving them easy access to scholarships, or say job promotion is in a way not helping them to stand alone and work hard. They do not have anything to worry about as compared to Indo-Fijians who have to worry about all these things apart from the land problem. This in fact creates the feelings among Ethnic Fijian students that they will always have somebody to help them, even if they do not work hard to achieve better results at school. (Interview, Varisila, female Ethnic Fijian parent Loma, 2001.)

It is true that what the government is doing in introducing the affirmative action plan to help Ethnic Fijians will improve Ethnic Fijians; however, there is always the disadvantage if we look at it from the other angle. It is not helping us to be independent of our lives. It is also not helping us to work hard, at school. (Interview: Sera, female Ethnic Fijian focus group teacher, urban Ethnic Fijian school, 2001.)

Indeed, the Ethnic Fijians’ easy access to resources provided by the government in the affirmative action plan to help Ethnic Fijians such as scholarships, education funds to particularly help Ethnic Fijian schools etc. is likely to have some indirect effect on the performance of Ethnic Fijian students in any subject including science at school. It will not help Ethnic Fijians to stand alone to do things on their own. As a result, whenever the help is not available, they cannot survive. This could also explain why Ethnic Fijians do not work hard to achieve better at school - because they know that they will always be assisted every time. On the other hand, this could also explain why Indo-Fijians are doing well at school. The feeling that there is no body around – even the government to support them in their education has even strengthened them to work hard and achieve better at school.
6.4.4. Thought Structure of Oral Culture Versus Scientific Culture

During my investigation, I interviewed both ethnic groups to find out what type of thought structure they have and whether or not it matches the way science orients itself to literal, objective truth. The results of my interviews especially with teachers, parents and community elders reveal to me that the two ethnic groups of people have different thought structures from one another.

The Ethnic Fijian thought structure is based on oral tradition where everything told by the elder is taken as authoritative because elders are taken to have lived longer and thus know more. As some Ethnic Fijian elders mentioned:

... In our traditional belief system, for example in my case, whatever my elder brother says I believe and follow it because I know he is the eldest surviving member of the family and he is the one who knows more about the structure of our traditional system than myself. Whether what he says has some proof or evidence, I would not know. Our culture is oral and we do not have any written things to rely for as our proof or evidence of what we follow. (Interview: my father, Natoa, 2001.)

... In the Ethnic Fijian culture, information is passed on from generation to generation orally. Whatever is told by the elders is believed and is followed by the young without questioning. To question it would mean that we are not respecting the elders. (Interview: Neumi, male Ethnic Fijian focus group teacher, urban Ethnic Fijian School, 2001.)

... In terms of our Ethnic Fijian culture, we obtain our knowledge by imitation. That is, we always obey and follow whatever is told by the elders and we believe in it because we trust them. (Interview: Vili, male Ethnic Fijian Head Teacher teaching class 6, Loma, 2001.)

... I think for us (Ethnic Fijians) it’s a bit different. We do not often dig into the facts when we are told about anything because our traditional custom does not allow us to ask questions especially if something is told to us by an elder person. Asking questions is regarded as being disobedient in our traditional Ethnic Fijian custom and that is why we are often not very inquisitive in our behaviour. We also have our system of obeying and trusting those who are older than us and that is why we do not often ask back questions to find out the truth about certain things we are told. (Interview: Salome, female Ethnic Fijian focus group teacher, urban Ethnic Fijian school, 2001.)

However, people I interviewed did sometimes remark that potentially not everything told by the elders is strictly or literally true. Yet despite this admission (which is perhaps symptomatic of the conflict that sometimes arises between the teachings of the elders versus the teachings of schools, scientists or whatever), the same interviewees stressed the seeming impossibility to them of questioning the word of the
elders or holding such teachings accountable to evidence. As stated by some Ethnic Fijians interviewed:

... Knowledge in the Ethnic Fijian culture is gained when it is passed on from one generation to the next one. We believe this knowledge because it is told by our elders or ancestors. But we have no way to tell whether what is passed on is true knowledge or not. Even though we believe most of these things because it is told by the older generation, we cannot be certain whether it is true or not. ... We obtain facts only by hearing things from our elders and there is no way in which we can prove that what we heard is either correct or not because we do not have any written things to refer to for proof. (Interview: Vili, male Ethnic Fijian Head Teacher teaching class 6, Loma, 2001.)

... Some of the things which are passed on from our older generation may be distorted and might not be true. But because we rely for our elders for the information, we do not have any means of checking to find out about the truth because our only means of spreading information is through mouth from elders to the young. We do not have written information like what we now have today. Writing in books or papers is new technology introduced to us by the Western culture just two or three generations ago. Since we follow whatever is told or spread to us by the elders, we never ask back to find out whether or not the information we received is correct. Our culture of silence and respect prevents us from finding out about the truth. This is why I think that our system of belief is very different from that of scientific belief. (Interview: my father, Natoa, 2001.)

... I think the problem with our system is that we would not know the truth about the information we get because there is no way in which we can get the evidence from our elders whether or not what they told us is true since they do not have any written documents or things like that which we can rely on to look for the truth. So if the information we received is wrong or distorted, then the next generation who get the information from the present generation will also receive the wrong information. This is the problem about our oral system. (Interview: Jone, male Ethnic Fijian focus group parent, urban Ethnic Fijian school, 2001.)

My mother relates the problem of Ethnic Fijian oral belief system to what is happening in the village of Natoa and said:

... Like the explanation of the structure of the people in this village for example, there is a lot of different stories told by different elders of the different clans in the village about who should be the right holder of the village chiefly title of “Roko Tui Tai” like what you and your father and other members of your clan knows. What is dangerous is that the young people or children are hearing some of these wrong translations of the structure of the people and their position in the village. Once this translation is wrong from the beginning, the whole thing will be wrong as it is passed on from generation to the next generation. This is what is happening to our village right now. The right chief as we all know is installed by the majority of people in the village but the other clan thinks that what we have done is wrong and they think that the one they bring up is the right one and should be installed as our chief. You see, this is what I mean about the wrong translation from their elders to their young. One group knows this side of the story whereas the other group knows another side of story. Where do they get their information from? It
is just their elders. That is probably what their parents or elders told them. When the Native Land Commission was asked to come and solve this problem about the decision of who should be the right title holder of the chiefly position in the village, they told us that there is no record of the chiefly title holder in their books for the past years until just recently when the last chief to hold that title died several decades back. But they told us that they are not going to make any decision about the chiefly title holder in this village because they know nothing about the structure of the people in this village. It is the people in this village who should decide since they know better than them according to what they see and hear from their elders. If only all these things were recorded in books, then we would just rely on the book to tell us the truth about the correct title holder of the chief in the village but the problem is that we have no record of such things until just recently. So in the village, you see there are a lot of different types of translation going on from different elders to their children. The children or younger generation are confused as to which translation is the right one to follow. This is why I think our way of thinking or believing things has some weaknesses. It does not have any evidence and it can be sometimes distorted if it is not translated correctly. (Interview: my mother, Natoa 2001.)

What these people say clearly indicates that when Ethnic Fijians believe whatever is said by their elders, it is not the same as believing something to be literally true because there may be some distortion in the way the information is relayed thus enabling those who receive the information orally to get the wrong or false message. In addition, even if the information is relayed correctly or wrongly, it is the Ethnic Fijian custom of ‘silence’ which will further prevent the younger generation who normally receives the messages to ask the older generation about its literal truth.

On the other hand, Indo-Fijian thought structure better respects the distinction between what is thought or said and whether what is thought or said is literally true, and so tends to better resemble the scientific thought system. This is evident from what most Indo-Fijian elders said.

We also respect elders but there is one difference. ... We do not just believe what the elders say unless we know that it is right or correct. I mean to find out whether or not such thing is right we have to do some homework our self. We have to reason it out. If we find that that thing is wrong, then we will tell the next generation that such thing is wrong. Improvements are brought on that. ... I think this system of believing things is very similar to the way science work where things are believed only when they are being proved by facts. (Interview: Vijay, male Indo-Fijian Head Teacher teaching class 5, Dioka, 2001.)

... Well in some cases, we also follow what our elders say but I think the only difference is that we do not just follow or believe whatever is told by somebody bluntly. To believe it, we have to sort of prove it by some means. We can look in books and other areas but we do not just believe it just because it is told by somebody whom we respect or is older than us. This is how our knowledge and belief system works. When we search for the truth, we need evidence and it is only
when there is evidence that we can believe in the particular event. I can say that we are sometimes very inquisitive about things. (Interview: Josh, male Indo-Fijian focus group parent, urban Indo-Fijian school, 2001.)

... We have written documents rather than what Ethnic Fijians normally practised in the village where they take what is called "I tukutuku" [information] from one person to another by way of mouth. There is no such verbal thing as this. Take for example in our case; if the father dies and has some properties, it is not natural that the eldest son will always take the property like in the Ethnic Fijian case. Whoever the parents make the documents to will take the property. ... So it is the availability of facts only that will give us the evidence about something. Without that, we do not believe things to be true. (Interview: Chandra, male Indo-Fijian Head Teacher teaching classes 3 & 4, Kristi, 2001.)

... In our system, (Indo-Fijian), we do not believe anything just because it is stated or given by the elder. In our system, reasons have to be given before we can believe such a thing. Without facts or reasons, we cannot believe it. So I think, our system is a bit different from yours (Ethnic Fijians). The other difference is that most of our records are kept in papers or written down whereas for the Ethnic Fijians, their culture is still oral and your only means of obtaining knowledge is to pass whatever you know to the younger generation and this is how the knowledge is relayed to the next generation. (Interview: Rago, male Indo-Fijian parent, Dioka, 2001.)

One Indo-Fijian parent thinks that there are certain aspects of the two cultures which are the same but clearly mentioned the differences and said:

... There are certain similarities in our culture also as compared to the Ethnic Fijian set up. We have certain areas where children are restricted or forbidden and some knowledge we receive from the Pundits or Preachers that we take it directly without questioning them - especially if the things are of religious facts or rituals. But then we have a lot of development and a lot of learning from reading materials. This could be the difference as compared to the Ethnic Fijian set up since your ancestors do not write on books. We learn a lot from the written evidence rather than on what is told by way of mouth only. In a way the Indo-Fijian system of believing things is very similar to scientific thinking because there must be evidence provided rather than just believing what somebody says. (Interview: Raju, male Indo-Fijian parent, Dioka, 2001.)

One Ethnic Fijian teacher of Natoa agrees with what other Indo-Fijian teachers and elders thought and said:

I think the Indo-Fijian way of thinking is very similar to scientific way of thinking. They do not just believe anything without reasoning it out. Indo-Fijians are very clever and very inquisitive people. If you tell them any thing which they suspect does not agree with what they think, they will always want to know the truth about it by digging up the facts. They will only believe things if it has facts to point out the reason for it. (Interview: Mela, female Ethnic Fijian teacher teaching classes 3 & 4, Natoa, 2001.)

This shows that the Indo-Fijian way of thinking and scientific way of thinking tend to resemble each other whereas on the other hand there is a difference between Ethnic
Fijian way of thinking and scientific way of thinking where something is meant to be accepted only when it is proved or at least strongly evidenced by facts.

Both ethnic group elders think that the difference in thought structure of the two ethnic groups could have some effect on the way in which the two ethnic groups of students think at school. As some of them stated:

... I think, this could have some link with the ethnic students’ differential performance in science at school. For example, it may be connected to the Ethnic Fijian students’ inability to ask questions at school. They think that whatever the teacher told them is always true and they believe in it without any intention to ask back. This could also be the reason for our Indo-Fijian children having an enquiring mind about certain things they are told and that what encourages them to mostly ask questions when they are not sure about anything. (Interview: Vili, male Ethnic Fijian Head Teacher Teaching class 6, Loma, 2001.)

... This type of belief will also be in the minds of children too especially if the children know that this sort of thing is carried out by parents and other members of the group. They will also have this type of thinking and they will get use to it. (Interview: Jay, male Indo-Fijian Parent, Kristi, 2001.)

... I think this type of thought and belief system can also be brought up by the two ethnic groups at school especially when they learn science. The reason why I say this is because; the home background of the students also plays a very important part in their way of thinking at school. What the students learn at their various homes is often brought up to school and sometimes it is very difficult for us teachers to try and turn or correct some of their pre-existing ideas because it has been in their system for a while and they are used to it. For example, if Ethnic Fijian students at home imitate things without questioning then at school they are also likely to do the same thing by following all the things given by their teacher without questioning. This could be the reason why you hardly find them asking questions at school. At school, they are very obedient and they respect us teachers. This is what I have experienced about Ethnic Fijian students at school. On the other hand, this could also explain why Indo-Fijian students’ performance in science is generally better than Ethnic Fijians because Indo-Fijian students are always very inquisitive. Scientific belief system is more like this. So I think this really plays some part in the differential performance of the two ethnic groups in science at school. (Interview: Vijay, male Indo-Fijian Head Teacher teaching class 5, Dioka, 2001.)

... I think this could be the reason for Indo-Fijian students doing well in science at school. You know Indo-Fijian children are very inquisitive and they will not just agree to anything you tell them. They will ask for more things. They will not be satisfied if they do not get the answer correct. If you do not get the proof they will try to prove it themselves that this is wrong and this is right. I experienced this at school here. Ethnic Fijian students never ever try to bring up questions to us or even in class even though there is an Ethnic Fijian teacher at the school. This teacher often said that only Indo-Fijian students bring up questions to her but not Ethnic Fijian students. So I think it is also their culture of respecting each other especially respecting elders which discourages them from asking their teachers...
questions. (Interview: Chandra, male Indo-Fijian Head Teacher teaching classes 3 & 4, Kristi, 2001.)

... There is no doubt that this type of thinking where we follow whatever is told or translated to us by the elders is also brought up by our children to school. They treat their teachers just like their elders at home and they believe whatever thing is told by their teachers and they do not ask back to find out whether or not the thing is correct because of the culture of silence and respect. It is probably why they do not ask questions at school. Their cultural upbringing at home is also reflected in their behaviour at school. (Interview: Jone, male Ethnic Fijian focus group parent, urban Ethnic Fijian school, 2001).

An Ethnic Fijian retired primary school head teacher pointed out what he thinks and also what he experienced during his days of teaching and said:

... The way I look at it, I think it has some effect in the classroom, not only in science but in other subjects too. ... I have noticed and experienced this during my days of teaching. That is the inability of most Ethnic Fijian students to ask teachers questions in class. Whether the thing is right or wrong, they will just follow whatever the teacher told them to do in class without any query. Now, you will see the sort of thing I am talking about here. The reflection of their culture is shown here in the classroom where they learn things only by receiving the information from the elder or in this case the teacher without questioning. They believed whatever is told by the elders and that is probably why they do not ask questions. To enquire to elders or to ask them questions is not considered a good manner in the traditional Ethnic Fijian custom and this is why they prefer to remain silent without enquiring in class. In most cases at home, whenever a child asks a lot of questions, or tries to be inquisitive about something, he will be shut down by the parents and will be told to keep quiet because it is not good manners to do such a practice. Parents often emphasise this because to the Ethnic Fijian culture, it is a sign of respect to keep quiet. As I have already mentioned, in science, you do not just believe anything which is told. You have to have some truth or ways of finding out the truth and enquiring or asking questions plays an important part in finding out about the truth. Now, if our Ethnic Fijian children are taught in this manner of not enquiring or asking questions, how will you expect them to learn the subject at school especially in science where you need to do a lot of enquiries? (Interview: Meli, male Ethnic Fijian focus group parent, urban Ethnic Fijian school, 2001.)

Ethnic Fijian society is in fact very structured and hierarchical. People know their role and position in the village and in the community as a whole. Knowledge is gained when it is passed on from the elders to their children. Anything that is told by the elders is expected to be received on that authority and this knowledge is thereby accepted by the children. This is how information and knowledge is gathered and distributed in an oral culture such as the traditional culture of Ethnic Fijian people. Children do not ask back about why certain things happen or do not happen or are the way they are. As long as it is told by their elders or people of higher authority it is expected that that way of
telling about things should be generally accepted within the community. The younger
generation tend to fall in without question to those ways of telling about things, partly
because they readily make out in their own experience good sense in what is said.

One good example of this is the story Ethnic Fijian elders tell about the meat going
bad if it is hung outside in moonlight. Ethnic Fijians in villages have the habit of
hanging out meat to drain away the blood so that the meat remains dry and can be
preserved for a longer time especially when they do not have refrigerators for storing it
like what is done today. However, younger children are often advised by the older
generation not to hang the meat out in moonlight because the meat might go bad. Ethnic
Fijian village people more or less universally accept this. If there is some sort of
scientific explanation for this phenomenon — something to do say with the meat’s
absorption of moisture from its surrounding atmosphere when light shines on it, then it
should follow that meat will also go bad if it is also hung outside with some other light
shining on it rather than the moon light only. However, if Ethnic Fijian village people
are asked whether the same thing will happen if meat is hung outside when a light bulb
is on, they will not agree — simply because they are not being told this by their older
generation. So they think that whatever is told by the older generation is authoritative, is
always true and in most cases they do not ask back or find out the reasons.

This type of knowledge system is completely different from the way science
knowledge is transmitted. Scientific knowledge depends on careful marshalling of
evidence through processes of hypothesising, making predictions, observing, measuring
and classifying, communicating and questioning, recording and testing of results,
inferring and drawing conclusions. Ideally everything has to be proved by facts or at
least strongly supported by evidence after doing the above methods in order for the
findings to be deemed valid and agreed upon universally. The kind of assent given is
full-scale literal belief, precisely because the standards set for acceptance are so high.

This type of thinking surely reflects what is happening inside the Ethnic Fijian
classrooms where students rarely ask questions or even bring up questions during their
free time to teachers. They treat whatever the teacher told them to be authoritative. The
teacher from the student’s view point represents the elder person or the highest authority
in the school environment and students do not usually ask back questions to find out
about the validity of the facts since everything which is told by elders or people of
higher authority is accepted as authoritative. Scientific belief on the other hand depends
on evidence and not on authority such as the teacher’s personal authority, or the authority that a text book has merely because it was written by a high ranking scientist. It is scientifically legitimate to question anyone, including the teacher or the author of the textbook, if the weight of evidence supports doing so.

On the other hand what is evident from the interview with elders of both ethnic groups is the fact that Indo-Fijian belief or thought structure is not the same as that of Ethnic Fijians. Indo-Fijians do not simply believe anything that they hear or are told by somebody. They have to find out the truth or evidence about it before they can believe in it. One of the Indo-Fijian parents of Dioka illustrated the difference to me in terms of how his father gave his house to him 10 years ago. He told me that he had told his father to do everything in black and white. He told me that he wanted the proof in papers to him because he has other brothers and sisters in the family who could potentially also have claimed the property. As he stated:

... There are four of us in our family. I am in fact the third. I have two other elder brothers and another one younger than me. You look at this land; it is a freehold land bought by my great grand father from a European settler. There is not much, only 5 acres. It belongs to our family and it has been passed on from one generation to the next. When my father was ill, and about to die, he called me and said that he is going to give the land to me because the rest of my brothers are working and I am the only one at home with him. I told him “Dad, please make all the things in paper and I will sign it”. ... I have to make sure that he has to put all the agreement in black and white in order for me to own the property. This will be the evidence because you know, if this thing is not done, any of my other brothers have the right to take the land from me. ... This is how we work. We work by evidence and not by just way of mouth because there is no proof there. (Interview: Raju, male Indo-Fijian parent, Dioka, 2001.)

In the Ethic Fijian community there is no such thing as the signing of such documents to act as a proof of what is given away. Anything that is agreed upon by the two parties is final because it is part of Ethnic Fijian custom to rely on each other whenever there is the need and that is why Ethnic Fijians often give away things without any strings attached.

From what the elders and teachers of both ethnic groups mentioned, it seems that the differences in the thought structure of the two ethnic groups where one operates mainly on obtaining knowledge from elders without asking for any proof because of the trust they have for the elders; while the other group’s reliance on evidence like writing rather than only by oral message could explain why one group do well in science at
school as compared to the other. Since each type of belief or thought system is inherited by the two separate ethnic groups, it is part of their life or culture which students bring to the classroom and thus can be reflected in the way they think about science at school. Thus Ethnic Fijians may not do well in science at school as compared to Indo-Fijian students because there is a mismatch between how the scientific knowledge system is obtained and believed as practised with that of Ethnic Fijian knowledge system and belief. On the other hand there is a much better match between how the scientific knowledge system is obtained and believed as practised at school with how knowledge is obtained and believed in the Indo-Fijian culture.
Chapter 7
Final Reflections and Conclusion

In this chapter, I will round off my investigation by looking back at my original thinking about the stated problem in order to indicate the ways my investigation has challenged and altered my prior way of thinking. My intention is to discuss some implications of my key findings towards concluding with some recommendations on how to enhance learning in the Ethnic Fijian classrooms.

As mentioned at the beginning of this thesis, I began thinking about this dissertation when I was teaching science at secondary and tertiary level education in Fiji. I experienced during all those years at the two education levels the tendency for Ethnic Fijians to not do well in science as compared to their Indo-Fijian students counterparts. As a nation, Fiji needs qualified people to enter the fields of science and technology — in order to strengthen its national sovereignty, to utilise its available natural resources, and to compete with other countries economically. It is therefore a serious problem that scarcely enough Ethnic Fijians are coming through to high levels in science education, and consequently achieving professional qualifications in science.

My concern about this problem led me when I was teaching at secondary level in Fiji to do my first research study, towards finding out why Ethnic Fijian Foundation Science students entering the University of the South Pacific for the first year from secondary school level were not doing well in science as compared to their Indo-Fijian counterparts. That research of mine pointed to some factors such as the characteristics of the school where the students came from, the quality of students coming to the university, the quality of teachers at secondary level, and the adaptability of students to the university environment, to mention only some main issues. However, my main conclusion from that earlier research was that there is a need for more research to be carried out on Ethnic Fijian Primary and Secondary education because the problem at the University level actually originates at these lower education levels.

When I began the present research, my original thought was to look at two main areas: the teaching-and-learning context, and the home background of the students. I initially hypothesised that the problem might lie chiefly within the approach of teachers
at the primary level. I based this hypothesis on two considerations: one that the trend in Fiji Primary schools is that ethnic teachers mainly teach in their respective ethnic schools, and two, that science teaching first begins at primary level. In terms of the home background of the student, I initially felt that the cultural background of the two ethnic groups was likely to also play a role but only to a minor extent in influencing the differential performance of the two ethnic groups of students in science at school.

However, after conducting my study and carefully reflecting on my findings, I have been persuaded by many reasons to shift my view. My findings in fact do not support, but rather refute, my initial hypothesis that there are sufficient differences between the ethnic groups in the teaching of the subject at school to represent the main cause of the differential performance of the two ethnic groups at school. On the contrary, I found very little difference between schools of the two ethnic groups in terms of how teachers teach science. The uniform approach taken is largely determined ‘from above’, by the Ministry of Education’s directives. The ethnic teachers’ practices and beliefs about what they do in their teaching of science in the classroom are more or less the same with the exception that Ethnic Fijian teachers recognise the value of group work given its suitability to their students’ culture and utilise it somewhat more than do Indo-Fijian teachers. Yet, in schools of both ethnicities, the ostensible group work done by students is mostly very closely directed by teachers. Thus it is impossible to credit differences in teaching approach with embodying the whole source of the problem.

The answer to my research questions of why Ethnic Fijian students are not achieving well in science at school does not point mainly to the teaching of the subject in the classroom by the teacher but instead highlights the significance of the relationships between the school setting and other settings in which the individual is embedded. The research showed that there are various other settings apart from the micro-setting of the classroom alone which influence the differential performance of the two ethnic groups in science at school. These settings constitute the child’s direct and indirect experiences both at school and at home.

The main areas which seem to have a significant effect on the differential performance of the two ethnic groups in science are the socio-cultural, political, and geographical backgrounds of the two different ethnic groups. There seem to be a mismatch between Ethnic-Fijian social norms and those required to be successful at school particularly in science. Given the current school structures therefore, Ethnic
Fijian cultural upbringing tends to hinder children's academic potential at school. On the other hand the socio-cultural background of Indo-Fijians tends to match much better with what is required in order for a child to be successful at school.

My research findings therefore have directed my attention in an unexpected way back to the question of the teaching approach. Rather than thinking as I did initially that differences in teaching approach might be the principal cause of the problem, I have been brought to think that the lack of any difference in teaching approach might be the principal cause of the problem. Given that the students from one ethnic group bring with them to the classroom substantially different experiences, culture and mindset, the teaching approach that would be most effective at inviting them into science, and helping them to cotton on to inquiring in a literal-minded way with an eye to the quality of evidence for or against various conceptions rather than on the personal authority of whoever propounds them, might be very different for one ethnic group from what it is for the other.

Even though what the two groups of teachers practise is very much the same such that their teaching approaches cannot explain the differential performance of the two ethnic groups of students in science at school, I believe that in order to promote scientific thinking in the classroom, there is a need for the education system in Fiji to move away from the 'scripted lesson' type of science curriculum. I would even hazard to guess on the basis of my understanding of the two main cultures in Fiji that the present regime is more harmful on average to the learning of the Ethnic Fijian children than it is to that of the Indo-Fijian children. The reason is that the current practice further reinforces the Ethnic Fijian cultural dispositions to trust authority over evidence rather than the other way round, and it creates formal learning hurdles for Ethnic Fijian children without much if any meaning for their lives.

As the picture now stands, the system of education in Fiji is producing Ethnic Fijian students who are substantially less well equipped for the job of nation building than their Indo-Fijian countrymen. The facts that Ethnic Fijians do not do well in science at all school levels and that not many have entered the fields of science, industry and technology as compared to Indo-Fijians is due cause for concern. The reasons behind such a difference have been explained earlier and need not be dealt with here again.
The problem clearly involves a variety of broader socio-cultural-historical, geographical and political considerations which educational administrators are unable to influence in the short term.

In this study, I would like to further stress that I am not advancing a deficit theory. I personally believe that Ethnic Fijian culture should not be blamed as the problem. In fact it is not the Ethnic Fijians who are inherently any less 'intelligent' than Europeans or Fiji Indians but rather it is the case that their cultural values and traditional lifestyles are not respected by European educational ideals and institutions such as the one used in the school system. The school in fact has its own unique culture. However, the educational context of the home environment of Ethnic Fijians with clearly defined social roles, lack of competition and group decision making tends to go against the Western inspired school culture where the individual stands alone in competition with his/her peers. On the other hand, the educational contexts of the home environment of the Fiji-born Indians largely match what is expected at school to be successful, with the result that they have been reaping the benefits for the past several decades. The question which obviously remains is what can be done about the school system which will result in an effective and relevant education for all the races in Fiji.

In this age of technology and mass production, a solution might be to simply push on with the present system with no regard for the customs and traditions which might go against it. This solution I think is both absurd and heartless because it would only destroy the culture of the Ethnic Fijians. Many questions have been raised by Ethnic Fijians themselves regarding the preservation of the Ethnic Fijian way of life and the degree of change that is acceptable. Some question the degree of change and see it as a threat to their continuation as a people. Some think that change and modernisation are inevitable and must be accepted as the way of the future. Hence Ethnic Fijians continue to face a dilemma: whether to advocate and support change or support tradition.

I personally think that the dilemma can be overcome in two ways. The philosophy behind schooling should be changed in ways that help to protect culture: schooling should not be so far different from daily life. At the same time Ethnic Fijians must try to improve the academic achievement of their children. Essentially my suggestion is that there should be give on both sides.

A system which fosters competition and individuality inevitably puts Ethnic Fijians at a disadvantage. I suggest that a system needs to be devised that does not put so much
emphasis on the teacher and external examinations. This would mean that the philosophy behind schooling needs to be changed. One way to do this is for schools to foster a group learning approach consistent with the Ethnic Fijian culture. Instead of presenting individual problems with respect to which students compete with each other, it would be appropriate to solve the problem as a whole group. Schools in Fiji as indeed elsewhere usually insist on problems where one correct answer exists. However experiences show that few situations occur in life where one right answer exists. Furthermore, in searching for answers to problems adult members of society do not compete with their peers; rather they use the information their peers can provide. Such real life experience should inform the situation in schools. Schools in Fiji have long been divorced from real life. It is no wonder that most Ethnic Fijian students interviewed said that they did not see any connection between what they do at school with what they do in their real life in the village. In my view, if schools changed to reflect a more realistic life situation and views of the society and a more effective way of training students to prepare for that society, education would indeed be a success.

Another way to solve the problem in the school system is to do away with the two External Examinations at primary levels but instead to introduce a system that allows teachers to look at the overall work and activities done by students throughout the whole year. In this way, teachers will still have a way to gauge students at school but the system will be seen as somewhat relaxing the more memorisation based/factual focus of teaching which is currently oriented only to particular topics or subject areas that enhance outcomes. This will also give a chance for students who are good in other areas apart from “the academic subjects” which the present curriculum is mainly focusing on to excel in their own ways. Assessment of teachers on the work done by students should focus on the practical work done by students rather than concentrating on examinations only. For example, if the subject is gardening, then why not let students be assessed according to how well they managed to plant their crops, and the quality of crops harvested? This will also put students in the real life situation like those they actually face in their village or community situation.

Steps should be taken to look at other areas, for example, the motivational factors which can enable Ethnic Fijians to recognise the importance of education in their life. Ethnic Fijian youths do not mostly view education as a necessity for future security.
There is lack of urge on the part of parents and the community at large to ensure that Ethnic Fijian children get on in education.

To change this situation, there is a need, as I have remarked, among other things for parental attitudes and behaviours to change. This will be a long process, but as there get to be more Ethnic Fijian parents who have themselves done well in school and succeeded, largely because of the qualifications they attained, some of the necessary change will happen spontaneously because of their experience. Their example to other parents might also be a key cause of change.

In terms of the second solution, one may ask: Is it possible to protect culture and at the same time improve the academic achievement of students at school? From my experience I can say that this is possible. In fact the culture can maintain itself with considerable integrity even with some changes occurring in the educational quality of the home environment of Ethnic Fijian students. To create space at home for school work, to foster patterns of discussion that look to evidence rather than the personal authority of the elder as the mark of a good idea, and to instil new values that reflect the importance of formal education, need not destroy the traditional knowledge and values of the Ethnic Fijian community. However, these cultural adjustments can be made only over time, and the people that makes them has to be helped (through recruitment of inspirational teachers, affirmative action, scholarships, and other incentives) first to see that they are worthwhile.

Some Ethnic Fijian parents think that their children’s academic school work is the sole responsibility of the teachers at school. They view schooling or the education of their child at school as consisting only of the school microsystem in terms of the child-teacher relationship while they have no part to play in it. They do not credit the part played by the home microsystem in terms of the relationship between the child, the parents and other members of the community in helping to develop the child within the school microsystem. This is contrary to what Bronfenbrenner (1979) and other context theories of development suggest that in order to understand the development of a human, one must consider the entire ecological system or contexts in which growth occurs. In this sense, child’s learning does not only take place at the school as some Ethnic Fijian village parents today think, but instead it also occurs at home. There is a need to recognise and suitably orchestrate the interaction between these two microsystems in order for the child to grow academically.
I would also like to stress the fact that children are our future. If there is anything to invest in today, we should invest in the education of our children. Indo-Fijians have already seen this and that is why they are pushing forward today. We Ethnic Fijians should try to learn from our Indo-Fijian friends' ways if we want our children to achieve well at school and our people to advance. In order to further the changes that are needed before Ethnic Fijians in large numbers can advance in science and take professional qualifications in science and technology; perhaps the most important step would be to foster better recruitment into teaching of those few Ethnic Fijians who are science oriented. Concerted attention is also needed to the question of how the teaching approach can better reflect the experience and culture that Ethnic Fijian children bring with them to the classroom. Finally the space for school work and the respect for the qualities of thinking that it ideally inculcates need to increase among Ethnic Fijians. Hopefully this will happen spontaneously over time.

The future is therefore up to the Ethnic Fijians. To keep those aspects of their culture which they value the most while equipping themselves for life in a modern world is the Ethnic Fijians' greatest challenge today.
References


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## Appendix A

Table 25. Percentage Pass Rate of Ethnic Fijian and Indo-Fijian Students in Standardised External School Examinations from 1996 – 2000

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>81.9</td>
<td>86.1</td>
<td>38.7</td>
<td>58.7</td>
<td>41.0</td>
<td>57.0</td>
</tr>
<tr>
<td>1997</td>
<td>82.8</td>
<td>86.0</td>
<td>39.1</td>
<td>59.1</td>
<td>57.7</td>
<td>75.5</td>
</tr>
<tr>
<td>1998</td>
<td>81.2</td>
<td>86.4</td>
<td>38.4</td>
<td>60.5</td>
<td>55.1</td>
<td>77.6</td>
</tr>
<tr>
<td>1999</td>
<td>80.9</td>
<td>85.0</td>
<td>44.4</td>
<td>61.9</td>
<td>51.6</td>
<td>71.3</td>
</tr>
<tr>
<td>2000</td>
<td>79.9</td>
<td>84.3</td>
<td>44.9</td>
<td>63.5</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

*Note. Derived from “Ministry of Education Annual Reports 1997, 1998, 1999 & Statistics of the Ministry of Education”. For F.S.F., numbers passed are those that score 200 and above for English (at least 35%) and best 3 subjects. The figure does not represent the quality of subject passed. Figures for F.S.F. result in 2000 for both ethnic groups were not obtained. There was no figure available for F SF Examination in 2000 during the analysis of the above years’ Ministry of Education Report.*

- F.J.C. = Fiji Junior Certificate
- F.S.L.C. = Fiji School Leaving Certificate
- F.S.F. = Fiji Seventh Form
Table 26. *Form 6 Fiji School Living Certificate % Sat and Pass Rate per Science Subject by Race – 1999.*

<table>
<thead>
<tr>
<th>Science Subject</th>
<th>Ethnic Fijian % Sat</th>
<th>% Pass Rate</th>
<th>Indo Fijian % Sat</th>
<th>% Pass Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maths</td>
<td>46.9</td>
<td>22.4</td>
<td>53.1</td>
<td>40.1</td>
</tr>
<tr>
<td>Biology</td>
<td>47.8</td>
<td>33.8</td>
<td>52.2</td>
<td>51.5</td>
</tr>
<tr>
<td>Chemistry</td>
<td>43.4</td>
<td>36.0</td>
<td>56.6</td>
<td>56.8</td>
</tr>
<tr>
<td>Physics</td>
<td>44.1</td>
<td>25.3</td>
<td>55.9</td>
<td>58.7</td>
</tr>
<tr>
<td>Agricultural Science</td>
<td>55.5</td>
<td>58.4</td>
<td>44.5</td>
<td>65.3</td>
</tr>
</tbody>
</table>


Table 27. *Grade % Distribution by Race in Seventh Form Examination from 1996-2000*

<table>
<thead>
<tr>
<th>Year</th>
<th>Ethnic Fijian</th>
<th>Indo-Fijian</th>
<th>Ethnic Fijian</th>
<th>Indo-Fijian</th>
<th>Ethnic Fijian</th>
<th>Indo-Fijian</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>3.6</td>
<td>86.9</td>
<td>16.2</td>
<td>77.6</td>
<td>28.4</td>
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<td>12.6</td>
<td>81.3</td>
<td>30.8</td>
<td>62.7</td>
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<tr>
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<td>11.1</td>
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<td>16.3</td>
<td>77.3</td>
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<tr>
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<td>86.4</td>
<td>17.7</td>
<td>77.0</td>
<td>27.0</td>
<td>66.4</td>
</tr>
</tbody>
</table>

*Note.* Data derived from figures collected from the “Ministry of Education”, 2001. This grade % distribution does not include Other Races.
Table 28. % Pass and Enrolment of Ethnic Fijian and Indo-Fijian First Year Science Students at the University of the South Pacific from 1983 – 1993 and from 1997 to 2002

<table>
<thead>
<tr>
<th>Years</th>
<th>Ethnic Fijian</th>
<th>% Enrolment</th>
<th>Pass Rate</th>
<th>% Enrolment</th>
<th>Pass Rate</th>
</tr>
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<tr>
<td>1983</td>
<td>23</td>
<td>50</td>
<td>58</td>
<td>82</td>
<td></td>
</tr>
<tr>
<td>1984</td>
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<td>1986</td>
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<td>1987</td>
<td>43</td>
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<td>1988</td>
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<td>1998</td>
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<tr>
<td>2001</td>
<td>63.8</td>
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<td>2002</td>
<td>58.7</td>
<td>71.8</td>
<td>41.3</td>
<td>75.6</td>
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Note. Derived from “The University of the South Pacific, and Fiji Centre”, 2003. From 1983 to 1993, this first year University Programme was administered at The University of the South Pacific. It was phased out by the government in 1994 and was re-introduced by the Ministry of Fijian Affairs in 1997 through the Fiji Centre of the University of the South Pacific. That is why there is no data available between 1994 and 1996 in this table. The majority of Ethnic Fijians attending this programme when it resumed in 1997 were sponsored by Fijian Affairs Scholarships and Indo-Fijians who attended the Programme were private students.
Table 29. *Number and Percentage Pass of Ethnic Fijians and Other Races in the Fiji School Leaving Certificate Examination (FSLCE) from 1991 to 2001*

<table>
<thead>
<tr>
<th>YEAR</th>
<th>FIJIAN No.</th>
<th>FIJIAN Sat Passed</th>
<th>FIJIAN % Passed</th>
<th>OTHER No.</th>
<th>OTHER Sat Passed</th>
<th>OTHER % Passed</th>
<th>TOTAL No.</th>
<th>TOTAL Sat Passed</th>
<th>TOTAL % Passed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1991</td>
<td>3844</td>
<td>1595</td>
<td>41.5</td>
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Appendix B

[Note: The philosophical views presented here are mainly derived from attending a series of lectures by the Australian philosopher of science Dr Alan Chalmers at the University of Canterbury in 2001, and from undertaking the assigned reading in that course. For illustrations, however, I have endeavoured to use examples from the experience of Ethnic Fijian people.]

Philosophical Views on the Nature of Scientific Enquiry

To understand what scientific thinking is or what it is to do science, it might seem worthwhile to consider the various schools of thought concerning the nature of science within the inquiry called “philosophy of science”. The philosophers that I here examine are Francis Bacon, Karl Popper, Thomas Kuhn, Imre Lakatos and Paul Feyerabend. With the notable exception of Feyerabend, these philosophers each advocate a particular theory as to what constitutes science, or as to the way in which science is supposed to work. Each successive philosopher rebuts the earlier understandings and all except Feyerabend attempt to establish one of their own.

First, we shall briefly consider the nature of logical inference together with Bacon’s historically important conception of scientific method. This will be followed by the views of Popper, Lakatos, Kuhn and Feyerabend.

Bacon’s Scientific Method

In logic, we often refer to the two broad methods of reasoning as the deductive and inductive approaches. These concepts are both pertinent to Bacon’s understanding of science. Deductive reasoning works from the more general to the more specific. We might begin with devising a theory about our topic of interest. We then narrow that down into more specific hypotheses that we can test. We narrow down even further when we collect observations to address the hypotheses. This ultimately leads us to be able to test the hypotheses with specific data — a confirmation (or not) of our original theories. Deductive reasoning follows the following procedure:
Sometimes this is informally called a "top-down" approach. Deductive reasoning is narrower in nature and is concerned with testing or confirming hypotheses. A logical deductive argument works from given laws and theories to a conclusion via valid rules of inference. Usually, the conclusion of a valid deductive argument is contained within the premises of the argument. It follows that if the laws and theories of a valid deductive argument are true then the conclusion must also be true.

An example of a simple deductive argument can be taken from what most Ethnic Fijians in the village think about the effect of hanging meat outside at night during moonlight. They think that moonlight has some sort of power that it can enable any sort of meat or carcasses to go bad by the morning if the meat is exposed to the moonlight at night.

Theory: Moonlight causes meat to go bad; whenever meat is hung in the moonlight, it goes bad by the morning.

Initial condition: Some meat was hung outside during a moonlit night.

Prediction: That particular meat will go bad by the morning.

By looking at this example, it can be seen that the stated prediction validly follows from the premises, consisting of a theory, and a known initial condition. If the theory and the initial condition are each true, then the conclusion must also be true. It is truth-preserving, but it is not a pipeline to truth because it cannot tell us whether the premise is true or not. If one or more of the premises is false, then the conclusion is false despite the fact that the deductive argument is formally valid. This means that the validity of the form of a deductive argument does not depend on the truth or falsity of its premises. It cannot tell us whether the premises themselves are true or not. Thus the theory has to be
found out in some other ways, so logical deduction is in a sense not getting us anywhere new.

Inductive reasoning on the other hand works the other way, moving from facts acquired through specific observations to making broader generalizations to making laws and theories. It begins with specific observations and measures, detecting patterns and regularities, formulation of some tentative hypotheses that can be explored, and finally ends up by the development of some general conclusions or theories. Inductive reasoning, by its very nature, is more open-ended and exploratory, especially at the beginning. This can be summarised as:

![Diagram of inductive reasoning process]

This is sometimes called the "bottom up" approach. In contrast, the conclusion of an inductive argument does not follow necessarily from its theories, even if those theories are true.

I will try to illustrate this with a simple inductive argument from an Ethnic Fijian perspective. There are special seasons or months in which Ethnic Fijians plant their main root crops like for example the yam. They called this season “vula i teitei” or “vula i cukicuki” (planting month). This is shown in a tabular form below.

<table>
<thead>
<tr>
<th>Activities</th>
<th>Period</th>
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<tr>
<td>“Vula i Cukicuki”: (digging of plots / planting month)</td>
<td>August.</td>
</tr>
<tr>
<td>“Vula i Tubutubu”: (growing / springing month)</td>
<td>September</td>
</tr>
<tr>
<td>“Vula i Vavakada”: (hanging of yam stem month)</td>
<td>October</td>
</tr>
<tr>
<td>“Vula i Kelikeli”: (harvesting month)</td>
<td>February – March</td>
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</table>
There are various reasons for their doing these activities during these periods. For example clearing of the bush is usually done in the months of June and July because these are basically the dry months and it will be easy to burn the already cleared land during these months. Digging of plots and planting is the next step and this is why it is done in the next month after clearing – August. Once yams are planted in August, shoots will begin to appear within a month. September is the spring month. In order to make weeding of the yam plots much easier, yam stems which crawl on the ground are made to hang and crawl above the ground on sticks posted beside each plot. These sticks are banded towards each other to form a platform in the air in which yam stems can then crawl very easily thus making it easier to clear weeds on the yam plots below. This process is usually done in the month of October because by this time, yam shoots appear to come out of the plot. Yam should able to mature in about 6 to 7 months time and that is why it is harvested in between February and March.

Ethnic rural Fijian people believe that if they do the specified activities according to the "right period", their crop will grow very well and during harvesting season, yam plots will bear huge tubers. Their conclusion is generally based on what they heard from other people who may have experienced it individually in their planting. It should not be forgotten that there may be other factors which may affect the size of yam tubers during harvesting such as: the variety of yam planted; the size and depth of each individual yam plot; the type of soil in which the yam is planted; the keeping of the crop free of pests and weeds during the growing season; the application of manure or fertilizers by some planters on the yam plantation; the amount of sunshine and rainfall during the year etc.

So it would be wrong to make a general conclusion in terms of the size of the yam tubers during harvesting season on a limited observation about the "right period" for planting only because each individual planter may not be aware of other factors which they may apply in their plantation to enable their harvested yam to have big tubers. For example, some of them may not be aware of the depth of the hole they prepared for each plot and that different varieties of yams have different depth in which they can grow. Some varieties of yams grow deep down in the earth according to the length in which the plot is dug down. If the plot goes deep, it will have a long tuber and if the plot is not deep, the tuber will be just short and fat. In this case, we can see that the general conclusion is derived from only one-variety facts – concerning the "right period" –
within a broad range of varieties of other pertinent facts. It can happen that all yams will have big tubers but this is not guaranteed by the truth of the “right period” only.

The generalisation that states that by not following the “right period” we will not generate large yams is reached by an induction. That any of the other factors mentioned, such as a certain depth of planting, a certain minimum amount of rain and sunshine, etc., may also be necessary if yams are to grow large, must also be learned by induction. Each generalisation is meant to be justified or derived from the facts.

Yet as the example makes clear, there is a problem about inductive inference. The problem of induction as a scientific method is that it does not guarantee us that what we conclude is correct. If we try to make a generalisation quickly from a few data we have with us we can quite clearly go wrong. For example we might not get large yams sometime when we have followed the “right period”. But we would need to be alert to the possibility that that has nothing to do with the period. It might instead have to do with the depth of planting, or the amounts of rain or sunshine. But no matter how many data we have we might still go wrong if we generalise from them. There is no method for inductively generalising that could possibly guarantee on the basis of the data that the generalisation must be true. For example yams cultivated not quite by the “right period” but planted at an optimal depth in good soil and receiving optimal amounts of rain and sunshine might have grown large after all, but perhaps that case is not within the range so far of our data.

Some questions which anyone would want to ask are: When are generalisations of facts justified in science? Under what kinds of conditions is it legitimate to generalise from facts in science?

Bacon in a way tried to answer these questions. He was aware of the problems associated with making inductions about the world. In fact, he criticised Aristotle’s scientific method of induction which was well accepted up to his time. In Bacon’s opinion, Aristotle’s method was not perfect to the extent that it allowed generalisation to be made too quickly from an insufficient data base (Bacon, 1855).

He argued that in order to gain true knowledge, a careful application of induction should be used to avoid errors. His method takes into account the possibility of counter-examples and reaches its conclusion by a series of firm inductions, rather than just one simple induction. Bacon (1855) put this in his own words:
There are and can be only two ways of searching into and discovering truth. The one flies from the senses and particulars to the most general axioms... The other derives axioms from the senses and particulars, rising by a gradual and unbroken ascent, so that it arrives at the most general axioms last of all. This is the true way... (I,19).

He recognised that there are four difficult areas against which all investigators should take care in doing an investigation. He called these difficult areas ‘Idols’ which he classified into four classes namely ‘the Idols of the Tribe’, the ‘Cave’, the ‘Market-Place’ and the ‘Theatre’.

An example of the idols of the tribe is when we make generalisations too quickly and place too much significance on the confirming instances of a phenomenon (Losee, 1980). The idols of the cave refer to the interpretations we make according to what we have experienced. The idols of the market-place which he thinks are the most troublesome concern distortions and errors that appear when we use some common words to explain phenomena. Lastly, the idols of the theatre concern the difficulties we face in trying to avoid what is accepted by others especially those of our peers or those of a recognised authority. A good example of the idols of the theatre as pointed to by Bacon is the slavish following in Bacon’s day of Aristotle’s doctrines (Losee, 1980).

Bacon attempts to illuminate the best ways for us to avoid these idols. His scientific method — designed to confer immunity from the idols — begins with an active search for and collection of basic data. The data assembled are then used in the construction of three tables, tables which he calls: the ‘Table of Affirmation’ (or ‘Presence’), the ‘Table of Negation’ (or ‘Absence’) and the ‘Table of Comparison’ (Cranston, 1967).

The main purpose of constructing these tables is to establish some relationship or correlation between the aspects of the phenomenon under study. His method then proceeds by a series of inductions from less general correlations to ones of greater generality (Losee, 1980). This constitutes Bacon’s inductive method.

Bacon’s method also uses the method of deduction but only to a limited extent. This involves the stating of general laws based on observation and then the use of these laws to predict further observable facts, that is, to infer deductively that some specific events will occur. This is how he thought scientific research works.

This is the method that Bacon says distinguishes science from other forms of enquiry. According to him, science has its own special method which is quite different
from the methods of theology or philosophy. He was the first to argue that the new science has its own distinctive method.

It is true that Bacon has improved upon Aristotle’s understanding of method; however there are a number of difficulties faced by Bacon’s method. One is that we do not simply observe natural phenomena. We detect phenomena not simply by observation but always also in the light of some theory that we already have in mind. For example, every time meat goes bad, countless different things will have happened in the environment of the meat. Perhaps children have played nearby with a ball, perhaps an old man has coughed twice nearby and then sneezed. The date might be Tuesday and an odd number, or it might be Friday and an even number. And so on. Yet something in our background thinking might direct us to consider about the moon. Did it shine on the meat? Secondly, we cannot justify general laws from limited evidence. That is, induction does not justify scientific knowledge. For example, to conclude that ‘all meat goes bad by the morning if exposed to moonlight’ by looking at the result of exposing some meat to moonlight is unjustified on the basis of any finite number of confirming instances. This is so even when we vary other conditions that we might think to vary and find that the correlation is maintained, between moonlight shining on the meat and the meat’s going bad. For it is always possible that some other factor that we did not note and therefore failed to vary is in fact the cause of the meat’s going bad. (Present-day science would tell us that there is such a factor — invisible microbes, which because of their invisibility we might be unaware of, and so unable to subject to variation in an experimental way.) Another significant weakness in Bacon’s account of the method of science is that it neglects the important part that Mathematics has to play in the theoretical development of science. Today, Mathematics is also regarded as a science subject because of its involvement in some scientific theories. Some scientists’ theories like Newton’s involve the use of Mathematics to explain part of the theory. Bacon’s method also fails to describe accurately the work of scientists in his own time such as Copernicus or Kepler (Rosi, 1968).

Another very important point is that Bacon’s contention that science has a single method which is constant and does not change throughout history, is questionable.
Karl Popper's View of 'Falsification'

The next most influential wave of thought on science was due to the work of the Austrian philosopher Sir Karl Popper. He proposed that science works by a process of falsification. To falsify a scientific theory is to look at ways in which we can refute or disprove the given theory by observations. So according to him (Popper, 1972) we can distinguish scientific theories from other theories on the basis of whether or not a theory could possibly be falsified.

Popper opposed the idea that scientific knowledge is to be understood by inductive generalisation from the facts. One key feature of his philosophy is the importance he attributes to criticism. His principle is that: if you are going to criticise some position of an opponent, then always put that position in the strongest possible form and then criticise it. If you can see a way of strengthening your opponent's position, then do it before criticising it.

One could ask: what is so special about scientific theories that distinguish them from other kinds of theories? According to Popper, the main distinction is that science is falsifiable. For a theory to be scientific, it should make some definite claims. But the point is that as soon as a theory tells us something definite about the way the world behaves, it sounds the risk of being wrong because there is always this logical gap between the general theories and the finite evidence.

The conclusion which can be derived from this is that there is nothing straightforward about the establishment of facts of use to science. Experimental results are not totally independent of knowledge in the sense that you need to know a lot to be able to bring these tests to bear on various experimental claims. The issue is: How can knowledge be derived from these facts once we got them? The major problem is that: the generalisations that constitute our knowledge always go well beyond any facts that they are based upon. That is to say that the number of facts we have and the number of experimental results are always finite whereas the claims are quite general about all events of a particular class of a particular kind. We cannot hope to justify this by using inductive inferences which go from a finite number of facts to some general scientific law. For these inductive inferences are very difficult to characterise let alone justify. For after all, we know that not all generalisations from the facts are warranted. So it would seem that the questions to ask are: What distinguishes the warranted ones from
the unwarranted ones? What is a good inductive inference? Yet in Popper’s view these questions simply cannot be answered.

Popper thinks that he can solve all the problems associated with the claim: “Scientific knowledge can be derived from the facts”. He said that all these problems become non-problems if you deny that science can be derived from the facts. That is, any problem with characterising inductive inference can be swept away if you can give a view of science that does not involve induction.

Making a Logical Point

While it is never possible to logically prove a general scientific claim given the facts because of that logical gap, it is possible logically to disprove scientific generalisations given the facts. A simple illustration of this is shown by considering the generalisation: “a mouse is grey”; “therefore, all mice are grey”. We can never prove that “all mice are grey”, no matter how many grey ones we have seen, we can never rule out the possibility of black or white ones. On the other hand, we only have to see one black or one white, (observable fact – “one black mouse” or “one white mouse”) in order for the generalisation “all mice are grey” to be false.

This means that we can never prove scientific theories from the facts, but that sometimes given the appropriate facts, we can disprove them. So Popper is trying to give an account of science that involves only disproof and not proof. According to him, scientific knowledge involves only disproof and is always and forever fallible. That is, what we do in science is test our scientific theories in an attempt to falsify them. Having falsified a theory, we have the problem of replacing it by something better; in the sense that unlike the old knowledge, this better theory is not falsified by the available facts. Having thus got “something better” we now repeats the process and try to falsify it and eventually we are successful so that we then have a new problem, and there is then a need for a new theory and so it goes on. In this way, there is a sense in which our scientific knowledge is always improving because we expand the store of problems tentatively solved. So long as current scientific knowledge, unlike the old scientific knowledge has not yet been shown to be wrong, it is better than the old knowledge in that sense.

However, this does not mean to say that it is proven true and no doubt future science will bring out the limitations of current science. We in fact disprove the older theory but we have never proved the new. Only disproof is involved.
So Popper's idea described here can be summarised to say that: science is fallible; it is never proven; the only reasoning process involved in science is disproof, not proof; yet we can use this critical method to achieve some progress in science.

One important question which arises about Popper's "falsificationist" view of science is: What criteria should a hypothesis live up to if it is going to be counted as being "good science"? The answer Popper gives is that all scientific hypothesis or all bits of scientific knowledge should be highly falsifiable; the more falsifiable the better; but they should also be not in fact falsified. Statements such as for example: "It always rains on Monday"; "Substances expand when heated"; "Planets move in ellipses" etc. are all falsifiable. But one can always ask: How do we know that a statement is falsifiable or unfalsifiable?

In order to show that a statement is falsifiable, we just have to check whether there is an observable state of affairs such that if it were to occur, the statement would be shown to be false. So there must be a possible sort of observable circumstance that clashes with the claim; this alone makes the claim falsifiable. For example to falsify the statement "It always rains on Monday", we just have to find a Monday where the sky is clear for 24 hours without a drop of rain falling.

On the other hand, the statement "Either it is raining or it is not" is an unfalsifiable one. The reason is that we cannot describe any weather such that if this weather were to be observed, the statement turns out to be false. This statement is going to be right whatever the weather is like. That is if it is raining, it is right and if it is not raining, it is right too. It should be remembered that whether a statement is falsifiable or not, is a different issue as to whether it is in fact false or not.

This demand that any scientific hypothesis or claim should be falsifiable is really simply saying that any decent scientific theory is going to say something definite about the way the world behaves. That is to say that scientific theory is going to say "the world is like this, and not like that". For example: "Planet move in ellipses and not in squares"; "metals expand when heated & they do not contract". So in claiming something positive, a scientific theory also rules things out. It says: "the world is like this and not like that".

Not every thing is possible according to science; science rules things out. Since it rules things out, it is falsifiable because if we were to observe those very things that scientific theory rules out, then we have falsified the theory. So just in so far as it makes
definite claims about what the way the world is, scientific theory run the risk of being
wrong.

The other part of what Popper said is that the more falsifiable the theory is the
better, so long has it has not in fact been falsified. For example the theory: "Metals
expand when heated". This is falsifiable but every time we try to falsify it, it turns out
the metal expands. What happens to cases like this?

According to Popper, if we try to falsify the scientific theory or knowledge and we
find that we failed, then we retain the scientific theory or knowledge because we failed
to falsify it. The theory that survives after we have done all our falsifying represents the
current scientific knowledge. In this way, we can see that Popper's challenge to
scientific theory or knowledge seemed to be a sensible one.

Popper also thinks that it is a big mistake to try to think of science being built up
from scratch. Science according to him never starts from scratch. You start from where
we start but there is all kinds of background knowledge already in place and it is that
knowledge that we exploit when we are collecting facts, judging whether experimental
results are valid etc. We have to draw on current knowledge and we work from there.
The objective of science from Popper's point of view is to somehow improve the
scientific knowledge that already exists by finding its faults and thereby modifying
existing knowledge. If we modify our theories in the light of some unfavourable
evidence, we should do so in such a way that it opens up science to new criticism rather
than closing it down.

The key point in Popper's View concerns not how scientific knowledge is proved
but how scientific knowledge is improved from old to new. That is, the key point
concerns how scientific knowledge grows and not how it is proved. Popper also has the
notion that good scientific theories are the ones that survived severe tests.

So Popper's ideas can be summarized as follows:
• The whole point of science is to falsify theories;
• The big success in science is when we successfully falsify theories;
• Good scientific theories survive severe tests;
• Confirmations are highly significant i.e. we severely test the theory by
  attempting to refute it at its weak points but what is highly significant is when
  we fall.
Problem with Falsification

There seems to be some difficulties faced when we deal with falsification. For example if a theory clashes with the fact, this does not necessarily prove that the theory is wrong from the logic point of view. What logic tells us is that if a theory clashes with the facts, then they cannot both be right. It does not tell us that the theory is wrong. It might be that the observation is wrong.

In realistic science in general, when a prediction is made, what is used to make the prediction is quite a number of assumptions. Appeal will have been made to a theory, and typically the theory itself consists of more than one claim. Moreover, appeal will have been made to various additional theories and other assumptions, for example about how certain experimental equipment works etc. Various other assumptions would have to be fed in order to get the predictions out. The point is that in this logical situation, if the prediction fails, then any number of different assumptions could be blamed for that.

Suppose the prediction turns out to be false when the experiment is done. The important feature of logic is: if all the premises or theories are true, then the conclusion has to be true. That is, logic is truth preserving. But in this case the conclusion is false, so not all these can be true. There is something wrong somewhere. However all that logic can tell us is that something is wrong somewhere. Logic cannot tell us that the theory is false. So from a logical point of view, the falsification of a theory is by no means straightforward. A logical conclusion is that we can never straightforwardly falsify a theory with logical certainty.

Lakatos' View

Lakatos is a supporter of Popper. He is very aware of both Popper and Kuhn's writings and criticism. His view or philosophy of science tends to solve some of the problems faced by Kuhn's philosophy of science about paradigms. His philosophy of science is summed up by the methodology of scientific research programmes. He tries to develop a Popperian style philosophy of science but he realised that Popper's falsificationist account of science ran into problems especially in the light of problems posed by Kuhn. So Lakatos explores ways to modify Popper's views in light of the kinds of problems that have been opposed by Kuhn.

Lakatos finds a few things which seemed to be valid in Kuhn's view of science. He is impressed by Kuhn's observation that all scientific theories throughout their history have problems. More specifically, they are faced with generally accepted facts which seemed to clash with the theory. For example if the theory that: the earth is a
planet orbiting the sun along with the other planets, then this theory has the consequence
that planets like Venus and Mars should change size as viewed from the Earth because at
certain time of the year they will be close to the earth and then much later in the year
they will be far away from the Earth. However, observation shows that these planets
change size very little. So in this case, the theory makes the prediction and the
prediction seemed to be invalidated. So the theory is falsified. Kuhn's point is that this
kind of situation is widespread yet the theories in question are nonetheless maintained (at
least until a rival to it is developed). These facts about how science actually operates
pose a problem for at least Popper's own style of falsificationism.

Lakatos is impressed by Kuhn's idea of "normal science" in so far as it is non-
critical. He argues that typically in a science, the fundamentals are taken for granted and
they just have to be learned and applied. If scientists do not take them for granted, then
they would never get any detailed work done and we would never get science as we
know it. So this uncritical feature of normal science seems to be necessary and there is a
sense in which Lakatos recognises that scientists work in a framework that in some sense
they take for granted and do not criticise.

Lakatos also recognises that there are such things as scientific revolutions. He
recognises that these revolutions are complex affairs that do not take place only at an
instant as Kuhn insists but instead they are complicated processes that take maybe
decades to bring to effective completion. So Lakatos is trying to build these features of
Kuhn that he accepts into Popper's falsificationist account but in a way that he is going
to retain a rational account of scientific progress in a way that Kuhn fails to do.

Key Ideas in Lakatos' View

He points out that when scientists work on their theories, it's simply not the case
that all the assumptions that they work with are of equal status. Some are more
fundamental or essential than others that they in a sense more as define the theory.
Some assumptions are more general than others whereas others are more peripheral and
can quite readily be modified or changed or even thrown out when the need arises. He
picks out these very fundamental principles or claims within a science and names these
assumptions the "Hard Core" of a research programme. For example, in Darwin's
theory of Evolution, the key ideas or "hard core" are that there are random variations in
heritable characteristics and the idea of natural selection. But he suggested that various
assumptions have to be added to the "hard core" in order to solve a problem within a discipline. These additional assumptions are named by Lakatos as the "protective belt".

So according to Lakatos, a research programme contains hard core or central assumptions that do not get changed plus a protective belt. So what you actually do is tinker with the protective belt but not with the fundamental assumptions (hard core). That is, you tinker with additional assumptions to try and remove problems besetting the research programme. He points out that we can make any change we like as long as the change has some consequence that can be tested.

One non-Popperian aspect in Lakatos' methodology of research programme is the idea that what is important in the development of the research programme is the successes or confirmations rather than falsifications. So it is the positive successes that are crucial for understanding science from Lakatos' point of view. Novel predictions (predicting something new and not previously known) come about as a result of modifying the protective belt and then putting those suggestions to the tests and then at least occasionally finally getting it right.

A progressive research programme according to Lakatos is one that retains coherence to the extent that it does map out a programme and meets with at least occasional successes. These successes are going to be the confirmation of novel predictions. A degenerating research programme on the other hand according to Lakatos fails to meet with significant successes and various changes that are introduced to try to cure the problem. So this idea that progressive research programs eventually replace degenerating ones is Lakatos' attempt to rationalise scientific revolutions to say what it is that is better about the new programme as compared to the old.

**Thomas Kuhn's View of Scientific Revolutions**

In 1962, an American socio-historian, Thomas S. Kuhn made the biggest upset in the philosophy of science when he described how a scientific theory may be abandoned by most scientists and for reasons that are not necessarily fully rational. He called such events 'scientific revolutions'.

His view of science offers a major challenge to both the Positivists' and the Popperian current accepted beliefs. His general idea is that once you become familiar with the real thing then you could just see this big gulf between the simplistic formulations of the philosophers at one end and what science is actually like on the
other. He gives us an alternative way of looking at science based on a close look at the real thing as it were.

According to Kuhn, science evolves and is typically practised in a framework. When scientists work in science, there is a lot that they share and take for granted. This framework is called a Paradigm. That is scientists work in a paradigm.

What is a Paradigm?
According to Kuhn, the paradigm consists of the following:

- the fundamental laws or principles that make up science. For example in Darwin’s time, the Darwinian paradigm would involve fundamental principles like – there are random variations in the characteristics of offspring subject to natural selections.

- the various practices and procedures that are used in science to make the laws and principles applicable to particular cases. This refers to the whole range of theoretical and experimental techniques that are required to be added to the laws in order to make the science work in detail.

- tacit knowledge or knowledge that cannot be reduced to some explicitly stated principles. That is knowledge that we learn in practise and acquire through doing something and become familiar with that we gain a certain kind of expertise. According to Kuhn, this body of tacit knowledge is the important part of science. By doing it, we acquire this tacit knowledge.

- the standards on the work that we do within a paradigm. For Kuhn, the standards themselves can vary from paradigm to paradigm. For example, the idea of continental drift went against anything that could be allowed in Geology in the 1900s whereas in but a few decades, it became a standard part of Geology.

- the question of what basic kinds of things exist is answered by the paradigm. For example modern chemistry which talks about chemical elements. Today, there are more than 100 elements identified whereas previously, far fewer were known.

For Kuhn, normal science is the work that is done within a paradigm or the work that is done and guided by a paradigm. He insists that normal science is uncritical. His idea almost directly opposes Popper’s idea of science which insists that science is critical.
According to Kuhn, "normal" scientists take the paradigm for granted and work within it. What normal science deals with is trying to solve puzzles or trying to make the paradigm work in specific cases; so normal science according to Kuhn is uncritical puzzle solving — uncritical in the sense that the paradigm is taken for granted. What for Popper is a falsification is a puzzle for Kuhn. To Kuhn, in a science, you have an established framework or an established way of doing things; an established set of principles that you just have to become familiar with and come to accept and come to understand and be able to use before you can start doing the science. This is why he thinks that science is uncritical.

He also thinks that there is a pre-science period. In a pre-science period there is very little agreement about anything and the various practitioners in the field have to start from scratch because there is no generally accepted way or principle of doing things. According to him, what is involved in a move from the pre-science to a science is in a sense a move from lack of consensus to consensus. One view becomes dominant and once it becomes dominant, there is general agreement about what the fundamental principles are, the general set of techniques used, what counts as a problem and what counts as a solution etc. This is what is involved in a move from pre-science to science.

What actually distinguishes Science from Non-Science? For Popper, scientific theories are falsifiable yet not falsified. For Kuhn, a science is a science if there is: a consensus on the fundamental principles and a puzzle-solving tradition.

Paradigms according to Kuhn can run into trouble and he calls such an eventuality a period of "crisis". That is, a paradigm can experience a crisis and the ways in which it can experience a crisis are: when there is an increasing sea of unsolved problems or puzzles, all seeming to resist solution within the paradigm. When this situation occurs, scientists will try to make moves that break the rules of the paradigm. It can happen that one of these ideas meets with some significant success that may even solve some of the problems that worried the previous science. Because of the success, what starts to happen is that people abandon the old paradigm and begin to get converted to the new. A scientific revolution has taken place by the end of this process and a new paradigm evolves. To Kuhn the paradigms on either side of the revolution have no common measure. That is, the two paradigms do not have any sort of standards that you can bring to bear, to decide that one paradigm is better than the other. This is where there is a deep problem. The question is in what sense is the new paradigm better than the other?
He insists that there is this “gulf” which separates the paradigm on either side of the scientific revolution. It just happens and this is Kuhn’s real science. He is a firm believer in scientific progress. Every time we solve a problem within a paradigm, we have progressed one step, and the more problems we solve, the more progress we make.

However one can ask: In what sense is the move from one paradigm to the new one progressive? It is clear that when Kuhn is defending scientific progress, he thinks that science progresses in some sense through revolutions. So what is an element of science for one group or one culture need not be an element of science for the other group or the other culture. He says that the new paradigm is better problem solver than the old paradigm and that is the sense that is better. So not only is “what counts as a problem” paradigm dependent, “the kinds of solution that are regarded as adequate” are paradigm-dependent as well.

Kuhn in fact tries to have it both ways in regard to this issue. On the one hand he wants a reasonably clear sense in which science progresses, on the other hand the way he sets his own system up and the way he insists some thing like problems and solutions being paradigm-dependent means that he cannot really sustain a clear sense in which science progresses.

**What is good about Kuhn’s view of science?**

Kuhn’s view is that if we are going to have a decent philosophy of science, then we should take a close look at what actual science involves – both contemporary science and historical science. Kuhn does bring out this incompatibility between the simple minded formula of some philosophers of science on one hand and the actual science on the other. This seems to be a positive move. Philosophy of science has been transformed in the last few decades in the sense that it now heeds actual science.

The other good thing about his view is the emphasis he places on techniques. There is more to science than just the general principles of theories. There is all the apparatus and materials that are also involved in actually putting the theories to work and solving some real life problems.

His idea that normal science is non-critical is right in a sense. For example if scientists were all critical in the sense that they were quite free to wonder whether Newton’s second Law was a good idea or not, then the consequence would be that no detailed work would ever get done. So it seems that there is something right about Kuhn’s normal science.
We can use this notion of a detailed problem-solving apparatus which normal scientists employ to make distinctions – for example between Science and Pseudo-science or say Astronomy and Astrology. In a way, this seems to be far more superior to Popper’s perspectives in terms of the fact that Astronomy and Astrology are alike in a sense that they are falsified. What Kuhn says is what typically happens in a science. That is, we focus on this problem and see what changes we can make to solve the problem. In many cases, this is what happens. A good example to illustrate this is the Planet Uranus moving out of accord with the prediction of Newtonian mechanics. What happened is that scientists worked on this and this led them to discover the Planet Neptune which solved the problem. So whereas for Popper a falsification just tells us that we are wrong and that we have to look elsewhere in terms of new theory, for Kuhn, these falsifications pose the puzzles that scientists typically work on.

There is a sense in which Kuhn is right when he highlights this notion of a scientific revolution. He is right in the sense that progress in science is not simply cumulative. The important question to ask is: Would proven law remain unproven? The answer is “No”. In the history of science, what happens is there are disruptions that the very fundamental principle gets replaced by a quite different principle. For example: from Aristotle to Newton; from evolution before Darwin to evolution after Darwin; from Geology before tectonic plates to Geology after tectonic plates etc. All these changes involve many disruptions; so the fact that there is revolution is an important one.

**Problems with Kuhn’s View of Science**

Kuhn has some problems in his view or philosophy of science. One of them is the way he talks about scientific revolution in terms of the way he emphasises the gulf between the paradigm that gets replaced in a scientific revolution and the new paradigm or the one that does the replacing. He emphasises that if we are in one paradigm, we see the world one way and if we are in the other paradigm, we see the world in another way and to such an extent that the two paradigms are incommensurable. That is, there is no common measure and so we constantly necessarily talk through each other. Because of that, the change from one paradigm to another cannot be rational or cannot be argued.

Kuhn states in his book that the transition between competing paradigms must occur all at once (not necessarily an instant) or not at all (Kuhn, 1970). There is confusion between this sentence in terms of what it can mean for the paradigm to change to another all at once but not necessarily an instant. The way he mainly talks about
scientific revolution is not talking about what is going on in people's heads at all. He is talking about what kinds of things paradigms consist of; about laws, techniques, standards etc. All these things are not private things that are hiding in a person's head. In fact they are public things that can be learned and improved or argued about and replaced.

According to Popper, if we want a decent account of science, we need to be able to discriminate and evaluate. Merely describing science like what Kuhn does is not enough. Our theory should prescribe things for science. The question is: Why does science need normal science? Kuhn's answer to this question is that unless you have periods of normal science, (where the fundamentals are taken uncritically), you will never get any detail work done. Both normal science and scientific revolution play a key function in science for Kuhn. However, his account is merely descriptive which seems to be a drawback for him.

Paul Feyerabend's View about 'No Single Method'

Paul Feyerabend tends to take Kuhn's ideas a step further towards a more sceptical and relativist position by declaring that scientists have no single method and that there is no hard and fast way of limiting science from mysticism, magic and voodoo. He thinks that there is no single or fixed method of science as the rationalists like Bacon, Popper and Lakatos declare.

Whereas Bacon, Popper and Lakatos think that there is a correct scientific methodology which provides the means of making a rational choice between competing theories, Feyerabend on the other hand thinks otherwise. He thinks in the same way as Kuhn that there is no unique correct methodology of science. He thinks that different methodologies are employed for all sorts of reasons and that scientific knowledge is not different from other forms of knowledge. Feyerabend (1975) declares that it would be difficult to describe science by using fixed rules especially when historical evidence is considered. For example he writes:

The idea of a fixed method, or a fixed theory of rationality, rests on too naive a view of man and his social surroundings. ....there is only one principle that can be defended under all principle that can be defended under all circumstances and in all stages of human development. It is the principle: anything goes. (pp. 23, 27-28).

A good example to illustrate what he tries to drive at concerns Galileo's defence of the Copernican theory. Copernicus theorised that the Earth is rotating. Galileo agreed but argued that nevertheless if an object is to be dropped from the top of the tower, the
object should land at the base of the tower rather than many meters away from the base. Yet Aristotle would have taken the same fact to falsify Copernicus’s theory. According to Feyerabend, Galileo makes a new interpretation of empirical results (object falling at the base of the tower). He defends Copernicus’s theory in a way that completely restates what was to be counted as evidence and how it was to be interpreted. This according to Feyerabend means that Galileo makes use of ad hoc adjustments in order to overcome his initial objection to the Earth’s motion and at the same time to give some space for the development of the Copernican theory. This shows that the history of science can deal with any methodological rule depending on what reasons the researcher desires. His general conclusion is the non-existence of proper scientific methodology. He also argues that in science, it is normal to have more than one theory existing in a given field at any one time. In fact the competition in theories is what gives rise to progress in science.

He argues that science is one type of belief system amongst many others and is not of higher status than any other belief system. It is characterised as a belief system because people believe the claims made by science. He thinks that myths, voodoo and witchcraft are also examples of belief systems which have common traits and are based in the natural world as science. Myths as well as science according to him are highly developed systems of belief based on observations. They begin with experience in terms of observations and then they are developed theoretically. In this sense, they follow the same general path as a science.

One weakness in Feyerabend’s argument on the parallel between science and other belief systems such as myth, witchcraft or voodoo is that he fails to show how witchcraft explains the world. Scientific theories are different for the fact that it can qualitatively explain and quantitatively predict things to some degree of accuracy. However, how witchcraft or voodoo does this, is not explained by Feyerabend.
Appendix C

CONSENT FORMS

CONSENT FORM FOR TEACHERS, PARENTS AND COMMUNITY MEMBERS.

An Exploration of the Nature and Context of Teaching and Learning of Science at Ethnic Fijian and Indo-Fijian Primary Schools in Fiji

After the project was explained to me by Mr. Dakuidreketi, I understand what his project is about. On this basis, I agree to participate in the project.

I agree that:
• he can observe my class. Yes/No
• he can interview me during the course of the study. Yes/No
• my interviews will be audio recorded. Yes/No

I understand that I am free to stop participating in his project for any reason at any time. I also understand that I will be given the chance to listen to my interview replay. At that time, I can change or withdraw any comments I might have made during my interview.

I consent to the result of the project being written up by Mr. Dakuidreketi with the understanding that the data collected will be confidential and anonymity will be preserved.

Name: ____________________________

Signed: ____________________________ Date: ____________________________

Contact Address: __________________________

Signed by Researcher: __________________________ Date: ____________________________
CONSENT FORM FOR STUDENTS

An Exploration of the Nature and Context of Teaching and Learning of Science at Ethnic Fijian and Indo-Fijian Primary Schools in Fiji

My teacher ___________________________ has explained to me about the above mentioned project that we are going to take part in. I understand that my activities inside and outside the school will be observed by Mr. Dakuidreketi during the course of his stay at the school.

I agreed to be interviewed by Mr. Dakuidreketi at any time convenient to him. I also understand that my interview will be recorded in audio tape and that if I do not want to carry on doing the interview, I do not have to and I can stop. I also understand that I will be given the chance to hear, modify or delete any part of my interview which I do not want to be recorded when the tape is replayed to me after the interview by Mr. Dakuidreketi.

I consent to the result of the project being written up by Mr. Dakuidreketi with the understanding that the data collected will be confidential and anonymity will be preserved.

Name: ______________________________________

Signed: ______________________________    Date: __________________

Contact
Address: ______________________________________

Signed by Researcher: ______________________    Date: __________________
Appendix D

Letter to New Zealand Primary School Principal

The Head Teacher/Principal,

Dear Sir/Madam,

I would be very grateful if you could allow me to conduct some classroom observations of the teaching and learning of science at your school.

I am a post-graduate Fijian student doing my Ph.D. study at Canterbury University in New Zealand. As a requirement of my study, I am interested in exploring the nature and context of teaching and learning of science at Ethnic Fijian and Indo-Fijian primary schools in Fiji. My aim is to find out why Ethnic Fijian students do not achieve as well in school science as do their Indo-Fijian counterparts.

I will be doing my field work in Fiji shortly (at the end of May this year) but observations on the teaching and learning of science at primary level schools in New Zealand should help me a lot in doing my research in Fiji. It will enable me to compare the teaching approaches used by teachers to teach science at this level. This observation may also help me to determine ways of improving or enhancing science teaching and learning at Ethnic Fijian Primary and Fiji Primary Schools as a whole and may also help our present and future students to succeed better in science at Primary and higher level education in Fiji.

I will therefore be very pleased if your students and teachers are informed about my intention to do some observations inside and outside the class room during my visit.

I will be happy to discuss any concerns you may have about your teachers' and students' participation in this observation. I can be contacted either by telephone: 64(3)3411500 (Ext 54443) or mobile: 0211466760 or by fax: 64(3)3642418.

Your acceptance to my request is very much appreciated. I am looking forward to your favourable response and consideration.

Yours faithfully,

Mesake Rawaikeka.
Appendix E

Focus Area of Interview (Based on Research Questions)

Research Questions

Why are Ethnic Fijian students not doing as well in science at school when compared to Indo-Fijian students? What is their under-achievement at school related to? Is it related to the teaching of the subject at school or to other factors? If so, what other factors? Could it be related to the fact that Ethnic Fijian students tend to find the subject difficult or do they tend simply not to find it interesting or pertinent? Either way, what are the reasons?

Theme Area of Interview

1. Students' and Teachers' Perspective on Teaching and Learning of the Subject.

The following questions are to examine the role of the teacher and the expectations of both children and teachers about this role. For example: Is this role directive? Is the teacher seen as authoritative and restrictive? Or is the teacher seen as a facilitator, and in that role very open in his approach etc. The following questions aim to determine what science teaching is in fact like and also what both children and teachers believe it ideally should be like.

* To Children: Activities at school

(Remember to use immediate recall type questions - and not mainly general notion type questions).

* Find out whether or not the student has any interest in school. e.g. Tell me, do you like or enjoy going to school? What do you like about it? About school, do you think it is important? Why? What do you hate about school? Tell me what are the subjects you like at school? Why do you like the subject? What about science? Do you like it or not? Why? What do you hate about science?

* In what way he or she find the learning of the subject important for him or her? e.g. Do you think that science is important? If so, how? If not, why not?

* Imagine you were the teacher in science. What would you do? [Followed by:] If you were the teacher, how could you make the science lesson
fun? [Followed by:] If you were the teacher, how could you best help the children to learn about science?

* Who is your favourite teacher? Why do you like him or her? Who is not your favourite teacher? Why don't you like him or her? Do you like the way he or she teaches? When he or she takes you in science, do you like it or hate it? Why?

* What things do you get to do as part of learning about science? Is that fun for you? What do you most like about learning about science? What don't you like?

* To Teachers:

* How long have you been teaching? What do you teach? What's your favourite subject at teaching? Why? Tell me when do you develop this interest? At what level? Why? Do you still have the interest in the subject now?

* How do you teach the subject you like above? Do you teach it in the same way as you teach other subjects? How is that different/same than what you do in your science teaching? [What things do you do as a teacher of science that you can remember your teachers doing? What things do you do as a teacher of science that your teachers never did?]. What is the most important thing you can do as a teacher of science?

* Please describe your favourite science lesson. What did you do when you give this lesson? What do the children do when you give this lesson? Was the teaching effective for the understanding of the subject? How do you know if your teaching was effective?

* Please imagine a worst-ever science lesson, maybe one you actually experienced as a child, maybe one you gave when everything went wrong. In any case, please imagine for a moment a teacher giving a worst-ever science lesson. What is bad about the lesson you are imagining? In this lesson, what does the teacher do? What do the children do?

* How do you prepare your students for their tests and examinations? How often do you conduct tests? What type of questions do you give students in their tests? Some teachers use previous year's National examination papers as a guide to constructing their tests or internal examination
questions. Do you also do this or construct your own test papers? Why? How do you find your method of preparing students for examinations work in enabling students to pass the subject at National examinations? Why do you do it that way? Do you do this with other subjects too?

- What is the best way you think your students should be taught in order to understand the topic well and why do you think that? Do you use the same approach in teaching science? If yes or no, why?
- Find out what teachers think of the curriculum.

2. Students' and Teachers' Perspective on the roles and activities played by students and parents at Home.

- To Children and Teachers: Activities and Roles at Home

- Find out from students what they do when they return home from school in the afternoon.
- Find out from them about the activities and the roles played by their parents at home.
- Ask teachers on this area too.

Research Questions

Is what the students learn at school viable within the context of their cultural and traditional up-bringing? If yes or no, in what way? Are there other factors? If so, what are they?

Theme Area of Interview

3. Parents, Teachers and Community Members' Perspective of Formal Education and Science Learning by their Children.

- Schooling versus traditional community practice.

- Find out how do parents, teachers or community view or perceive the practice of schooling (school science) to their traditional village or community practices.
- Do they have negative or positive perceptions of the value of schooling and why?
• Which type of learning - school subjects or village lore they think best prepared their students for life in their community or village - (a place where most are destined to live out their lives)? Why do they think so? In what way it is preparing or not preparing their children for life in their community or school?

• Practicality of science learned at school to daily village or community life.

• Any relevance of the science children learn at school for their daily life of the village or community? If yes or no, in what ways they are relevant?
• Do they apply these to enrich the existing village or community practices such as for example cooking, gardening, fishing etc.? If no why?
• Are the new ways they learn from school regarded as more or less productive or as leading to or not leading to improvement in the quality of living?

• Value of education.

• How do parents value schooling as compared to other things like church or religion? Is schooling in terms of science learning perceived to be valuable for village life? If yes, in what respect? e.g. could be its economic respect in bringing money to the family.
• What is the parents' expectation of their children? e.g. as future income earners etc. Do parents perceive that gaining a job leads to making money?
• How do they regard people having more money? e.g. highly or lowly. They may not widely regard education as a valuable experience unless students subsequently obtain a job and repay all monies spent by their parents on their education.
• Can things learned in science at school be applied successfully in the village or community without money? Money could be a problem in villages which give rise to students not applying what they learn at school in their village or community.
Activities and role of parents at home

- Ask parents about the activities they do at home and the type of activities they give to their children at home.
- Do they carry out their roles in caring for the child at home? If yes or no, find out why?

Land

- Could it be that Indo-Fijians work hard at school because of no land? Could it be that Ethnic Fijians do not work hard at school because land is readily available for them?
- Ask parents, teachers and community members what they think about this.

Ways of thinking in oral culture versus scientific culture.

- Look at the human level in terms of their traditional knowledge system and beliefs of the two ethnic groups.
- Find out about the traditional knowledge system especially in terms of how it works and whether there is any sort of proof in their belief system. Do they have any knowledge or thought system in the first place? How do they know that what they believe is true knowledge?
- Do they see any differences in their way of thinking and the so called scientific thinking? Any similarities?
Appendix F

Observation Sheet

Date: ____________  Class/Year: ____________  Duration: ____________
Day: ____________  Teacher: ____________  Time: ____________
Site: ____________  Subject: ____________  Class Roll: ____________
School: ____________  Topic Covered: ____________  Number Present: ____________

Classroom Sketch with Student’s Sitting Arrangement

For Example:

![Classroom Sketch]

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Observer’s Table

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Salient Points &
Why:

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Questions to be asked or clarified from further observations:

Comments on Observation Experiences:
Appendix G

LETTER TO HEAD OF SCHOOLS CHOSEN FOR THE STUDY

Investigation of the Teaching and Learning of Science at Primary Level Schools in Fiji

The Head Teacher/Principal,

Dear Sir/Madam,

I would be very grateful if you could allow me to conduct my field study at your school at the beginning of the second term this year (2001). You are requested to permit your teachers and students to participate in the above-named research project.

I am a post-graduate Fijian student doing my Ph.D. study at Canterbury University in New Zealand. As a requirement of my study, I am interested in exploring the nature and context of teaching and learning of science at Ethnic Fijian and Indo-Fijian primary schools in Fiji. My aim is to find out why Ethnic Fijian students do not achieve as well in school science as do their Indo-Fijian counterparts.

I will be very pleased if your students and teachers are informed about my proposed visit and my intention to do some observations inside and outside the classroom and also conduct some interviews with them during this visit.

I intend to record interviews with some of your teachers, students and school community on audio-tapes with their prior consent. You are assured of the complete confidentiality of the data gathered in this investigation. Only I and my two supervisors in New Zealand (Dr. Baljit Kaur and Dr. Philip Catton) will see the data. Identity of teachers, students and the school community will not be made public.

This particular research of mine is important for the following reasons:

1. It may help to determine ways of improving or enhancing science teaching and learning at Ethnic Fijian Primary and Fiji Primary Schools as a whole and may also help our present and future students to succeed better in science at Primary and higher level education.

2. The study may indirectly help in bridging the gap between Ethnic Fijian and non-Ethnic Fijian achievement in science at all school levels in Fiji.
3. It could indicate potential areas of further research and inform policies and decision making for improving science teaching and learning at Ethnic Fijian Primary.

I will be happy to discuss any concerns you may have about your teachers' and students' participation in the project. I can be contacted either by telephone: 64(3)3411500 (Ext 54443) or mobile: 0211466760 or by fax: 64(3)3642418.

Your acceptance to my request is very much appreciated. I am looking forward to your favourable response and consideration in taking part in this project.

Yours faithfully,

Mesake Rawaikele Dakuidreketi.

........................................................................................................

Please indicate with a tick in the box provided below whether or not you accept my request to conduct my field study at your school during my visit. Tear off this part, place it in the pre-paid envelope provided and drop it in any nearest post office around your area.

☐ I accept your field study to be conducted at my school.

☐ I do not accept your field study to be conducted at my school.

Thank You
Appendix H

Examination Analysis Sheet

Dioka Primary School

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Examination

Analysis Sheet

Year: _______  Subject: _______

Class: _______  Possible Mark: _______

Number in class: _______  Highest Mark: _______

Number Sat: _______  Lowest Mark: _______

Number Passed: _______  Class Median: _______

Number Failed: _______  Standard Deviation: _______

WEAKNESSES NOTED

__________________________________________________________________________________

__________________________________________________________________________________

REMEDIAL MEASURES

__________________________________________________________________________________

__________________________________________________________________________________

__________________________________________________________________________________

PUPILS NEEDING MORE ATTENTION

__________________________________________________________________________________

__________________________________________________________________________________

__________________________________________________________________________________

/ / /

CLASS / SUBJECT TEACHER

DATE
Kristi Primary School

Analysis Sheet

Examination: Year: ________

Remedial Measures Sheet: Class: ________

No. In Class ________ Subject______________ No. Passed ________

No. Tested ________ No. Failed ________

Highest Mark ________ Lowest Mark ________

Class Average % ________

ANALYSIS OF COMMON ERRORS

____________________________________________________

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REMEDIAL MEASURES TAKEN

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____________________________________________________

SIGN. ________________________ SIGN. ________________________

Class Teacher

Subject Teacher

Head Teacher