AN INVESTIGATION

INTO VARIABLES ASSOCIATED WITH

CURIOSITY BEHAVIOUR IN PRE-SCHOOL CHILDREN

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by

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CHAPTER I

INTRODUCTION: THE IMPORTANCE OF CURIOSITY TO THE EDUCATIONAL PROCESS

Curiosity is a topic which has been frequently mentioned in educational literature, appearing in philosophical works and historical treatises, as well as in more recent research publications. Most of the earlier references were based on assumptions with no empirical foundations, but following the increase, over the last fifteen years, of psychological research on the subject together with proliferation of theoretical formulations, current educational writings tend to be derived from, or supported by, experimental findings.

Evidence will be presented in this chapter showing the importance of curiosity to education as well as the background to the question underlying the investigation. Curiosity as an educational topic will be discussed first, followed by an outline of theoretical interpretations, and finally a reassessment of the field with delineation of the problem area.

A. VIEWS EXPRESSED BY EDUCATIONAL WRITERS

One of the earliest to discuss curiosity at length was Rousseau (Boyd 1956, p.71) in "Emile", where he mentioned
it during his consideration of the third stage of childhood, from twelve to fifteen years. He said:

It is the same instinct that animates the different human faculties. To the activity of the body with its urge to growth succeeds the activity of the mind eager to learn. Children begin by being restless; then they become curious; and this curiosity when rightly directed becomes the driving power of the age we have now reached .... There is a quest for knowledge which comes only from the desire for reputation as a scholar: another which springs from natural curiosity about anything interesting, near and far. The innate desire for happiness and the impossibility of finding complete satisfaction for it prompt an unceasing search for new sources of interest. Such is the basic principle of curiosity, a principle natural to the human heart but dependent for the measure of its development on our passions and our intelligence.

Arousal of the child's curiosity was seen by Rousseau to be an important aspect of the teaching process and was an integral part of his method, as is shown in the following quotation: "Be content to show him things at the right moment. Then when you see his curiosity is sufficiently active, ask him some brief questions that will set him searching for an answer". (ibid. p. 74)

Curiosity was similarly regarded as a spur to learning by Pestalozzi (Green, 1912, p. 104) who considered curiosity to be part of the sensory responsiveness of human nature. As such it was the second of the three sources from which he derived his laws that govern the intellectual development of man. This "capacity for response to stimuli" he described as vacillating "between the inclination to learn
and to know everything and the love of passive enjoyment which deadens the desire for knowledge. Curiosity stirs up our native inertia, and our inertia represses our native curiosity". In a rather obscure discussion that followed, he indicated that he regarded curiosity as the sensory foundation of the capacity to investigate, or "the capacity for acquiring experience".

A different aspect of curiosity was mentioned by Marcel, in a brief quotation by Spencer, (1949, p. 52) who said that the child's "natural desire of variety should be indulged, and the gratification of his curiosity should be combined with his improvement". The linking of curiosity with the need for variety is one of the more recent theoretical concepts to be put forward as an explanation of curiosity and exploratory behaviour.

That intelligence and curiosity are associated, implied by both Rousseau and Pestalozzi, was also the view held by the modern philosopher, Russell (1960, p. 42). After defining intelligence as the aptitude for acquiring knowledge, and explaining that he regarded the cultivation of intelligence as one of the major purposes of education, he specifically stated that, "The instinctive foundation of the intellectual life is curiosity ... Intelligence demands an alert curiosity". He disassociated this curiosity from
"the sort that leads village neighbours to try to peer through curtains after dark".

Curiosity properly so-called ... is inspired by a genuine love of knowledge. You may see it .... in children .... whose thirst for knowledge puts the most intelligent adults to shame. This impulse grows weaker with advancing years, until ... what is unfamiliar inspires only disgust, with no desire for closer acquaintance .... with the death of curiosity we may reckon that active intelligence, also, has died.

However, in his opinion, curiosity could improve in quality for a long time after childhood, even although it could also lessen in intensity and extent. He considered that curiosity about general propositions showed a higher level of intelligence than curiosity about particular facts, and that if curiosity was to be fruitful it must be associated with "a certain technique for the acquisition of knowledge". This he described as "habits of observation, belief in the possibility of knowledge, patience and industry". To overcome the tendency of curiosity to conflict with other passions, he advocated the cultivation of open-mindedness as an additional intellectual virtue.

The need for research to clarify the issues relating to curiosity behaviour is evident from statements such as Russell's, and Bruner (1963, p. 50) reflected this when he said "There has been much written on the role of reward and punishment in learning, but very little indeed on the role
of interest and curiosity and the lure of discovery."

The effect of this on education was considered by Arnstine (1966) in an article in which he discussed the "persistent pedagogical problem" of how to get the student to learn. His argument (p. 595) was that

It is commonly known that people often find things out when they are curious and that the satisfaction of curiosity seldom discourages curiosity in the future. It would seem sensible, then, to get students curious about the studies we offer to them. Yet it is hard to do this, for we are not always clear about what it is that makes a person curious.

He felt that curiosity had "great potential for learning and schooling", but that many schools could not utilize it as an aid because pressure-creating goals were encouraged which inhibited curiosity. In his view curiosity appears when people are "relieved of the pressures of strong needs or goals, and when they want to find things out". It would thus appear to be an internal condition which is prevented from operating by externally-induced goals.

He felt that the task of the teacher was to provide the right conditions for the encouragement of curiosity, but that this was made difficult by lack of understanding.

Although educators seem to be in general agreement about the motivational value of curiosity, there have been some who disagree. Friedlander (1965, p. 24) for example, criticized the idea that children in their natural state
are "steady, burning flames of curiosity", and added that he "doubted very much" whether most teachers' daily experience matched that "hyperbolic view of children's love of learning". (p. 25) He did not consider curiosity alone would supply sufficient motivation for the mastery of today's curricula.

In direct reply to this, Arnstine (1966, p. 601) commented that what is normally called curiosity is often confused with other types of behaviour, especially with the sort of problem-solving which he described as being "cued by an obstacle to an ongoing activity, and with the need for social intercourse". He added that, "These confusions have led to the opinion that curiosity is difficult to exploit, and that it has doubtful value for cognitive development". He concluded (p. 602):

.... it seems to me that nobody has ever tried to deal with an intellectual problem without being curious about it, and that this ought to be taken into account when we consider schooling. If we are to achieve our hopes with regard to the intellectual content of the school curriculum it may be necessary for us to find something for students to be curious about.

Educators on the whole thus consider curiosity to be an integral part of the individual's natural or spontaneous search for knowledge, which should be recognised by the teacher as a component of the learning process and utilized accordingly. The practical application of curiosity in
the classroom is therefore motivational. Harnessing the natural desire of the pupil to learn is seen as a solution to the problem of making the pupil interested in the material to be learnt. The main practical problem envisaged by educators appears to centre around the conditions necessary for the arousal of curiosity.

B. INSIGHT FROM RESEARCH

Until comparatively recently those engaged in behavioural research tended to overlook the more recreational aspects of behaviour, such as play and investigatory activity, which are characteristic of both animals and men. Fowler (1965) has reviewed the research relating to these activities up to 1965, mostly based on animal studies, and has outlined the changes which have occurred in theories of behaviour necessitated by the challenge of curiosity and exploratory behaviour. Systematic research on the subject, begun in the early 1950's, has been concerned with answering the same questions posed by educational writers, namely: What is curiosity? What causes it to occur? What function does it perform?

Definitions. The term 'curiosity' has generally been used synonymously with exploratory behaviour although the dictionary definitions imply a difference. The Concise
Oxford Dictionary gives the following definitions:

curiosity: eager to learn; inquisitive
explore: inquire into; examine .... by touch

Fowler (ibid. p. 23) discussed them together as "A Behaviour Without a Definition" and said that the task of definition was difficult because "there appears to be no goal object or condition to and for which the organism responds". He favoured Berlyne's definition which made a distinction between intrinsic and extrinsic exploratory behaviour, the difference being that extrinsic exploration has a clearly discernible goal object, whereas intrinsic exploration, or curiosity, refers "to those behaviours that seem unrelated to any goal object". Berlyne (1966, p. 25) referred to them as being sought "for their own sake", and pointed out a distinction between Western countries, where the behaviours are known as "exploratory", and Eastern Europe where they are called "orientational-investigatory activity". He distinguished between the two types of curiosity activity, both of which he considered to be examples of specific exploratory behaviour. The first of these he called perceptual curiosity, which he has shown to be elicited by exposure to "collative" stimulus properties of novelty, surprisingness, complexity, ambiguity and incongruity, while the second was termed epistemic
curiosity, which he felt tended to characterize human exploratory behaviour.

The use of this term is proposed in order to indicate that it is aimed not only at obtaining access to information-bearing stimulation, capable of dispelling the uncertainties of the moment, but also at acquiring knowledge — that is, information stored in the form of ideational structures and giving rise to internal symbolic responses that can guide behaviour on future occasions. (Ibid. p. 31).

He has described curiosity as "intrinsic motivation" (1965, p. 70-71), defined as activities that are performed because they are "satisfying in themselves" or "self-reinforcing", and which "depend for their reward-value on events in the central nervous system rather than ... events in other tissues", and considered thinking to be another form of epistemic behaviour. He made a further distinction (1966, p. 26) between specific exploratory behaviour which results from "a lack of information", and diversive exploration, which is a search for stimulation regardless of source or content, that offers an "optimum amount of novelty, surprisingness, complexity, change, and variety" and is "not preceded by receipt of partial information about the stimulus patterns at which it is aimed". It was not considered to be motivated by curiosity. Berlyne has thereby distinguished two aspects of exploratory behaviour, one motivated by curiosity and the other not, and curiosity
he described as "the condition of discomfort, due to inadequacy of information, that motivates specific exploration".

It thus appears that Berlyne's definition offers the same distinction between curiosity and exploratory behaviour that is apparent from the dictionary definition, i.e. that curiosity is a covert motivational state which gives rise to overt exploratory behaviours. Exploratory behaviour could equally be called curiosity-motivated, or curiosity behaviour.

Berlyne's description, which is probably the most comprehensive, is supplemented by several more behaviourally oriented and objective definitions which seem to identify the characteristics of curiosity-motivated behaviour. The most frequently used definition from this source is that formulated by Maw and Maw (1961, p. 167) which is as follows:

An elementary school child is said to exhibit curiosity to the extent that he:

a) reacts positively to new, strange, incongruous or mysterious elements in his environment, by moving towards them, exploring them or manipulating them,

b) exhibits a desire or need to know about himself and/or his environment,

c) scans his surroundings and seeks new experiences,

d) persists in examining and exploring stimuli in order to know more about them.

Several other definitions have been formulated to guide research. Smock and Holt (1962, p. 631), based on Berlyne,
said:

Curiosity motivation is generally inferred from instrumental actions that function to increase the organism’s contact with new or different environmental objects. These actions may be such as to: (a) increase the level or quantity of sensory input; (b) increase the perceptual clarity, or number, of objects perceived; (c) increase verbal behaviour that elicits information from others; (d) increase avoidance of familiar objects or environmental situations.

Penney and McCann (1964, p. 324) made a distinction between reactive curiosity and other forms of curiosity since "a child may be curious but may not react to his curiosity".

Their definition of reactive curiosity is:

(1) a tendency to approach and explore relatively new stimulus conditions, (2) a tendency to approach and explore incongruous, complex stimuli, (3) a tendency to vary stimulation in the presence of frequently experienced stimulation.

Several other, less encompassing, definitions have also been used, for example McReynolds (1958, p. 321) defined curiosity and exploratory behaviour as a "tendency to explore novel percepts", and made a distinction between curiosity and "object curiosity". Penney, (1965) referred to "object curiosity" as being limited to the exploration of specific objects, while he and McCann (1964) earlier considered it to be part of reactive curiosity. However, it appears that their definitions are similar to Berlyne’s concept of specific exploratory behaviour, without making
his more precise distinction between perceptual and epistemic curiosity. Maddi (1961, p.254) distinguished three types of exploratory behaviour, i.e. orienting response, investigatory response and play, while Maddi, Propst and Feldinger (1965, p.84) described curiosity as being a search for new information, and exploratory behaviour as "the degree to which attention is given to aspects of the stimulus environment," neither of which gives the precision of Berlyne or Maw and Maw.

In answering the question "What is curiosity?"
Berlyne's definition is probably the most useful, but in identifying curiosity behaviour from its behavioural context, the definition given by Maw and Maw, formulated for use in the classroom, has been most frequently used and is less subjective in its application.

From the definitions offered in the literature, therefore, it can be said that an organism shows its state of curiosity, about any event or situation in the environment, when it looks, approaches, establishes and maintains contact by sensory investigation and manipulation, as well as actively seeking additional stimulation by searching and extending contact with its surroundings.

The question as to what causes the arousal of curiosity is partly answered by Berlyne's list of collative stimuli,
and partly by the theories that have arisen from the research in order to explain the behaviour. Early
investigators in the field quickly found that animals responded to new, changing or unfamiliar stimuli and subsequent research tended to concentrate on the two stimulus properties of novelty and complexity. Berlyne has again been one of the main contributors to study in this area, and his list of stimulus properties known to evoke exploratory behaviour appears to include the stimulus factors covered by other investigators. He said (1966, p.30) that "what is explored and how vigorously, depends on many factors inside and outside the organism", and delineated three groups of stimulus properties which influence exploratory behaviour. (Ibid.) These were:

Firstly, psychophysical, closely associated with physico-chemical variables, e.g. brightness, loudness and colour, all of which are derived from distributions of energy.
Secondly, ecological, "dependent on association with noxious events or visceral gratifications", and these connect stimuli with the factors that govern natural selection.
Thirdly, collative, since they "depend on comparison or collation of stimulus elements, whether they be elements appearing simultaneously in different sectors of a stimulus field or elements that have been perceived at different times. They comprise the properties that we designate by words like novelty, surprisingness, incongruity, complexity, variability, and puzzlingness. (Part quote)

He considered that the collative variables have close connections with information theory, and that the property
which they all have in common is conflict—"between incompatible neural, and ultimately motor reactions that are simultaneously mobilized".

A property of the stimuli capable of evoking curiosity and exploratory behaviour which he noted, as others have done, is that stimuli that are capable of exciting curiosity and exploratory behaviour can also evoke fear and flight. The condition of the organism and intensity of the stimulus determine which response occurs.

Theoretical Interpretations: From Fowler's (1965) review of research on curiosity and exploratory behaviour, five major theoretical formulations may be identified.

1. The instinct theory: (Fowler, ibid. p.9; McDougall, 1933, p.143) Curiosity was included in McDougall's list of instincts, and was considered to be "displayed as a prelude to some other mode of action". He described it as having no specific object, but able to be activated by imperfect apprehension or perception. Novel or unusual objects were considered to excite curiosity because they resembled objects that normally evoked other instincts but were not sufficiently strong to do so. The instinct explanation was not a sufficiently scientific explanation, as Fowler observed, and was eventually superseded by the drive concept.
2. **Drive theory:** Within this framework, which postulated an exploratory drive to account for investigatory behaviour, two concepts became differentiated, firstly the concept of curiosity and secondly the concept of boredom. Exponents of the curiosity concept, principally Berlyne, Montgomery and Harlow "maintained that external forms of stimulation that were both mild and novel motivated the animal to explore and investigate these forms of stimulation. The animal became 'curious' of the novel or unfamiliar stimuli and, hence, responded to them". (Fowler, 1965 p.31). Thus the novel stimulus was considered to arouse curiosity and then cause it to diminish with repeated exposure, or habituation. Theorists associated with the boredom concept, chiefly Myers, Miller and Glanzer, formulated the concept that the organism responded to familiar and unchanging stimuli. Thus a change in stimulation, by a novel or unfamiliar stimulus, reduced the drive to explore. Both these viewpoints conceived exploratory activity to be externally elicited, and Fowler considered that both could be incorporated within one account, which happened with the later concept of optimal stimulation. Empirical studies which demonstrated the reinforcing nature of a mild or moderate change in stimulation gave support to the boredom formulation, however, but led to the rejection of the
original curiosity concept and its eventual incorporation within a new conception.

3. The incentive-motivational construct: This concept, developed within drive theory by Hull, and Spence, was first applied to curiosity and exploratory behaviour by Fowler. Both the curiosity and boredom concepts were integrated within this theory, which conceptualized curiosity as a learned anticipatory response to novel or unfamiliar stimuli. It was not considered to be present on the first appearance of the stimuli, and could not, therefore, be an innate response. The novel stimuli were considered to act as incentives, or goal objects, which the organism came to anticipate as a result of previous encounters, and the strength of the motivation which stemmed from the anticipation (i.e. curiosity) depended on the intensity of the stimulus. Thus, motivation arising from curiosity, or anticipation, was a form of classical conditioning involving feedback from the goal response and which led to fractional anticipatory goal responses as well as anticipatory feedback. In this way curiosity behaviour was considered to result from the anticipation of a novel stimulus, and therefore could occur before the onset of the stimulus, which would account for curiosity behaviour or investigatory activity with no
observable goal object. This could explain curiosity and exploratory behaviour which resulted from boredom, i.e. from the anticipation of the change that would occur if the organism acted on the environment. The response, or curiosity behaviour, which arose in such circumstances would be instrumental in effecting the desired change, thereby reinforcing the tendency of the organism to respond to such stimulation. In this connection, Fowler (1965, p.42) said:

Specifically, drive motivation (boredom) may be defined in terms of the animal's length of exposure to or "familiarity" with a relatively unchanging stimulus condition, or conversely, in terms of the animal's length of deprivation of a change in stimulation. Incentive motivation (curiosity), on the other hand may be defined in terms of the magnitude of the exploratory incentive - that is, the magnitude of the change in stimulation that the animal experiences upon performing some instrumental response for stimuli that are novel, unfamiliar, and so on.

If, as this theory suggested, curiosity is a learned anticipatory response, rather than an innate one, the implications for education are considerable.

4. The concept of optimal stimulation: Views put forward by Leuba and Hebb independently formed the basis for a new explanation for curiosity behaviour, but still within the context of drive theory, whereby "both decreases and increases in drive (arousal) could be reinforcing (or motivating ...) depending on the organism's momentary level of total stimulation and arousal." (Fowler, 1965, p.64)
Fowler compared this conception to Cannon's earlier doctrine of homeostasis. Two independent but similar concepts arose within this framework. The first, developed by Fiske and Maddi and outlined by Fowler (ibid. p.63) described the organism behaving "so as to maintain (through increments and decrements) an intermediate or optimal level of arousal, arousal being directly related to stimulus impact." The organism was thus considered to exhibit curiosity behaviour because it increased the total stimulus impact or decreased it, thus serving to sustain its normal or optimum level of activation or arousal. Berlyne's theory, on the other hand, "suggests that the animal performs to reduce arousal .... arousal is high not only under stimulus conditions that are very novel or unfamiliar, but also under those conditions that are very familiar or monotonous." (Fowler, ibid.) These two conceptions were criticized by Fowler, Fiske and Maddi's because of basic inconsistencies which he felt led to paradoxical predictions, and Berlyne's because he did not consider that it adequately replaced the drive theory that it was supposed to do. However, he felt that Berlyne's theory was more consistent than Fiske and Maddi's, and was useful "because of the convergence of theoretical ideas" that it reflected. After examining these various approaches, he concluded that the only adequate explanation of curiosity remained with the
"old and worn" concept of drive.

3. **Information theory**: It has been only comparatively recently that information-theoretic concepts have been applied to curiosity behaviour, although it has long been a popular conception that curiosity somehow facilitated the attainment of information. The connection is clarified by Fowler as follows (ibid. p.71):

The relationship between information theory and the stimulus events that affect curiosity and exploratory behaviours becomes evident when one considers the meaning of the term information. This term does not have reference to knowledge or understanding ... but instead to a reduction of entropy or uncertainty in the organism ... In the context of information theory, then, when the animal explores a novel surround, or unfamiliar pattern or object, it reduces its uncertainty of the sequence of stimulus events or elements that it experiences, and thus it gains information, and the more change or variation provided the more information it gains. (Italics in original)

No information is received from events that are "redundant, repetitive, and completely organized ... or ... inchoating and completely familiar". Fowler cited the work of Berlyne and Jones in this context, Berlyne on the effect of conflict or uncertainty engendered by his "collative" stimulus properties, and Jones et al who have indicated that "information served as an incentive or goal condition and information deprivation as the drive condition underlying behaviour directed to this type of incentive."

Fowler concluded by putting forward two principal tenets
toward an understanding of curiosity behaviour (ibid. p.73):

whether through high drive or high arousal, the organism is motivated by exposure to homogeneous, simple, restricted, and/or redundant stimulation; correspondingly, it will respond to and learn to work for stimulation that reduces its drive or arousal - that is, stimulation that is novel, unfamiliar, complex, and/or changing. If we are to summarize these two tenets in a few words or with a single picture, then that picture is one of the organism needing, seeking, and processing information, not in the sense of receiving signals or stimulus input, but in the full theoretical sense of the word. (Italics in original)

An adequate theory, with predictive power, has yet to be formulated to account for such investigatory behaviour, and theorizing has only recently begun to move towards the integration of earlier concepts and the utilization of findings in other fields, as has been done with information theory. Further light has recently been thrown on the subject, however, by Pribram and his co-workers in the field of neuropsychology (Miller, et al 1960. Pribram, 1964.) They have developed a new theory of motivation - the 'feedback loop' or TOTE mechanism, analogous to a homeostat. By this, the reflex arc association between stimulus and response is replaced by a feedback unit which involves (a) a Test of readiness with regard to the input, (b) an Operation that seeks to match the test, (c) a re-Test to see whether match has been accomplished, before (d) Exit from control is effected. (Pribram, 1964 p.89. Italics in original).

This is similar to Berlyne's concept of conflict,
generated by collative stimulus properties, and with the uncertainty of information-theory. The point of similarity is the match-mismatch process in the theories, whereby input is matched against previous inputs, and information is obtained from the resolving of the discrepancy. Curiosity is therefore associated with behaviour directed toward information attainment, probably by a TOTE mechanism, which has been shown by Pribram (1964) to have a neurological basis.

The fact that the TOTE system can be biased to make it control the input to which it is sensitive and to increase that sensitivity, suggests a parallel with the theory of optimal stimulation, since both are related to Cannon's doctrine of homeostasis. (Fowler, 1965 p.69; Pribram, 1964, p.102). The homeostat functions to maintain stability or equilibrium, and this appears similar to Fiske and Maddi's proposition that the organism will behave in a manner that will maintain an optimum level of arousal.

Pribram (1964, p.80) also related readiness to the organism's tendency to respond to novel stimuli, through the operation of a "newness neuron" which is activated by variations on the familiar, i.e. novelty. His work has shown that habituation, or familiarity with the environment,
is a state of expectancy, and also that "an organism attends (orients) when, after exposure to recurrent events, these events change." This suggests that even if curiosity is largely a learned anticipatory response, as suggested by the incentive - motivational concept, there is an innate aspect. This is reminiscent of Berlyne's distinction between perceptual and epistemic curiosity. It would thus seem probable that there is a neurological basis to curiosity behaviour, although not yet fully understood, which lends support to the motivational and information attainment functions of curiosity.

A point of contact has also been made between Berlyne's concept of curiosity as intrinsic motivation and Piaget's theory of intellectual development, through the concept of equilibrium, which also links them both with the Miller, Galanter and Pribram TOTE mechanism. All three make use of the concept of equilibrium, derived from homeostasis. Berlyne (1965, p.74) has described Piaget's concept of 'equilibration' which indicates the similarity of the concept to his own theory of equilibrium:

'equilibration' is a "tendency for the child to abandon structures characterized by relative disequilibrium, which means inconsistency of judgment, uncertainty, or even, in certain conditions, inability to make a judgment at all, in favour of structures possessed of better equilibrium."
The process of adaptation by which equilibrium is achieved, involves the two processes of assimilation and adaptation, assimilation being the adaptation of the environment to the individual, i.e. experiences are taken in and consolidated "in terms of his own subjective experience", (Maier, 1965 p.86) while accommodation is the impact of the actual environment on the individual - to accommodate "is to conceive and to incorporate the environmental experience as it truly is". (Maier, ibid.) Thus the process of intellectual development is seen to be dependent on interaction between the individual and the environment - an environment that causes a response which in turn alters the structure of intellectual abilities. Responses performed and abilities developed at one stage determine the intellectual functioning possible at a later stage. Therefore, the impact of the environment on the individual is of vital importance, in effecting responses that will further intellectual development. It is also apparent that the responses made, at least in the early stages of development, are of an exploratory nature. For example, two factors which are frequently mentioned in the literature on curiosity and exploratory behaviour are specifically mentioned by Piaget (1964), namely orienting, and reaction to novelty. Orienting, one of the behavioural indices of
animal curiosity, (linked by Pribram with readiness, and also with the "newness neuron"), is considered by Piaget to be one of the innate reflexes and its development can be traced through the sensori-motor stage of intellectual development from birth to two years. During the stage of primary circular reactions the child "seeks to prolong the use of the reflex, i.e. sucks for the sake of sucking and looks for the sake of looking". (Stendler, introduction to Piaget, 1964 p.146). By the time the child reaches the stage of secondary circular reactions, he repeats what he has first tried out on his own body on the environment. It was in connection with the stage of secondary circular reactions that Piaget made reference to reaction to novelty, whereby the child "repeats, for the sake of creating again an interesting result from the environment." (Stendler, ibid.)

The function of curiosity behaviour in facilitating intellectual development is made clear by Hunt (1968 p.192), who, in describing his theory of the growth of intrinsic motivation, the term used by Berlyne to describe curiosity, makes use of Piaget's theory on which to base his own. He describes three stages in the growth of intrinsic motivation – "characteristics of an organism's progressive
relationship with any new set of circumstances." In the first stage, during which the infant is conceived to be "essentially responsive", motivation is considered to be aroused by painful stimulation, homeostatic need, and sex. Since the orienting response is operative "any changes in the ongoing perceptual input will attract attention and excite the infant." This stage ends when the infant tries actively to retain or repeat interesting patterns of stimulus change. During the second stage the infant is motivated by "something newly recognized as familiar - a repeatedly encountered pattern of change in perceptual input", which efforts are made to retain. Hunt considered that this stage ends when "with these repeated encounters, the child becomes bored with the familiar and turns his attention to whatever is novel in familiar situations. Motivation during the third stage is aroused by novelty within a familiar context, and appears towards the end of the first year.

Thus the development of intrinsic, or curiosity, motivation can be considered to develop as a continuous process with each stage dependent on the previous one, as in Piaget's scheme for intellectual development. Environmental changes perceived in the first stage are recognized "with interest" in the second stage, thus
providing a context for response to novelty during the third stage. "Interest in the new", Hunt concluded, "is the infant's basis for 'growth motivation' ", and he offered this concept as a tentative solution to the problem of how the environment interacts with the organism to impede or impel intellectual development.

There are thus clear grounds for linking curiosity to intellectual development, and it can be considered to be the natural process of learning. Piaget's discussion lends support to the concept that curiosity is innate, as suggested by Pribram's work on the orienting response, and learned, as conceived by the incentive-motivational view, since the anticipation of an interesting result is involved in the stage of secondary circular reactions. This happens when the child's actions become the means to an end of recreating an interesting result - "confronted by new objects, the child intentionally seeks to find out in what way they are new and so experiments on them before assimilating them to a schema constructed on their effect." (Piaget, 1964 p.147).

In addition, a further link between Berlyne's concept of conflict, information theory, and the TOTE mechanism is exemplified in the stage of secondary circular reactions, i.e. the matching of input with previous inputs. This happens when an "unforeseen result" of the child's activity
is seen as baffling, and leads to an unexpected conclusion. It is this that causes the prolongation of the activity - to make interesting sights last. By the time the child has reached the later stage of tertiary circular reactions, at the end of the first year, his accommodation process is intentional, and, being capable of experimentation, he seeks novelty and varies conditions, which thus reduces the discrepancy between input and previous inputs.

The child thus engages in curiosity and exploratory behaviour as part of his cognitive development, and it appears clear that these behaviours result from a discrepancy between incoming stimuli and what the organism expects from previous experience. Maintaining contact and investigating the environment is considered to be the organism's method of maintaining equilibrium, of adapting to a changing world, and of gaining information about it, and there is a growing body of evidence, from opinion and research, that links curiosity with cognitive development and the receiving of information. As such, curiosity is the 'natural' desire to learn, and can be called intrinsic motivation, as Berlyne described it, since the organism is aroused to action, of an investigatory, explorative nature, by the effect of the stimulus situation on the central nervous system, not by external extrinsic, incentives or rewards.
Curiosity can still be conceived as a drive — a drive condition aroused by discordant or discrepant elements in the stimulus situation, with the resolving of conflict or uncertainty as its goal, which is self-reinforcing.

C. REASSESSMENT

Curiosity behaviour appears to be central to the educative process, if one of the major aims of education is the acquisition of knowledge through information received and stored. This is evident if, as theorists have indicated, curiosity is the response of the organism to stimuli that give rise to uncertainty the reduction of which leads to information. Through this process, curiosity has been shown to motivate the organism and to ready it for learning, and evidence has been presented of the concern of educators with problems of motivation.

A beginning has been made by Berlyne (1965, p.75) in the application of curiosity to the classroom. From his conception of curiosity as intrinsic motivation, he recognized a similar concern in Dewey’s ideas on progressive education. In discussing Dewey he referred to his book "How We Think" and said, "he describes ... how thinking begins with a "felt difficulty", which commonly takes the form of a conflict "between conditions at hand and the
desired or intended result, between an end and the means of reaching it". It is interesting that Pribram, also, finds much in Dewey that relates to his own theory. He quoted Dewey (from "The Quest for Certainty", p.84), as follows: "The method of ... inquiry is to introduce some change in order to see what other change ensues; the correlation between these changes ... constitutes the definite and desired object of knowledge."

Berlyne further considered that discovery methods of teaching make use of intrinsic motivation. He said (1965, p.84) of the two distinctive features of discovery methods:

First, there is insistence that the student find solutions to problems through his own thinking or research. Secondly, there is systematic exploitation of intrinsic motivation and reward with a clearer-than-usual differentiation between an earlier phase in which the motivating conflict is induced and a later phase in which conflict is relieved by means of the response patterns that are to be acquired.

He listed, as ways in which epistemic curiosity can be induced by conceptual conflict, a number of methods, including surprise, doubt, perplexity, bafflement, and contradiction. In addition to discovery methods, he considered (1965, p.81) that programmed instruction also made use of intrinsic motivation and reward.

It is evident that those concerned with discovery methods also are aware of the motivational difficulties
involved. Kagan (1966, p.157) stated this clearly, when he said:

... learning and performance require an understanding of the interaction between cognitive skills and motivational variables ... If the child has minimal motivation to learn, manipulation of external stimulus materials may have little effect on new acquisition ..... The puzzlement that envelops the twin issues, What is learning ? and How does it occur, is clarified by assuming that if a child attends to information he is likely to learn something about it ... the discovery approach requires more involvement on the part of the child and, therefore, greater attention to the component materials being presented ... A major advantage of the discovery strategy is that it creates arousal, and as a result, maximal attention.

In particular, attention is being focussed on individual differences, as Wittrock (1966, p.68) for example, pointed out quite unequivocally: "The second thing to be learned from these studies (of discovery methods) is that future studies should give greater attention to individual differences and to the history of the learners".

Kagan (op.cit.) also mentioned the need for understanding about individual differences in motivation and suggested an enquiry into the psychological variables that promote or obstruct attention to symbolic material.

This aspect of curiosity behaviour has received very little mention by investigators, who have tended to concentrate on the stimuli associated with its arousal and with concomitant behaviour. The emphasis has been on the norm, rather than
the exception. It is frequently heard that "all children are curious," and the literature on education, particularly pre-school, contains many references to the curiosity of the young child. Friedlander (1965, p.26) recognized the importance of individual variations in curiosity when he said: "As a personal trait, curiosity is distinguished by a broad range of individual differences. Some children have lots of it, and some have little." It is possibly this realisation that led to his criticism of the use of curiosity as a motivational aid in the classroom. It would seem that the fact that curiosity behaviour has been empirically shown to be evoked in animal and human subjects by particular stimuli under certain circumstances has obscured the very real individual differences that exist.

That these differences exist has been demonstrated by several studies in which subjects, both children and adults, have been divided into high and low curiosity groups, based on their response to stimuli known to elicit curiosity and exploratory behaviour. (Lucco, 1967; Nau and Nau, 1961 and 1965; Penney and McCann, 1964).

The question that prompted this study, therefore, was: If curiosity is considered by educators, and from the results of research, to be of vital importance to learning,
what are the reasons for individual differences in curiosity behaviour?

Consequently, this study is concerned with the problem of individual differences in curiosity behaviour, and is centred on the four year old child. The reasons for selecting the pre-school level were threefold:

1. The view that education, like development, is a continuous process and that any behaviour manifest at a later age has its roots, apart from the genetic basis, in early childhood and infancy. This is the theory of intellectual development propounded by Piaget - that each successive stage develops from the one preceding it, each stage being incorporated into the one following. The idea of continuous learning is not, however, new to education. It is essentially the view put forward by Dewey (1933, p.42):

   The two principles of continuity and interaction are not separate from each other .... They are, so to speak, the longitudinal and lateral aspects of experience. Different situations succeed one another. But because of the principle of continuity something is carried over from the earlier to the later ones .... The immediate and direct concern of an educator is then with the situation in which interaction takes place.

For an understanding, therefore, of behaviour which is important during the years of formal schooling, the educator must begin with the earliest years.
2. The emphasis placed on curiosity by pre-school educators. This is exemplified by the following three extracts from recent works on the education of young children.

The objectives of instruction in these years lie in four major areas - intellectual, emotional, social and physical. The intellectual goals include the promotion of curiosity, growth of language, and generation of readiness for the intellectual activities that will come in later years.

(Frost, 1968, p.6)

Many of these three, four and five year olds, demonstrated their capabilities for effective exploration and understanding .... If adults would foster the kind of intellectual curiosity and growth for which young children are ready then they must provide the setting in which children can explore and investigate.

(Wann, Dorn and Liddle, 1962, p.64)

We realize now that whatever a youngster may become is very much a function of the interplay between that body which he brings with him, which is already competent, which is already active, which is already curious, which is already individual, and the nature of the life circumstances which we provide for him. Since by and large we are in the business of educating, it is the second factor - that of environment - upon which we can really work.

(Gordon, 1968, p.14)

Thus, since curiosity is considered such a characteristic trait of the pre-school child, any differences in its manifestation should show up clearly at that age.

3. The concept of critical periods in development. In this connection Hunt (1968, p.194) said:
The effects of a lower-class environment on a child's development may become even more serious during his fourth and fifth years. Furthermore, the longer these conditions continue, the more likely the effects are to be lasting.

He made reference to experiments on chicks and tadpoles which have demonstrated the adverse effects of deprivation at critical stages in their development. Although he does not explicitly say so, it would appear that this is the concept of critical periods in development put forward by Scott (1963), with reference to socialization. The importance of critical periods in a child's life was also mentioned by the Plowden Committee Report (Children and their primary schools, 1967, quoted by van der Eyken, 1967, p.34) who emphasized "that these critical periods not only occur at highly specific times, but that their results are irreversible." Supporting evidence from EEG records is also quoted by van der Eyken (ibid. pp.36-7) indicating that critical periods have been detected in brain activity.

There is thus a considerable amount of evidence in favour of such crucial periods in development, and it is not unreasonable to assume that curiosity develops in a similar fashion. If so, it is possible that a critical period coincides with the four-year-old level, as suggested by Hunt (op.cit.).
For these reasons, therefore, the four-year-old level was selected as an age at which individual differences in curiosity behaviour could be expected to appear. It was felt that the identification of variables that affect the development of curiosity should be a matter of concern to educators, in view of the connection, demonstrated by the research cited, between such behaviour and intellectual functioning in general and motivation in particular.

The purpose of this study was to investigate areas of possible influence on overt curiosity behaviour, in order to isolate effective variables, since an understanding of the reasons for human variability is a prerequisite for effective teaching.

Presentation of material in Chapter II which led to the development of specific hypotheses will cover research concerning factors shown to elicit curiosity behaviour in humans, variables that have been demonstrated to relate to its occurrence, and the effects of the early childhood environment. Details of the investigation will be given in the third Chapter, and the findings and conclusions concerning the value of this study to the general problem under consideration will be discussed in the fourth.
REFERENCES

Arnistine, Donald, 1966, "Curiosity," Teachers College Record, 67: 595 - 602


Dewey, John, 1938, Experience and Education. New York: The Macmillan Company


McReynolds, Paul; Acker, Mary; and Piitila, Caryl, 1961, "Relation of Object Curiosity to Psychological Adjustment in Children", Child Develop. 32: 393-400


Penney, Ronald, 1965, "Reactive Curiosity and Manifest Anxiety in Children", Child Develop. 36: 697


CHAPTER II

REVIEW OF THE LITERATURE AND DEVELOPMENT
OF HYPOTHESES

A. DEMONSTRABLE VARIABLES RELATED TO CURIOITY

Stimulus factors

Replication of animal studies, using human subjects, has generally confirmed the earlier findings. Cantor (1963) in a review of responses of infants and children to complex and novel stimulation found that in most cases preferences for such novel and complex stimuli could be demonstrated, but expressed doubt about the relation found between the variable of stimulus complexity and curiosity behaviour. In addition to those reviewed by Cantor, several other investigators found preferences for more complex stimuli over less complex. Morgan (1965) found a significant increase in response rate for normal and retarded children, and Minton (1963) found that with undergraduates, perceptual curiosity was a function of stimulus complexity. Munsinger and Weir (1967) also report a strong preference for increasing levels of complexity.

Of studies which used the stimulus variable of novelty, Cantor (1965) found that observational studies indicated
that novel stimuli elicit attending and manipulative responses in children, and that the remaining studies on children all reported significant preferences for novel as opposed to familiar stimuli. This tends to be confirmed by other investigators. Smock and Holt (1962) with first grade children, found that novelty in the environment evoked positive approach behaviour, i.e. additional contact. Viewing rate was found to be longer to novel stimuli than less novel, by Cantor and Cantor (1964 a), who also found the difference was greater for high than for low amounts of familiarization (1964 b). The same investigators found that response speeds were slower to familiar than unfamiliar visual stimuli, in two studies (1965 and 1966), and Witte and Cantor (1967) reported that starting movement speeds were faster to novel than unfamiliar stimulation on a motor task. Bogartz and Witte (1966) reported greater initiation, but not execution, speeds to novel than unfamiliar stimuli. Harris (1965) found that kindergarten children showed a preference for more novel toys in a choice situation, while Gullickson (1966) found a preference for novel auditory stimuli. Greene (1964) found that children preferred an untried task rather than a tried one, and Morgan (1965) reported that the response rate was significantly higher under high novelty than low
novelty conditions. Novel, surprising and incongruous items were found by Berlyne and Frommer (1966) to elicit more questions than others. In addition, Charlesworth (1964) reported that surprise (non-confirmation of expectancy) was capable of instigating exploratory behaviour.

The findings from animal studies were therefore confirmed by human studies, many of which used children, in that stimuli characterized by Berlyne's collative properties of novelty, complexity, surprisingness, incongruity and ambiguity were found to be capable of eliciting curiosity behaviour such as looking, approaching, maintaining contact, choosing and questioning. Also there are indications that within these variables there are gradients of preference, e.g. Cantor and Cantor (1964 b) and Morgan (1965), and also that response speeds are faster for the stimuli high in collative properties. The actual stimuli used included lights, cards, slides, and toys, in various combinations of colours, shapes, patterns and sizes, and generally were given in a standardized testing situation. There do not appear to be any significant findings to challenge the general finding that stimuli high in collative properties evoke curiosity behaviour.
**Individual Variables**

Research on individual variables related to curiosity have shown a steady increase over the last ten years, enabling the characteristics of the highly curious child as distinct from the child low in curiosity, to become more certain, and less a matter of opinion.

**Intelligence:** Some of the more surprising results have emerged from studies of the relationship between intelligence and curiosity, which, according to popular opinion, educational writers, and theorists, should be highly correlated. Three investigators have, in fact, reported no correlation. Penney (1963) found no correlation between reactive curiosity (i.e. overt curiosity) and intelligence with four-, five- and six-year-olds, using the Peabody Picture Vocabulary. Schwartz (1965) with fifth-grade children and a school score on intelligence also reported no correlation, as did Minton (1963) working with undergraduates, and scores on cognitive complexity (i.e. intelligence) and perceptual curiosity. Only one study, by Maw and Maw (1961 b) found a relationship, and they reported a low but significant correlation between rated curiosity and the Lorge-Thorndike verbal and non-verbal I.Q.'s, with fifth-grade children. Non-statistical evidence in support of a positive correlation between
intelligence and curiosity was found by Isaacs (1930) who said:

Active pleasure in looking at these things, and eager curiosity about them, is one of the most striking features of the minds of intelligent children of two years and more. (p.17)

It may well be that this active interest in the real world is one of the distinguishing marks of the intelligent child, and that those of average ability show it less. How far this is so would itself be worth inquiry; certainly this group of intelligent children as well as others I have observed, showed a very lively curiosity. (p.20)

Although the evidence is inconclusive at present, the probability of a correlation between intelligence and curiosity remains high, and research is needed in this area. It is possible that the tests of intelligence used may affect the results since different intellectual abilities are often required. Tests used so far have been the Lorge-Thorndike, verbal and non-verbal, the Peabody Picture Vocabulary and school test scores (unspecified). No tests using the more reliable measurements such as Stanford-Binet or the Wechsler Scales have been reported.

Age: A few age differences in curiosity have been reported. Munsinger and Weir (1967) with newborn infants to six-year-olds found that a strong preference for increased level of complexity was independent of age, but Mendel (1965), with children of three-and-a-half to five
and a half, found that the older children preferred higher
degrees of novelty, while the younger children showed no
significant preference between higher and lower degrees of
novelty. This is in agreement with a statement by Piaget
(Stendler, 1964, p.151) that "the younger the child, the
less novelties seem new to him". At the same time, Berlyne
and Frommer (1966) found that younger children (U.S.A.
Kindergarten) asked fewer questions than older ones, and
interpreted this as being due to increased sensitivity to
gaps in information with increased age. With five- to
eight-year-olds, Elkind and Weiss (1967) found that the
tendency to explore an unstructured array increased with
age, but that exploration of a structured array was
systematic at all levels. Finally, in a study unrelated
to curiosity, but of interest nevertheless, Stewart (1958)
reported that young children were less consistent in their
choices, chose more rapidly, and were more indecisive than
older children.

As with intelligence, experimental findings relating
age and various indices of curiosity, were in the direction
contrary to general expectation, (i.e. that curiosity is
characteristic of younger organisms) although again,
evidence from such a small number of samples cannot be taken
as conclusive. Also, the findings in each case do not report that the younger child is not curious, merely that he exhibits less of the behaviour considered to be indicative of curiosity than older children. Considerable individual differences may still be found in curiosity scores at each age level.

Sex: Findings on sex differences, however, appear to indicate a definite tendency for boys to display more overt curiosity. Walker (1963) found that nursery school boys were rated by their parents as being more curious; Mendel (1965), with children from three-and-a-half to five-and-a-half years, found that boys preferred higher degrees of novelty in toy choice; and Lucco (1967), also with four-year-olds, found a relationship, for boys, between independent functioning and curiosity behaviour in an insecure situation, while dependent girls expressed greater curiosity in a secure situation. As well, a positive and significant correlation for boys was found between curiosity and independent functioning, and a negative, insignificant correlation for girls. With first-grade children, Smock and Holt (1962) found that in general boys were somewhat more curious, although girls showed a preference for the unknown and more curiosity in the absence of environmental
stimuli. However, Penney and McCann (1964) found that 4th, 5th and 6th grade girls scored higher on the Reactive Curiosity Scale than boys, but another study by Penney (1965) with children of the same age found no differences. Similarly Pangrac (1964) found no significant difference with 4th grade children.

It is possible that the difference in curiosity measures used by the different investigators may account for some of the results, but the results as a whole seem to indicate a high degree of uncertainty.

**Anxiety:** This is one variable which has shown a consistent correlation with curiosity, in a negative direction. With pre-school children, Mendel (1965) found a significant inverse relationship between general anxiety and preference for degrees of novelty. As well as Lucco's study, (op.cit.), Isaacs (1930, p.103) also mentioned the inhibitory effect of anxiety on curiosity. "We had some striking evidence to confirm the view that anxiety is highly unfavourable to free inquiry and interest in the objective world". Medinnus and Love (1965) failed to find the correlation they expected, but blame this on their curiosity test. Studies with older children, McReynolds, Acker, and Pietila (1961), Penney (1965) and Schwartz (1965) all report inverse relationships between anxiety and curiosity.
It is thus highly probable that such a relationship does exist, and if so, this could be a reason for the lower curiosity scores found with younger children, most of whom were tested in a standardized situation (i.e., due to test anxiety through unfamiliarity with the situation), but evidence on this is not clear.

**Creativity and originality:** Naw and Naw (1962a) with fifth-grade children found that highly curious children selected more unbalanced and unusual designs, while McReynolds et al (1961) found they were more original, using teachers' ratings and an unusual uses test. A correlation between reactive curiosity and originality was also reported by Penney and McCann (1964).

These findings are consistent with Pribram's discussion on creativity (1964 p.107) which he considered to arise in conditions similar to those that arouse curiosity. He said that discoverers, as creative people,

make their discoveries through what they already know: they match the unfamiliar against a thoroughly incorporated body of fact. This involves the match-mismatch mechanism already shown to arouse curiosity when the match shows a discrepancy. The inventor achieves novelty within the bounds of certainty.

Curiosity and creativity, therefore, should be related.
Information-seeking: Maw and Maw, working with fifth-grade children, found that highly curious children amassed greater amounts of general information (1963) and also retained it better than children with lower curiosity levels (1961 b). In addition, they found that they were more aware of their own curiosity on a self-appraisal test (1961 a) and showed greater comprehension of sentence meaning (1962 b).

The results of these studies appear to confirm the expectation, arising from theory, that curiosity behaviour facilitates the attainment of information. The consequences of these studies are therefore of great importance to education, since the theory that intrinsic motivation, or curiosity, promotes information attainment is given a measure of support.

Position in the family: Pangrac (1964) reported that girls who were first children in the family were more frequently found in the high curious group than girls who were middle or last children. Although this is the only study reported on this factor, and nothing significant was found for boys, the suggestion that place in the family can be correlated with curiosity is worthy of research. Rubenstein's (1967) finding that maternal attentiveness was positively correlated with exploratory behaviour of six-
months-old infants is relevant in this respect, since first children could be expected to receive more attention from their mothers than subsequent children. It is also possible, for the same reason, that youngest children particularly of large families, would also show higher curiosity scores.

**Independence:** Lucco's study (1967) already mentioned, is the only one that reported a positive correlation between curiosity and independence, but his finding was significant only for girls. Although evidence from his study can only be regarded as suggestive, it is reasonable to assume that independent children would be more inclined to venture into unexplored territory in order to investigate.

From the research thus presented it seems clear that although there are a number of variables which can be shown to correlate with curiosity, the evidence is by no means certain. This can be at least partly attributed to the lack of replication of the exact conditions of the studies, except for a few such as Cantor and Cantor. Measures of curiosity vary greatly and point to the need for standardization of curiosity tests. (cf Appendix A). Nevertheless, investigations such as these have opened the way for further research, and the results are at least indicative of dimensions which could be influencing the amount of curiosity expressed.
Therefore, despite their limitations, these results must be considered in any study concerning curiosity, since any or all of these variables could be influencing the results. Consequently, from the evidence at present available, it appears that:

i) correlations between intelligence and curiosity have so far been slight, but expectations are that they should be higher,

ii) younger children show less overt curiosity than older ones, contrary to opinion,

iii) boys show more curiosity than girls in most curiosity test situations,

iv) curiosity is negatively correlated with anxiety,

v) position in family may correlate with curiosity,

vi) highly curious boys appear to be more independent,

vii) creativity and originality have been shown to be correlated with curiosity, and,

viii) curiosity is associated with increases in information attainment, and better retention, as predicted by theory related to curiosity.

It thus seems probable that the highly curious child is less anxious, more creative and original, acquires more information and remembers it more efficiently, as well as understanding sentence meaning better than the less curious
child. At the same time, he is more likely to be aware of his own curiosity but may not have any higher intelligence. If a boy, he is probably independent, whereas a highly curious girl is more likely to be dependent as well as showing more curiosity about the unknown and in the absence of environmental stimuli. Girls that are highly curious are more likely to be the eldest in the family, but a boy has more likelihood than a girl of being in the highly curious group. In addition, the probability is greater that a highly curious child will be found in an older age group than in a younger one.

These, then, are some suggested reasons for individual differences in curiosity behaviour, although the evidence is, as has been pointed out, inconclusive. However, a further sphere of influence on curiosity, to which a few references have been made, is located in the environment. It is considered highly probable that the environment of the growing child, particularly in the early years, is a determining factor of some importance. The term 'environment' in this context, refers to the general living milieu of the child, both physical and social, and has become a subject of great importance for those concerned with the roots of development in the pre-school years.
B. THE EFFECTS OF THE PRE-SCHOOL ENVIRONMENT

Realisation, not only of the prominent part played by the early environment in the development of the child, but also of the responsibility of the education system to provide for the needs of the pre-school population, is evident in the following two quotations from both sides of the Atlantic.

The first, from Britain, is from the Plowden Committee Report "Children and their primary schools", (1967, para 42 quoted by van der Eyken, 1967, p.13)

Very few of the child’s responses are wholly innate; most require learning, though the basis on which learning can take place is inborn. The baby depends on environmental stimuli for his development, and these need to be varied and complex if the full range of normal behaviour is to be developed. It is the function of the educational process to provide these stimuli from the moment of birth onwards.

The second is from America and reflects the current concern over the effects of cultural deprivation:

Recognition of the facts of deprivation and of the needs of slum children or their equivalent in rural depressed areas has logically led to the pre-school movement. The argument in favor of such education is virtually unanswerable: if deprivation starts to build up at an early age and progressively limits and eventually blocks entry into the mainstream of society, then an early start must be made to offset the lack of parental teaching, care and mind-molding. (Hechinger, 1966 p.8).
One of the main reasons for the upsurge in interest in early childhood education has thus been the increasing awareness arising from research of the long-lasting effects of environmental deprivation, not only on intellectual development, but also on physical growth. (Gordon, 1968 p.15). From this, the realisation has grown that children from disadvantaged areas, such as the slums and ghettos in America, are starting school with a crippling handicap and are thus predisposed towards failure from the start. As the Educational Policies Commission of the NEA* and the American Association of School Administrators stated (quoted in Frost, 1968 p.5):

Research shows clearly that the first four or five years of a child's life is the period of most rapid growth in physical and mental characteristics and of greatest susceptibility to environmental influences. Consequently, it is in the early years that deprivations are most disastrous in their effects. They can be compensated for only with great difficulty in later years, and then probably not in full. Furthermore, it appears that it is harder to modify harmful learnings than to acquire new ones. Finally, experience indicates that exposure to a wide variety of activities and of social and mental interactions with children and adults greatly enhances a child's ability to learn ....

Reference to the Educational Policies Commission of the NEA is also made by van der Eyken, who said that the Commission pointed out that the need for pre-school education

* National Education Association
was most urgent "among families already deprived, either in educational background, environment or economically" (van der Eyken, 1967, p.133). He quoted the Commission as follows:

But not only those commonly considered disadvantaged \textit{(sic) are disadvantaged in their lives at home}. The pampered also are disadvantaged; so are those whose parents are obsessed with the need to impress and achieve; so are those, whatever their economic background, whose parents show them little love; so are those who have little chance to play with other children or with children of other backgrounds; so are those with physical handicaps. \textit{Early education would help all these children.}

\ldots Early education has long been available to the well-to-do, and it is commendable that governments are now acting on the need to make it available to some of the poor. But the large middle group should have the same opportunities.

\textit{(Universal opportunity of early childhood education, 1966, p.4).}

The deprived or disadvantaged environment is therefore not considered to be confined solely to the lower stratum of society, although it is at the lower socio-economic levels that the effect is possibly most noticeable. The educational implications of disadvantage due to economic or social deprivation are set out by Hechinger (1966, p.2)

\textit{All the evidence today indicates that children from a home background that not only is economically and socially at the lowest level but lacks family orientation towards formal learning are virtually excluded from success in school. They are pre-conditioned for failure. The school, attuned as it is to the middle-class majority, seldom helps such children catch up; it often actually (though}
unwittingly) widens the gap between success and failure. 
... the middle-class parent welcomes and encourages 
questions, explorations and - within reasonable limits 
- even a certain amount of damage done by an adventure-
some child. Mothers are virtually obsessed with ways 
of exploiting - even pushing - the natural curiosity 
of infants; see the mass sales of books about infant 
behaviour and about the best ways of answering or 
extracting young children's questions. 
By contrast, the slum home is a place of little 
opportunity for infants to talk, question, and seek 
answers. In an overcrowded tenement, curiosity is a 
uinance .... There is little patience with childish 
talk and questions. The passive child is considered 
the good child.

It is evident from Hechinger's statement that the 
stifling of curiosity is considered to be one of the major 
effects of a deprived environment. Hunt (1968, p.194) 
elaborated this point, by describing the effect at each 
year of the child's growth from birth to five years.

... it is unlikely that most infants in families of 
low socio-economic status suffer great deprivation 
during their first year. Since one distinguishing 
feature of poverty is crowding, it is conceivable 
that the infant may actually encounter a wider variety 
of visual and auditory inputs in conditions of poverty 
than in most middle- or upper-class homes .... 
During the second year ... crowded living conditions 
would probably hamper development ... In such an 
atmosphere, a child's opportunity to carry out the 
activities required for his locomotor and manipulative 
development must almost inevitably be sharply curbed. 
Moreover, late in his second or early in his third 
year ... His questions too seldom bring suitable 
answers, and too often brings punishment that inhibits 
further questioning ... conditions ... now supply a 
paucity of suitable playthings and models for 
imitation. .... The effects ... may become even more 
serious during his fourth and fifth years ...
He concluded (p. 195) with the proposal that the best
method for combating cultural deprivation at the pre-
school level should proceed on two fronts - environementally
by the provision of a wide variety of experiences, and
socially by providing behavioural models, social approval
for appropriate behaviour and answers to questions.

That pre-school educational experience, apart from the
home, is beneficial, and tends to give children who have
had that experience an advantage over those who have not,
has been shown experimentally by several investigators,
(van der Eyken, 1967, Ch. 8) although the evidence is not
conclusive. Furthermore, although the encouragement of
curiosity has long been considered to be advantageous
(see earlier references in Chapter I; also Gardner, 1949,
p. 15 and Isaacs, 1930, p. 17), the developmental process by
which this is accomplished has not been clearly understood
in terms of a comprehensive theory that would account for
the presumed or observed changes in behaviour. The
foundations for such a theory, however, have been laid, as
is shown by the research in Chapter I, which has uncovered
some of the processes by which curiosity facilitates
information attainment.

While recent American writings on early childhood
education have emphasized the counteraction of deprived
home conditions (which have led to the Federally-sponsored Head Start programme), not all deprivation results from poor home conditions, as Wann, Dorn and Liddle (1962) have indicated. They pointed out that kindergartens and nursery schools tend to concentrate on social, emotional and physical needs of children to the detriment of their intellectual growth. They criticized some current theories (including Piaget's) which suggested that the child was not capable of critical thinking before the age of seven or eight, and reported that their study showed that "young children are highly motivated to explore, to test the accuracy of their observations of the things and events in their environment" (p.55). They did not consider that all nursery schools and kindergartens provided the kind of material and encouragement necessary for intellectual growth, through the stimulation and satisfaction of curiosity.

There is thus a clear body of opinion, mostly based on observation and research, which indicates that the early childhood environment has an effect on curiosity which in turn affects intellectual growth and later school achievement. Both the home environment and that of the kindergarten and nursery school, have been considered to impede the expression of curiosity by failure to provide sufficiently varied and
stimulating physical surroundings as well as support and encouragement by adults.

Consequently, it appears highly probable that a major cause of individual differences in curiosity behaviour is located in the early environment of the developing individual. Since the environment provided by the home is effective before the child experiences any other form of pre-school education, it would seem logical to consider first the effects of variables in the home environment.

The general question raised, therefore was: What effect does the early home environment have on individual differences in curiosity behaviour? Two questions in particular were asked:

1) What is the effect of a varied environment?
2) What is the effect of parental behaviour?

C. FORMULATION OF HYPOTHESES

Effects of varied experience.

Evidence has been put forward on one hand which indicates that environmental deprivation could be a factor leading to inhibition of curiosity behaviour, and on the other that environmental variability encourages such behaviour.
In terms of physical surroundings, 'deprivation' can include "absence of books, relatively few toys, and, in many instances, nothing except a few normal home objects which may be adopted as playthings" (Hechinger, 1966, p.79). However a clinical definition was given by van der Eyken (1967, p.47) who said the term was applied to "those children who have lost an essential feature of their home environment" which he described as loss of either or both parents, loss of the home, a broken home, or handicap of some kind, as well as the fact that "a child brought up in an environment which is intellectually dull, devoid of stimulus and deadening to the spirit of enquiry might be described as a deprived child". (p.48). The term 'deprivation' covers a number of aspects but in this context it will be used to refer to physical surroundings only, as social aspects are included in another section.

Environmental deprivation has been associated with lower socio-economic levels, as is evident from Hechinger's statement (1966, p.2), and it is at the lower levels of society that the Head Start programme in the United States is concentrating its resources, in order to counteract the effects of cultural deprivation. However, it has been indicated that deprivation can occur at higher socio-economic levels also, but more in a social context (van der Eyken,
1967, p.133). Both Hechinger and Hunt (1968, p.194) have described the inhibiting effects of environmental deprivation on the development of curiosity, so that, on this basis, it could be postulated that low curiosity is associated with cultural deprivation and lower socio-economic level.

Evidence in support of this is given by Shirley (1937, quoted by Berlyne and Frommer, 1966) who found that many more questions were asked by children of higher socio-economic status. Lore (1966) with five- and six-year-olds found a generalized and marked deficit in attending to visual stimuli associated with the genetic and environmental factors labelled 'cultural deprivation'. In opposition to this, however, is the finding by Rheingold, (in Foss 1961) with infants of three months that "the lesser amount of environmental stimulation provided by (an) institution ... did not reduce their manual exploration of non-social objects with which they had no prior experience". An explanation for Rheingold's finding is found in Thompson and Schaefer's study (1961) in which they stated that "in general ... complexity and variability are probably less important dimensions of stimulation for the younger and more primitive organism, but more important dimensions for the older, more fully developed organism."
It would thus appear that Rheingold's infants were too young to be affected, but Lore's five- and six-year-olds, being older, were. This is in agreement with Hunt's contention that infants up to one year of age were less likely to show the cultural effects at that age (1968, p. 194). However, a study by Pangrac (1964) also reported no correlation between curiosity and social class, so that on the basis of research it can only be stated that although it is still probable that there is a correlation, the results of investigations are inconclusive at this stage.

That deprivation can refer to information deprivation also is evident from a study by Jones et al (quoted by Fowler 1965, p. 72) who defined it as lack of uncertainty in the environment which means that it must, by information-theoretic definition, be familiar and unchanging. He found that such information deprivation was the drive condition underlying behaviours directed to information attainment. The postulation thus put forward is that low curiosity is associated with environmental deprivation and lower socio-economic level.

A further postulation, which is a corollary to the first one, results from information-theory and states that high curiosity is related to a high degree of environmental variation. This follows from a consideration of Fowler's
discussion of information-theoretic concepts (1965, p.71),
where he said:

... the organism gains considerable information when it experiences a sequence of events of which it is uncertain – for example, events that are varying, disorganized, or random in nature and order or ... changing and unfamiliar ... the more change or variation provided, the more information it gains.

Therefore increased variation in the environment, of a changing nature, should lead to higher curiosity, as it has already been demonstrated in Chapter I that uncertainty resulting from discrepant or unexpected environmental events evokes curiosity behaviour.

This is essentially the view held by Fiske and Maddi, since they considered that variation (novelty) in the environment aroused curiosity. "The novelty of a stimulus is the extent to which the stimulus provides variation from the organism's previous stimulation ..." (Fowler, 1965, p.64). Maddi et al (1965) considered curiosity to be one of the three expressions of the need for variety, the others being desire for novelty and novelty of productions, while Maddi (in Fiske and Maddi, 1961, p.274) directly related individual levels of optimum arousal (for curiosity behaviour) to factors in early childhood experience, and said that "the adult exposed to a relatively great degree of variation in childhood may have a higher normal activation level than the person who has been more restricted in this regard."
Although the theoretical basis of the Fiske and Maddi conception of arousal or optimal stimulation was considered doubtful by Fowler, the concept that variations in the environment stimulate curiosity is still acceptable, as shown by his inclusion of environmental variation in his discussion of the information theory viewpoint. The difference between the optimal stimulation and information-theoretic standpoints concerning the effect of variation is that for the former, variation is presumed to alter the organism's momentary level of activation (or arousal) which causes it to act in order to maintain its individual level of arousal, while in the latter, variations cause uncertainty, which in turn cause the organism to explore in order to reduce the uncertainty, and in so doing gain information.

The theory that variation from the familiar pattern of stimuli or sequence of events in the environment result in behaviour described as curious, exploratory, manipulatory or investigatory therefore remains acceptable. Supportive evidence for this theory remains sparse, however, and indicates the need for research. Two studies mentioned by van der Eyken (1967) on the effects of kindergarten and nursery school experience (which it is assumed, offer increased variation to the children), appear to support this view. Walsh (1931, quoted in van der Eyken, 1967, p.99),
found that children who had experienced six months nursery school were more curious, among other things, than children who had not, while Harrold and Temple (1959-60, ibid. p.110) found there were more children with nursery school experience in groups classified as "asks questions, investigates, explores", than without that experience. These results were not statistically significant, but give an indication that an environment that offers more variety is more likely to produce curious children.

It was considered reasonable to conclude, therefore, that curiosity is in some measure affected by the environment, and that the type of environment most likely to encourage curiosity was one that offered varied stimulation, while a deprived environment would tend to inhibit curiosity. Also, as evidence was inconclusive, the possibility of a relationship between low socio-economic level and low curiosity, was not rejected. Consequently it was postulated that:

a) Increased variability in the home environment is associated with a high level of curiosity behaviour, and
b) Low levels of curiosity behaviour are associated with lower socio-economic status.
Effects of Parental Behaviour

Suggestions concerning parental attitudes and practices, from the literature available, tend to be implicit rather than explicit, and usually result from studies of child behaviour variables other than curiosity. For example, Witkin et al. (1962, p.306), in a discussion on the origins of differences in level of differentiation reported that "mothers who encouraged questioning, who offered their children an opportunity to understand 'how things are', who, in disciplining their children, explained 'why', gave evidence of encouraging curiosity". In a further study, Dyk and Witkin (1965) used nine indicators as Witkin et al. had, to ascertain whether mothers fostered or inhibited differentiation in their children, and used as the ninth indicator (p.50) "limits curiosity, stresses conformity". Mothers who were considered to inhibit curiosity behaviour were described as giving "general prescriptions" (p.36) as to dangers rather than specifically defining them, and their discipline did not include explanations about reasons for limitations.

Baumrind (1967), from a study of child care practices anteceding three patterns of pre-school behaviour, found that children who were explorative (as well as socialized, independent, self-controlled and dis-affiliative, self-
reliant and self-assertive), had parents who were consistent, loving, conscientious and secure in handling their children. She found that the mothers of these children were firm and controlling, demanded a good deal, were more supportive, and communicated more clearly with their children. Although conflict in the home was often vigorous, they were not marked by discord. In general, high nurturance was balanced with high control, and high demands with clear communication about what was required from the children. It is impossible to determine from Baumrind's conclusions which of the parental behaviours were affecting exploratory behaviour in the child, as most seem to relate to independent and achievement behaviour. Since a relationship has been reported between independence and curiosity in boys (Lucco, 1967) it could reasonably be postulated that there is a correlation also between curiosity and the parental behaviour found to be associated with independence. Baumrind's findings would seem to suggest that these would be firm, loving, demanding and understanding.

Hartup (1963, p.355) reported that experimental studies of dependency show that "frustration and inconsistency in the behaviour of adults towards children appear to elicit greater dependence than consistent attention and approval."
(i.e. consistency and approval would be associated with independent behaviour). This is in agreement with Baumrind’s findings, which thus seem to suggest that exploratory behaviour is associated with consistent, approving, parental behaviour. To this list of parental behaviour apparently associated with curiosity and exploratory behaviour can be added the findings of Witkin et al (1962, p.306) that parents who encouraged curiosity gave children opportunities to understand how things work, and who also gave reasons for discipline. In this connection, the findings of Baldwin, Kalhorn and Breese (1945, quoted in Frost, 1968, p.191) are relevant. They reported a finding that the I.Q.’s of four to seven year old children showed a tendency to fall if parental discipline consisted of nonchalant unresponsiveness or of demands for obedience for its own sake with painful stimulation as the alternative. Increases in I.Q. were found if parental discipline consisted of “responsive and realistic explanations”, which is similar to Witkins’ finding concerning curiosity. Although the correlation between intelligence and curiosity has not been proved conclusively it seems useful in this context to consider that similar parental behaviour may affect both.
A suggestion that parental restrictiveness may be a factor leading to low curiosity in girls was made by Smock and Holt (1962) after reporting the finding of sex differences in curiosity level. However, Pangrac (1964) found that low curiosity girls perceived their parents as high on love and autonomy and low on hostility and control, while high curiosity girls rated their parents as moderately high and about the same on all four factors. He reported a similar relation for boys.

From the studies reported, it appears that curiosity could be associated with parental behaviour that is warm, loving, consistent, firm, communicative, democratic (from Witkin's findings) and moderately permissive. Becker's three-dimensional hypothetical model for parental behaviour (1964, p.175) is helpful in this connection. The parental behaviours which have been suggested as being associated with curiosity all occur in the area of the model bounded by the warm, democratic, and permissive dimensions, which suggests that a combination of these behaviours may be operative in the development of curiosity.

Of more significance, however, are the conclusions reached by Becker (ibid. p.171) after a review of literature relating to methods of discipline by social class. He concluded that:
Generally, the research has shown that middle-class parents provide more warmth and are more likely to use reasoning, isolation, show of disappointment or guilt-arousing appeals in disciplining the child. They are also likely to be more permissive about demands for attention from the child, sex behaviour, aggression to parent, table manners, neatness and orderliness, noise, bed-time rules and general obedience. Working class parents are more likely to use ridicule, shouting, or physical punishment in disciplining the child, and to be generally more restrictive.

It was felt that the reasons determining the second postulation (that low levels of curiosity behaviour are associated with lower socio-economic status) were also relevant to the consideration of parental behaviour, since Becker indicated that permissiveness may be associated with higher socio-economic levels. Parental permissiveness is possibly related also to democratic, warm behaviour as is indicated by the investigations reported. The inference is that both high socio-economic level and parental permissiveness are related to high levels of curiosity behaviour, and it was therefore postulated that high curiosity is related to parental permissiveness.

Hypotheses

From the postulations presented, three hypotheses were formulated for testing:
$H_1$ Curiosity is related to variability in the home environment.

$H_2$ Curiosity is related to socio-economic status.

$H_3$ Curiosity is related to parental permissiveness.

Subsidiary hypotheses formulated were that curiosity is related to (a) age, (b) sex, (c) intelligence, (d) anxiety, (e) independence, and (f) kindergarten experience.
REFERENCES


Cantor, John H., and Cantor, Gordon N., 1964a, "Observing Behaviour in Children as a Function of Stimulus Novelty", Child Develop. 35: 119 - 128


Charlesworth, William R., 1964, "Instigation and Maintenance of Curiosity Behaviour as a Function of Surprise versus Novel and Familiar Stimuli", Child Develop. 35 : 1,169 - 1,186


Greene, Frances M., 1964, "Effect of Novelty on Choices Made by Pre-school Children in a Simple Discrimination Task", Child Develop. 35 : 1,257 - 1,264


Mendel, Gisela, 1965, "Children's Preferences for Differing Degrees of Novelty", Child Develop. 36 : 453


Munsinger, Harry and Weir, Martin, 1967, "Infants' and Young Children's Preferences for Complexity", J. Exp. Child Psychol. 5 : 69 - 73


Rubenstein, Judith, 1967, "Maternal Attentiveness and Subsequent Exploratory Behaviour in the Infant", Child Develop. 38: 1,089 - 1,100


CHAPTER III

THE INVESTIGATION: EXPERIMENTAL PROCEDURE

A. DESIGN

General

The hypotheses were tested by the use of a one-sample design whereby the relationship was measured between the dependent variable of curiosity and independent variables of socio-economic level, environmental variability, and parental permissiveness.

Major unwanted variables, hypothesised from relevant research, which were controlled were age, sex, kindergarten experience, intelligence, anxiety, independence and need for achievement*. Other variables which were controlled as far as possible were time of day, condition of subject and general motivation.

Statistical

1. Statistical Model As the scales used were not equal interval, the non-parametric tests of chi-square and the Spearman rank order correlation coefficient (instead of product-moment) were used to measure the relationship

* Need for achievement, as in Ach, was included in the Independence Scale used. It is defined as Autonomous Achievement Striving.
between the dependent and independent variables. It was proposed to use analysis of variance if significant correlations, greater than .50, were found between the dependent variable and the major unwanted variables.

To measure the extent of these correlations with curiosity, the Spearman rank order correlation coefficient was used with intelligence, anxiety, independence and n Ach.

A correction for tied ranks (Siegel 1956 p.206-210) was used with the Spearman formula in all cases.

The test of significance used was students t (Siegel, ibid. p.212) and the criterion for rejection of the Null Hypothesis, in all cases, was set at the .05 level of significance (two-tailed). The level of significance was set at .05 rather than .01 following suggestions, put forward in Popham (1967, p.54), that a less stringent level is accepted by some researchers in situations where no alternative methods of measurement are available. As curiosity is a comparatively new field of study, it was felt that if a lower level of significance was set (and the possibility of making a Type II error thereby increased), relationships that existed but were obscured by the measurements would be overlooked, thus eliminating possibly fruitful areas for future research.
2. Sample. The subjects in the sample consisted of 70 children aged between 4.0 and 4.6 years at the time of testing, and their parents. (Girls, N = 34; boys, N = 36). The population from which the sample was drawn comprised families in the Christchurch area who had one or more children, in the age range given, attending Free Kindergartens. The seven kindergartens from which the sample was drawn covered all levels in the socio-economic scale, although situated predominantly in the North-West, generally considered to be one of the higher socio-economic areas.

Table I presents descriptions of the areas served by the seven kindergartens, together with the number of subjects in the sample from each area.

<table>
<thead>
<tr>
<th>Number of Kindergartens</th>
<th>Number of Children</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>7</td>
<td>Area of new, modern housing development.</td>
</tr>
<tr>
<td>2</td>
<td>24</td>
<td>Mixed: two older State Housing areas; &quot;good&quot; residential area - old and new houses.</td>
</tr>
<tr>
<td>1</td>
<td>19</td>
<td>Mixed: exclusive luxury homes; State Housing area; industrial - residential area.</td>
</tr>
<tr>
<td>1</td>
<td>11</td>
<td>Mixed: semi-luxury homes in &quot;good&quot; area; industrial - residential area; business area.</td>
</tr>
<tr>
<td>2</td>
<td>9</td>
<td>Older industrial area, factories, some houses in disrepair, but &quot;pockets&quot; of new homes</td>
</tr>
</tbody>
</table>
In the selection of subjects, this rough survey was the criterion for estimating coverage of socio-economic areas, in conjunction with four other criteria (see below). However, the distribution of subjects on the socio-economic scale, shown in Table II, shows that the sample was slightly biased in the direction of the higher socio-economic level, although all levels are represented.

<table>
<thead>
<tr>
<th>TABLE II</th>
</tr>
</thead>
<tbody>
<tr>
<td>DISTRIBUTION OF SUBJECTS ON SOCIO-ECONOMIC SCALE</td>
</tr>
<tr>
<td>-----------</td>
</tr>
<tr>
<td>Rank on Socio-Economic Scale</td>
</tr>
<tr>
<td>Percentage of subjects</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>1.4</td>
</tr>
</tbody>
</table>

It must be concluded that the sample is unrepresentative in this respect, and would bias any correlations with the independent variable of socio-economic status.

The criteria for selection of subjects, in order of consideration, were:

1) Kindergartens with suitably quiet rooms for testing,
2) Directors who were capable of rating the subjects, willing to do so, and who had been in charge long enough to know the children well,
3) Parents who were willing to co-operate, and
iv) Children who were not handicapped to any extent that would affect test results, e.g. deafness.

A selection factor of co-operativeness was therefore unavoidably operative in the choice of children, and can also be expected to influence the parent sample.

Tables III and IV show the age and educational characteristics of the parent sample, indicating that the range, in both cases, approximates the normal distribution curve, and does not appear unduly biased.

---

**TABLE III**

**AGE RANGE OF PARENTS SHOWN AS PERCENTAGES IN 5-YEAR CATEGORIES**

<table>
<thead>
<tr>
<th>Age</th>
<th>20-24</th>
<th>25-29</th>
<th>30-34</th>
<th>35-39</th>
<th>40-44</th>
<th>45-49</th>
<th>Mean (in N years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mothers</td>
<td>1.4</td>
<td>8.6</td>
<td>41.4</td>
<td>30.4</td>
<td>17.3</td>
<td>69</td>
<td>34.6</td>
</tr>
<tr>
<td>Fathers</td>
<td>4.4</td>
<td>27.9</td>
<td>35.2</td>
<td>22.0</td>
<td>10.2</td>
<td>68</td>
<td>37</td>
</tr>
</tbody>
</table>

---

**TABLE IV**

**YEARS OF SECONDARY SCHOOLING AND EDUCATIONAL ACHIEVEMENT OF PARENTS, IN PERCENTAGES**

<table>
<thead>
<tr>
<th>Years of Secondary Education</th>
<th>Educational Achievement</th>
</tr>
</thead>
<tbody>
<tr>
<td>0  1  2  3  4  5  6</td>
<td>S. Cert  U.E. Univ.</td>
</tr>
<tr>
<td>Mothers: 5.8 5.8 16.1 26.4 26.4 11.7 7.3</td>
<td>45.5  16.1  7.3</td>
</tr>
<tr>
<td>Fathers: 7.3 1.5 16.4 19.4 26.8 16.4 11.9</td>
<td>55.3  35.8  20.8</td>
</tr>
</tbody>
</table>

Mothers: N = 68; Fathers: N = 67.
Discrepancies in the size of N were due to the desertion of one father, and two parents who omitted to answer these items in the questionnaire. The fact that the ages of the fathers is generally several years more than the mothers appears to follow the statistics for the general population.

Family size and position of the subjects in the family are presented in Tables V and VI, and include one set of fraternal twins—brother and sister. Although the size of family appears representative, the percentage of subjects who are the youngest in the family, as compared with those who are eldest, seems disproportionate. It is not known how closely this resembles the total kindergarten population, but it is reasonable to assume that it is fairly accurate since mothers often find it difficult to take the eldest child to kindergarten if there are smaller siblings to care for. It is therefore assumed that the sample is not unduly biased in this respect.

<table>
<thead>
<tr>
<th>Number of Children in Family</th>
<th>Percentage of Subjects</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4.3</td>
</tr>
<tr>
<td>2</td>
<td>24.6</td>
</tr>
<tr>
<td>3</td>
<td>37.6</td>
</tr>
<tr>
<td>4</td>
<td>24.6</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>7</td>
<td>7</td>
</tr>
</tbody>
</table>

N = 69; Mean = 3.1
TABLE VI

POSITION OF SUBJECTS IN FAMILY

<table>
<thead>
<tr>
<th>Position in Family</th>
<th>Only</th>
<th>1st</th>
<th>2nd</th>
<th>3rd</th>
<th>4th</th>
<th>5th</th>
<th>6th</th>
<th>7th</th>
<th>Eldest</th>
<th>Youngest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage of subjects</td>
<td>4.3</td>
<td>14.4</td>
<td>28.9</td>
<td>31.8</td>
<td>14.4</td>
<td>2.8</td>
<td>1.4</td>
<td>1.4</td>
<td>14.4</td>
<td>47</td>
</tr>
</tbody>
</table>

Additional sample characteristics included four families with grandparents or elderly relatives living in the household, and five with student boarders, one of which had three. Only one mother was in paid employment, on a part time basis.

It is concluded that generalizations from this sample to the total kindergarten population, of this age group, in Christchurch, must therefore be made with reservations, due to the slight bias towards the higher socio-economic level, and the co-operative factor in the selection of subjects.

Control of Variables

The unwanted variables of age and sex were controlled by sample selection, age by reducing the age range to six months, and sex by equal numbers of both sex. (The numbers of boys and girls were equal at the beginning of testing, but two girls were later dropped from the sample due to familiarity with some test items). Kindergarten experience was similarly controlled by including only those children who had attended kindergarten for three months or more at the time of testing.
Control of the major unwanted variables of anxiety, intelligence, independence and \( n \) Ach. were to be controlled by analysis of variance, if correlations between these and the dependent variable of curiosity indicated that such procedure should be followed.

Time of day was controlled, as much as possible, by testing during the morning kindergarten session, but towards the end of the testing programme it was necessary to accelerate the testing as some families were going on holiday, so that subjects were visited at home during the afternoon. In such cases, arrangements were made with the mother the previous day, so that the child could rest beforehand, if necessary. No adverse effects were noticed with these subjects, as they were all anticipating the visit of the investigator and were highly motivated.

B. SELECTION OF MEASUREMENTS

Measurement of the dependent variable

The dependent variable of curiosity was measured by an individually administered curiosity test, constructed for the purpose, the development of which is described in Appendix A together with administrative procedure and scoring techniques. The test consisted of twelve pairs of experimental stimuli, and two practice pairs, each pair
consisting of one familiar object and one novel object. Subjects were presented with the pairs of stimuli in a box, and were free to look at, and investigate each object for as long as they liked. The length of time spent with each stimulus object was recorded on a tape recorder and measured with a stop watch when the tapes were played back. Reliability was obtained by the split-half technique, and was low, but was used in the absence of any other suitable method. An attempt to establish validity was made by correlating the test scores with rating scales completed by parents and staff.
(Described in Appendix A.)

Measurement of the independent variables

Rating scales were used to measure the independent variables of environmental variability, socio-economic level, and parental permissiveness, and data for these were obtained from a questionnaire sent to the parents (Appendix B.) No reliability coefficients were available for the measures of environmental variability and parental permissiveness.

1. Socio-economic level: Two indices from Havighurst's Index of Socio-Economic Status (1954) were used, as this scale had been specifically developed for use in Christchurch.
These were the Occupational Rating and the House Rating, validities for which were given by Havighurst as .48 and .87 respectively. As data for the two remaining indices in the Index (Dwelling Area and Source of Income) were not easily obtainable, a composite score was obtained by summing the index values for the two ratings used. This technique was described by Havighurst as "useful" (Havighurst, 1954, Appendix A, p.13), and the two indices selected were the ones he recommended if only two were to be used. Data for the Occupational Rating was obtained from the questionnaire, and the occupations given were rated on the seven point scale described by Havighurst. House ratings were based on age, size and condition, data for age and size being obtained from the questionnaire, while condition was rated by two judges and their ratings pooled if they were not in agreement. (Very little disagreement was actually found). Havighurst's method of rating each of these was followed, with the exception of age. His sub-division of houses on an age basis classified pre-1890 buildings as "old", those built between 1890 and 1935 as "middle", and "new" houses were those built after 1935. It was felt that the addition of another eighteen years, to bring the category up to 1968, extended the division beyond reasonable limits, consequently the lower
limit of the "new" classification, in this study, was set at 1950. Havighurst's "new" category thus became the middle one, and his middle one became the "old" category. The "old" classification used by Havighurst was omitted. Three-point scales were used to rate age and size, and a four-point scale was used with condition, and the scores for each were multiplied and assigned a position on a seven-point scale as designed by Havighurst. Occupations were also rated on a seven-point scale and ratings for both Occupation and House were summated to give a measure of socio-economic status, which ranged from one to fourteen.

2. **Variability in the home environment:** As no measures of variability were available and none were found in the literature, it was necessary to construct a measure. Six questions were included in the questionnaire and were designed to tap a number of factors in the home environment which could be expected to show considerable variation. These covered the following variables:

i) amenities and equipment which facilitated variety in activities, e.g. car, caravan, boat, musical instruments, scientific instruments;

ii) places of interest visited by the child since the age of three, and methods of transport used by the child also since the age of three;
iii) reading material available to the child, e.g.
library books borrowed by the child and magazines
available for the child to look at;
iv) hobbies followed by members of the family, which
the child saw being carried out;
v) play materials and play space available;
iv) variety in the natural surroundings, e.g. trees,
flowers, vegetables.

Other areas which could have been included covered such
variables as number of books, ornaments and pictures,
types of materials used in furnishings and pot plants.
These were not included, they were considered to be less
susceptible to change, and were therefore more likely to
be familiar and less curiosity-arousing. The items
included in the measurement were all those which could be
expected to provide constant variation and change,
opportunities for investigation and exploration, and to
enrich the child's experience thus giving rise to questions.
Parents were required to underline items in each question
that were applicable to their home background, and to
supply additional information in some cases. Scoring
consisted of giving one point to each item given, with the
exception of one question for which half points were given
to avoid undue bias on that factor. Points were then
summated, and subjects ranked on the basis of their final scores. It was not possible to obtain reliability coefficients, as the only feasible method of obtaining another estimate would have involved assessment by independent observers, and much of the information would not have been available. As the reliability of this method is not known, therefore, the results obtained by using it are interpreted with caution.

3. Parental permissiveness: Areas of parental behaviour considered by several investigators to be indicative of permissiveness or restrictiveness were followed to build a measure of parental permissiveness, as no relevant measure was directly available. Areas covered were those mentioned by Maccoby and Gibbs (1964), Sears et al (1953), Becker et al (1964), and Schaefer and Bell (1958), and included sex play, neatness, orderliness, obedience, cleanliness, care of house and furniture, noise, restrictions at mealtimes, participation in adult conversation, physical mobility, keeping track of the child, and extent of demands for obedience. In addition some items were included that covered areas specifically relevant to curiosity, e.g. answering of questions, and tolerance of exploratory and investigatory play. Two lists of questions were constructed to measure both attitudes and
actual practices and were answered by both mothers and fathers, thus giving a total of four measurements for each family. The "actual" scale consisted of twenty-four statements describing practices used by parents in bringing up children, and parents indicated their position on a three-point scale. The possible range for the scores spread from 24 to 72. The "attitude" scale was made up of a series of thirty-four statements to which parents indicated the strength of their agreement or disagreement on a four-point scale. Scores for this measure had a possible range of 34 to 136. Parents were then ranked on both scales separately.

**Measurement of variables to be controlled**

Three of these variables, (anxiety, independence and need for achievement) were measured by teacher rating scales completed by the directors. (Appendix C) Inter-judge reliabilities were established from ratings completed on approximately half the sample by four assistant directors*. These were sufficiently high to give confidence in the measures. The fourth control variable, intelligence, was measured by a brief individual test for which reasonable reliability had been reported.

* The remaining three assistant directors could not be asked to complete ratings as they had not been at the kindergartens concerned long enough to know the children sufficiently.
1. Anxiety: Of techniques for measuring anxiety available (Bronfenbrenner and Ricciuti, 1960; Ruebush, 1963), very few are designed for use with preschool children. Apart from projective and observational techniques which were not considered suitable due to the time factor involved, Bronfenbrenner and Ricciuti (ibid. p.797) mention only two methods which involve reports of behaviour from others. These were by Conrad (1932, 1933) and Read (1940), but were not available. Ruebush (op cit. p.490) mentions objective test batteries for measuring anxiety in preschool children that were in preparation, but were not available for this study. The only suitable method found was that used by Mendel (1965) which was an adaptation of a widely used technique developed by Sarason et al, the Test Anxiety Scale for Children (Ruebush, op cit. pp.482-489; Bronfenbrenner and Ricciuti, op cit. pp.794-795), and which was reproduced as an appendix to the journal article. (Mendel, op cit. pp.464-465). Mendel described the scale as "24 items taken from scales used by Sarason et al (1960). The items, consisting of statements considered indicative of overt and covert anxiety, are on a 6 point scale, with two poles representing extremes in opposite directions of that statement of behaviour". Reliabilities reported by Mendel, using the Spearman - Brown formula, were .81 between three
teachers, and .75 for a split-half.

2. Independence (n Ach) and dependency: Beller's (1957) scales were used to measure these variables, as they were considered to be suitable for use by kindergarten staff, and had also been developed for children of two to six years of age. Hartup (1963, p.341) has described the scales as "particularly appropriate for use by nursery-school teachers in assessing dependence and independence in preschool-age children". Beller equated Autonomous Achievement Striving (A.A.S.) with independence and exploration, and considered dependency and independence to be uni-dimensional, although Hartup (ibid. p.336) said that only tentative support had been given for such an hypothesis. It was decided, however, that Beller's scales would give a useful measure of both behaviours, and, if his hypothesis was correct, the correlations should be in opposite directions. The only other techniques for measuring the variables of independence and need for achievement, apart from projective and observational methods which were considered to be unsuitable due to the time required, was Aronson's Graphic Expression method for measuring achievements (1953) and Finney's dependency scales mentioned by Hartup (op cit. p.341). As Finney's scales were not obtainable in time (and it was not known whether
they were any better than Beller's), and Aronson's method reported a much lower reliability coefficient, .13, it was decided that Beller's scales which combined measurements for both variables were most suitable for the purposes of this study. Bronfenbrenner and Ricciuti (1960, p. 809) described the scales as follows:

Specific variables rated include satisfaction derived from work, carrying out of routine tasks, overcoming obstacles, taking initiative, and completion of activity. Interjudge reliabilities for the five sub-scales range from .67 to .80.

Beller (1957) reported positive product-moment coefficients between teachers of .62 to .78 for dependency with a median of .78, and from .67 to .80 for achievement striving with a median of .75.

3. **Intelligence:** A choice was possible between two individual tests for preschool children— the Peabody Picture Vocabulary and the Columbia Scale of Mental Maturity (C.M.M.S.). The Peabody Picture Vocabulary had been used by Penney (1965) who had found no correlation between reactive curiosity and intelligence, and reliabilities between the test and others such as the Stanford-Binet were higher than between the Columbia Scale of Mental Maturity and the Stanford-Binet. However, since the possibility existed that the absence of many positive correlations between intelligence and curiosity could be a function of
the intelligence test used, it was decided that this hypothesis could be tested by the use of an intelligence test that had not already been used in a study of curiosity. Consequently the Columbia Scale of Mental Maturity was the test selected for use in this study. Reliabilities reported for the C.M.M.S. by Newland (1965) were .39 with the 1960 Stanford-Binet, and four- and five-year-olds but were higher with the 1937 Binet, being .78 for four-year-olds and .62 for five-year-olds. A correlation of .80 between the C.M.M.S. and the Peabody Picture Vocabulary was also reported, which suggests that the two tests may not measure very different mental abilities. The C.M.M.S. consists of a series of 100 cards (coloured white, blue, buff and green), each with three to five drawings, either black and white line drawings or coloured blue, red, yellow, green or black. One picture on each card was different from the others on it, and the subjects were required to decide, for each card, which picture was the one that was different. Time taken for the completion of the test was usually between 15 and 20 minutes. Raw scores were obtained by adding the number of correct responses which were converted into mental ages from tables given. No tables for converting the mental ages into intelligence quotients were supplied, necessitating the computation of these for each subject.
C. GENERAL TEST PROCEDURE

Testing of the sample proceeded in two stages, the first concentrated on the kindergartens and the measurements of the variables to be controlled, and the second centred on the homes and the measurement of the dependent and independent variables.

Stage I.

After the sample had been selected rating scales for anxiety, independence and need for achievement as well as a brief curiosity rating scale (Appendix A) were given to the seven directors and four assistants, and parents were thanked for their consent and were advised that they would be sent the questionnaire shortly and that the children would be given the first test while at kindergarten. Before the testing programme was begun, however, the investigator visited the kindergartens during normal kindergarten sessions in order that the children might become familiar with her. Directors introduced the investigator to the children individually, and time was then spent with them in normal kindergarten activities. During the course of conversation with each child, the investigator mentioned that she had brought some special pictures and suggested that the child might like to look at them later. In this way the intelligence test was introduced to the subjects,
and each one was given the test at a convenient time during the kindergarten session. Testing was done either in the staff rooms or in some other suitably quiet room away from distractions. Commencement of the testing programme in the kindergartens was found to be of particular benefit to a small proportion of children who were at first hesitant about the "special" pictures, but who gained confidence and were reassured by seeing that other children had obviously enjoyed seeing them. Before the standard test instructions were given at the beginning of the intelligence test, each child was told that the investigator was taking pictures and toys to some kindergartens and was showing them to the children to find out what sort of things they liked. At the conclusion of the test the children were told that the investigator would be returning another day and would bring the toys to show them then. On subsequent visits to the kindergartens to see the staff, the investigator was greeted enthusiastically by most of the children and none showed any sign of apprehension, so that it did not appear that test anxiety played any major inhibitory role in the testing of the children.
Stage II.

The second stage of the testing programme began with the delivering of the questionnaire to the parents. Each home was visited at least once during this stage, either for delivering or collecting of the questionnaire, or for testing of children, at which time the house was rated on condition as part of the House Rating for the socio-economic scale. Also during this stage the curiosity test was given to the children either at kindergarten or in their homes. It was found necessary to test some of the children at home in some cases because the families were going on holiday and testing had to be fitted in before they left, and in others because the kindergartens were preparing for Christmas and were therefore not suitable. The test procedure followed was the same whether the test was held at kindergarten or at home, as described in Appendix A. The response of the children to the curiosity test was good as they were all co-operative and interested, as were their parents. With the completion of the curiosity test, and the collection of questionnaires from parents and ratings from teachers, the second half of the test procedure was concluded.
REFERENCES


Havighurst, Robert J. et al. 1954, Studies of Children and Society in New Zealand. Christchurch: Canterbury University College


Mendel, Gisela, 1965, "Children's Preferences for Differing Degrees of Novelty", Child Develop. 36 : 453


CHAPTER IV

RESULTS, DISCUSSION AND CONCLUSIONS

A. ANALYSIS OF RESULTS

Raw Scores

Raw score data are presented in Table VII, showing the range, difference between highest and lowest scores, standard deviation and number of subjects for each of the test measures.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Range</th>
<th>Standard</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Highest</td>
<td>Lowest</td>
<td>Diff.</td>
</tr>
<tr>
<td>Curiosity Test</td>
<td>.861</td>
<td>.464</td>
<td>.397</td>
</tr>
<tr>
<td>Intelligence</td>
<td>127</td>
<td>88</td>
<td>99</td>
</tr>
<tr>
<td>Anxiety</td>
<td>58</td>
<td>30</td>
<td>28</td>
</tr>
<tr>
<td>Dependency</td>
<td>35</td>
<td>6</td>
<td>29</td>
</tr>
<tr>
<td>n Ach.</td>
<td>35</td>
<td>6</td>
<td>29</td>
</tr>
<tr>
<td>Soc-Ec. status</td>
<td>2</td>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td>Variability</td>
<td>202</td>
<td>55</td>
<td>147</td>
</tr>
<tr>
<td>Permissiveness:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Actual: mothers</td>
<td>63</td>
<td>40</td>
<td>23</td>
</tr>
<tr>
<td>fathers</td>
<td>64</td>
<td>39</td>
<td>25</td>
</tr>
<tr>
<td>Attitude:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>mothers</td>
<td>125</td>
<td>83</td>
<td>42</td>
</tr>
<tr>
<td>fathers</td>
<td>116</td>
<td>74</td>
<td>42</td>
</tr>
</tbody>
</table>

Differences in size of N were due to parents who failed to answer some parts of the questionnaire (variability scale), and to the permanent absence from the home of one father and
the absence during testing of another (parental permissiveness).

The mean for the curiosity scale was above .50, indicating that the sample as a whole spent more time with the novel stimulus than with the familiar one. Therefore, very few children could be classified as "not curious" in the sense that they spent less time with the novel stimulus. As a result of this, the division of subjects into two groups for the calculation of chi-square by a 2 x 2 contingency table meant that the groups were classified into high and low curiosity groups rather than "curious" and "not curious". The range of the high curiosity group was from .861 to .630, while the low curiosity group was from .628 to .464, which meant that the difference between the lowest in the high curiosity group and the highest in the low curiosity group was very slight. As only four subjects in the whole sample were below .50, the sample is obviously biased towards more curious children, although it is not known whether the total population would show even numbers above and below the .5 mark. Since curiosity is generally considered to be a characteristic behavioural feature of childhood it is doubtful that scores would go down as far below the half-way mark as they do above, in which case the test sample may not be as biased as it would appear.
The data on intelligence scores shows that the range was considerable, with one subject of extremely high intelligence, which probably accounts for the higher than average mean of the group. Only 10 subjects showed I.Q.'s below 100, and only one was below the lower limit of the range of normal intelligence. On the other hand, 40 of the total sample were within the range of normal intelligence (between 90 and 110 I.Q. points) but 29 were above this range compared with the one below it. Of the subjects above the normal range, 18 were between 111 and 120, 5 between 121 and 130, 4 between 131 and 140, 2 between 141 and 150 and one was above that level. The proportion of subjects with higher than average intelligence, therefore, meant that the sample was biased in that respect also.

Of the remaining measures, only the variability scale was capable of spreading the scores out so that excessive tying of ranks was avoided. However, as Siegel (1956 p.210) has indicated, ties have a "relatively insignificant" effect on the value of the Spearman rank correlation, which meant that the tying of ranks necessitated by the small spread of the other measures would not have affected the results unduly.

A point of interest occurs with a comparison of parental permissiveness scores, whereby it is seen that fathers tended
to be slightly less permissive than mothers, which is of significance to later findings in this respect.

Reliabilities of Measurements

1. Dependent variable: The reliability found for the curiosity test, of .25 (cf discussion of procedure in Appendix A) was extremely low and it is doubtful whether the test measures the behaviour it was intended to measure. However, due to the absence of a parallel form, and the inadvisability of doing a test-retest, the split-half technique was the only alternative. The discussion in Appendix A has indicated that the two halves of the test were not equivalent which is considered to be the main reason for the low reliability. Therefore it can only be concluded that all the items in the test do not measure the same behaviour, but this does not mean that the test would not measure whatever it does measure on a later occasion. That the test may be a reliable estimate of the behaviour it measures has not been proved conclusively, whereas the coefficient of .25 clearly demonstrates that the test is not internally consistent which is attributed to the failure to obtain equivalent halves.

Cronbach (1949, p. 61) has described a formula for estimating the reliability of a test n times as long which, applied to the curiosity test coefficient of .25 indicates
that a test twice as long would have yielded a coefficient of .40 while a test three times as long would have given a reliability of .50. It is possible, therefore, that the test was too short to give a reliable estimate and this, together with the lack of equivalence in the two halves, suggests that to improve the reliability of the test it should be lengthened and the halves made more equal. However, the test should not be lengthened to an extent that would make fatigue an inhibitory factor, as would happen if the test was lengthened as much as three times. The possibility also exists that a test even twice as long would be tiring to some subjects as some took 45 minutes with the test as used, although most took 20 to 30 minutes. It is therefore doubtful whether anything would be gained by lengthening a test of this nature for use with pre-school children. The only method of increasing reliability, apart from constructing a parallel form, is to render the two halves more equivalent. However, for the purposes of this investigation the curiosity test was used as developed as it had been found to be the only method suitable.

There are several precedents for using a test with a reliability as low as .25. Cronbach (1949, p.72) said, "There is no single standard of what is an adequate reliability coefficient. Few tests approach perfect
reliability. Sometimes short and unreliable tests are valuable for particular purposes, especially for making rapid judgments." Aronson's Graphic Expression Method (in Atkinson, 1958) for testing Ach. when applied to kindergarten children gave a reliability coefficient of .13, and for nine-year-olds gave .38 over two designs. Despite its almost negligible reliability, McClelland supported its use, and considered that the true reliability was probably "around .40." He blamed the coarse grouping of results, and also two deviant cases in a very small sample. Referring to this, Bronfenbrenner and Ricciuti (1960, p.806) "remain unconvinced", although Aronson, McClelland and Atkinson apparently considered it to be a useful technique despite its low reliability.

A more reputable and widely used test with extremely low reliability coefficients for many of its subtests is the Rorschach. Eysenck (1952) gave a table listing the correlations between the Rorschach and its parallel form (the Behn Rorschach or Bero) using 100 normal and 96 abnormal subjects. The correlations were given for the two tests on all 35 scoring categories, and for normal and abnormal subjects separately. Of the 35 correlations using normal subjects, 22 were below .50. Three of these were between .49 and .40, nine were between .39 and .30,
five were between .29 and .20, three were between .18 and .10, and two were negative. With abnormal subjects, twelve correlations were below .50, including one negative one, two were between .20 and .29, three between .30 and .39, and six between .40 and .49.

Low reliabilities were reported also for the Thematic Apperception Test, by Freeman (1950). He quoted Sanford's finding of .48 and .46 (split-half) reliabilities, and also Child's finding of internal consistency reliabilities of -.07 to +.34 with a mean of .13. Test-retest and interjudge reliabilities were much higher.

Use of the curiosity test, therefore, despite its low reliability was considered to have been given some justification, and, in view of the difficulties experienced in using the few methods found to be reliable by previous investigators in this comparatively new field of research, it was felt to be the only course available in the circumstances. The results of the investigation are consequently treated with caution.

2. Independent variables: It was not possible to establish reliability for the scales of environmental variability and parental permissiveness, firstly because the measures were not constructed in a way that would produce two equivalent halves for use in a split-half
estimate, and secondly because time did not permit the
giving of a retest, which would have been possible, as an
interval of several months should have been left between
tests. It was not possible to do this, however, as
subjects would have been on holiday and unable to be
contacted at the time when a retest should have been given.
The use of these measures may be justified on the grounds
that research in the behavioural sciences must often
proceed by using inaccurate and unreliable measurements in
the absence of more reliable ones, thereby gaining
information concerning the use of such techniques and
 possibilities for future research. Conclusions based on
these measurements, also, must therefore be suggestive and
will be regarded as indicative of areas for more rigorous
investigation, rather than conclusive evidence.

Estimates of reliability of the socio-economic scale
were not obtained, except for the two-judge ratings of
house condition which showed negligible variation, but
Havighurst considered the measures were reasonably reliable.
As there were no other methods of obtaining details such as
occupation and age and size of the houses, the information
given by parents must be assumed to be accurate, and there
is no reason to believe that it should not be so.
3. **Control variables:** Table VIII shows the correlations obtained between the ratings of assistants and directors.

<table>
<thead>
<tr>
<th>Measure</th>
<th>rho</th>
<th>t</th>
<th>df</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anxiety</td>
<td>.723*</td>
<td>4.795</td>
<td>23</td>
<td>25</td>
</tr>
<tr>
<td>Dependency</td>
<td>.54**</td>
<td>3.685</td>
<td>31</td>
<td>33</td>
</tr>
<tr>
<td>n Ach.</td>
<td>.60**</td>
<td>4.175</td>
<td>31</td>
<td>33</td>
</tr>
</tbody>
</table>

**significant at or beyond the .01 level**

Differences in size of N were due to the fact that only four out of the seven assistants knew the children well enough to rate them. The table shows that the correlations between staff for all three rating scales were highly significant, and that agreement was high for anxiety and reasonably high for dependency and n Ach. Therefore, as the directors ratings were the ones to be considered, it can be said that the ratings were reliable between staff. It is not known how these estimates would compare with other methods of measurement, or with parental estimates. It is possible that staff are not equally observant of all the eighty children in their care and that their ability to judge such behaviour is not as sophisticated as could be desired, but these were the only measurements possible, and they are therefore accepted as reliable.
Correlations between Dependent, Independent and Control Variables

Dependent and Control Variables: Correlations between curiosity and the control variables of intelligence, anxiety, dependency and n Ach. are presented in Table IX.

<table>
<thead>
<tr>
<th>Measures</th>
<th>rho</th>
<th>t</th>
<th>df</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intelligence</td>
<td>.40***</td>
<td>3.598</td>
<td>68</td>
<td>70</td>
</tr>
<tr>
<td>Anxiety</td>
<td>.002</td>
<td>.0169</td>
<td>68</td>
<td>70</td>
</tr>
<tr>
<td>Dependency</td>
<td>-.02</td>
<td>-1.675</td>
<td>68</td>
<td>70</td>
</tr>
<tr>
<td>n Ach.</td>
<td>.193</td>
<td>1.622</td>
<td>68</td>
<td>70</td>
</tr>
</tbody>
</table>

*** significant beyond the .001 level

It can be seen that only intelligence gave a significant correlation, but this was not high enough to warrant analysis of variance being calculated. A small but insignificant correlation was found between n Ach and curiosity, while correlations for dependency and anxiety were negligible.

Although hardly useful, the dependency and n Ach correlations are nevertheless in the directions expected from Beller's hypothesis, which suggests that his theory may account for this, but the indications are extremely slender. The correlation between intelligence and curiosity does not, however, support the results of previous investigators that the two are not related, and some confirmation is thereby
given to the expectation from theorists and educational writers that there should be a relation between the two. The finding that anxiety and curiosity were not correlated was not expected and, considering the weight of evidence in favour of such a relationship from other investigations, these results must be viewed with suspicion.

In addition to these findings, no sex differences between high and low curiosity groups were found. In the high curiosity group there were 17 girls and 19 boys (N = 36) and in the low curiosity group there were 17 of each sex (N = 34), while their scores were evenly distributed within each group.

Dependent and Independent Variables:

1. Socio-economic status:

<table>
<thead>
<tr>
<th>Measure</th>
<th>( \chi^2 )</th>
<th>df</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Curiosity</td>
<td>.022</td>
<td>2</td>
<td>.99</td>
</tr>
<tr>
<td>Variability</td>
<td>1.519</td>
<td>1</td>
<td>.30</td>
</tr>
<tr>
<td>Permissiveness:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Actual: mothers</td>
<td>.0002</td>
<td>1</td>
<td>.99</td>
</tr>
<tr>
<td>fathers</td>
<td>.073</td>
<td>1</td>
<td>.80</td>
</tr>
<tr>
<td>Attitude: mothers</td>
<td>.723</td>
<td>1</td>
<td>.50</td>
</tr>
<tr>
<td>fathers</td>
<td>.531</td>
<td>1</td>
<td>.50</td>
</tr>
</tbody>
</table>
Table X shows the significance of chi-square relations between the dependent and independent variables, none of which were significant at meaningful levels. The null hypothesis is therefore accepted in all cases, and hypothesis one, that curiosity and socio-economic level are related, is accordingly unconfirmed. Consequently the theory evident in the literature that it is low socio-economic level that causes low variability in the home environment is not supported, although the chi-square between variability and socio-economic level is the only one approaching significance. The fact that the measure of home variability has no known reliability raises the possibility that there is, in fact, a relationship which the measures used were not precise enough to measure. The expectation that parental permissiveness is also related to socio-economic level is also not confirmed, and from these results it thus appears that socio-economic level has little effect on curiosity, variability of the home environment as well as parental permissive behaviour.
TABLE XI
CORRELATIONS BETWEEN DEPENDENT AND INDEPENDENT VARIABLES

<table>
<thead>
<tr>
<th>Measure</th>
<th>rho</th>
<th>t</th>
<th>df</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home variability</td>
<td>.294*</td>
<td>2.418</td>
<td>62</td>
<td>64</td>
</tr>
<tr>
<td>Permissiveness:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Actual:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mothers</td>
<td>.013</td>
<td>.107</td>
<td>68</td>
<td>70</td>
</tr>
<tr>
<td>Fathers</td>
<td>-.598***</td>
<td>6.061</td>
<td>66</td>
<td>68</td>
</tr>
<tr>
<td>Attitude:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mothers</td>
<td>-.009</td>
<td>.074</td>
<td>68</td>
<td>70</td>
</tr>
<tr>
<td>Fathers</td>
<td>-.343**</td>
<td>2.966</td>
<td>66</td>
<td>68</td>
</tr>
</tbody>
</table>

* significant at or beyond the .05 level
** significant at or beyond the .01 level
*** significant at or beyond the .001 level

Home variability: Table XI shows that a significant but slight correlation was found between the curiosity test and the not very precise measure of home variability. The correlation was only significant at the .05 level, but was sufficient to reject the null hypothesis that the results were due to chance. The second hypothesis is thus confirmed, and support is given to the theories that differences in home environments are associated with individual differences in curiosity behaviour. As the measure of variability lacked precision, the results indicate that future research in this area could be fruitful.

Parental permisiveness: Results presented in Table XI show that highly significant negative correlations were obtained between curiosity and fathers permisiveness, i.e. that curiosity is related to restrictiveness of the father.

Correlations between ratings of mothers permisiveness and
curiosity were virtually non-existent and were insignificant, although for both parents correlations on the "attitude" scale were lower than for the "actual" scale, indicating that parents actual behaviour, particularly that of the father, has more effect on curiosity than attitudes. Although the correlations between curiosity and fathers' ratings were sufficiently high to confirm the third hypothesis in part and to reject the null hypothesis, the correlations were not in the direction expected from the literature, i.e. that permissive behaviour encourages curiosity. The differences between mothers and fathers was also unexpected, in view of the correlations found between parents ratings as shown in Table XII.

<table>
<thead>
<tr>
<th>Measures</th>
<th>rho</th>
<th>t</th>
<th>df</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual</td>
<td>.639***</td>
<td>6.748</td>
<td>66</td>
<td>68</td>
</tr>
<tr>
<td>Attitude</td>
<td>.518***</td>
<td>4.917</td>
<td>66</td>
<td>68</td>
</tr>
</tbody>
</table>

*** significant beyond the .001 level

The results of the correlations between the dependent variable and all the independent variables do not confirm hypothesis one, but do support hypothesis two, and hypothesis three in part.
B. DISCUSSION

One of the most significant findings from this investigation is the lack of correlation between curiosity and socio-economic status, particularly as the results of previous research had been inconclusive, but it had appeared to be related to environmental deprivation and to parental permissiveness. In view of the complete absence of any significant correlation at all between socio-economic level, curiosity, environmental variability, and parental permissiveness, the correlations found for environmental variability and father's restrictiveness are given added significance, and the reasons for such correlations must be found elsewhere.

The quotation from the Plowden Report (cf p. 54) is helpful in explaining the correlation, slight but significant, between curiosity and home variability. The suggestion from the Plowden Committee is that disadvantage in the environment may not be found at any one socio-economic level, but may instead be found at all levels. If they are correct, and the findings from this study tend to give a measure of support for such a contention, then factors other than economic ones must be operative to cause environmental deprivation (social or physical) which inhibits curiosity.
The environmental variables tapped in the measure of variability used, related to conditions that could be varied or changing, centred round areas that reflect the interests and abilities of the family group. It is possible, as the Flowlde Committee suggest, that those parents who are "obsessed with the need to impress and achieve" provide for their children an environment that reflects such needs, by displays of economic or social standing which may provide their children with an arid desert with little to excite curiosity and imagination.

Parents with such needs are possibly more likely to place care of possessions above a child's needs to explore and investigate, regardless of their economic situation.

Possibly, also, such parents may regard "good" behaviour of their children as a reflection of their ability as parents and to be more restrictive of investigatory behaviour that would create a mess and label the child as "difficult".

The suggestion is therefore offered that, whether or not a parent provides an interesting and varied environment, and thus facilitates the development of curiosity in children, is more dependent on personality factors in the parent, such as the need to impress, which may reflect underlying insecurity, than with purely economic factors.
In fact, the provision of a facilitating environment for the development of curiosity may be more closely linked with the ease with which a parent accepts the role of parenthood than with the financial means whereby it can be implemented. A parent who is more accepting of the parental role could find it easier to accept the needs of children, and to provide the social contact regarded by both Nechinger and Hunt (cf p.55) to be necessary for the development of curiosity behaviour. In addition, it is reasonable to suggest that a parent who enjoys and accepts the role of parent would find satisfaction in the pursuit of activities and interests in the home, to a large extent, rather than looking elsewhere for pleasure and enjoyment. As it was such interests that were reflected in the measure of home variability it seems probable that parental security reflected in interest and enjoyment of home and children, is a crucial factor in the provision of an environment in which curiosity can flourish.

This proposition is supported by the correlation between parental permissiveness and curiosity. The expectation was that permissiveness, related to higher socio-economic levels, would be associated with higher degrees of curiosity behaviour, but this was not confirmed. The unexpected but highly significant correlation between father's restrictiveness
and curiosity appears to agree with the suggested explanation for the correlation between curiosity and home variability. It is postulated that parents who are secure in their role and accept it, may find it easier to control their children and to define limits for behaviour than parents who are less secure. The insecure parent may be more concerned with an appearance of permissiveness, perhaps to demonstrate knowledge of current child-rearing trends, than with the provision of balanced freedom and control necessary for the development of security in children. A less secure parent may hesitate to apply control when necessary through fear of being thought too authoritarian or of losing the affection of the child.

The findings from the research on curiosity and anxiety (cf p.46) are relevant in this respect, as there has been general agreement that curiosity and anxiety are negatively correlated, i.e. that anxiety is associated with low curiosity. Therefore it seems possible that instead of causing anxiety in the child, restrictiveness of the father provides an atmosphere of security in which curiosity can develop. The fact that the results of the anxiety ratings by teachers with curiosity showed no correlation in this study is not considered to cast any doubt on the findings
of other investigators in this area, due to the unreliability of the measurements used. Consequently it is accepted that anxiety and curiosity are negatively related as found by other researchers, and the relationship is suggested as an explanation for the unexpected correlation between curiosity and father's restrictiveness.

However, it is not suggested that the findings in this respect are any more reliable or conclusive than those found with anxiety, since the reliability of the measure of parental permissiveness is also unknown, and it is possible that the measure is not as precise as could be desired. If this is the case, then parental behaviour classed in this study as restrictive could be less rigid than some definitions of restrictiveness and therefore provide the balance between freedom and control necessary for healthy child development. The possibility must also be considered that the relationship between curiosity and parental permissiveness is curvilinear rather than linear, in which case too much of either permissiveness or restrictiveness could cause inhibition of curiosity. Maier (1965, p.176) refers to Sears in this respect, and said that Sears' findings emphasize that child-rearing practices in certain critical areas "do not follow an accumulative linear pattern, but rather a curvilinear one".
He added that,

Child-rearing depends upon finding a proper balance between providing too much and providing too little in any one area .... curvilinear development implies that too much permission and opportunity intensifies the behaviour under question while at the same time, too many limiting or controlling actions inhibit behaviour.

It is therefore likely that the degree of restrictiveness shown by the fathers' ratings provide just that balance needed for the expression of curiosity behaviour.

Baumrind's finding (cf p.65) that mothers who encouraged curiosity were firm and controlling is also an important consideration, although the mothers tested in this study showed no relationship between their behaviour and curiosity. However, the suggestion from Baumrind is that controlled, loving and consistent discipline fosters curiosity, which is borne out by the findings concerning fathers in the present investigation.

The absence of any correlation between curiosity and mother's permissiveness is interesting. The possibility that the role of the father is more decisive and influential in providing a secure environment cannot be ignored, although it seems more probable that the sample of mothers was biased. This could have been due to the selective factor of cooperativeness that operated, since the signatures on the acceptance form were predominantly those of the mothers.
It is not unlikely that more restrictive mothers would not have accepted, thereby rendering the sample of mothers more permissive or child-centred than normal. In addition, as the measures are not accepted as reliable, and all results must be interpreted with caution, the probability that differences between the parents may be exaggerated must not be overlooked. Nevertheless, the size of the correlations and the significance of those concerning the father, seems to indicate that there is a difference between them. Therefore it is not improbable that there is a difference between parents in the effect of their child-rearing practices on curiosity level in children. Corroborative evidence is mentioned by Becker (1964), who cited studies in which a trend for fathers to be more strict had been observed.

A further point, which must be emphasized, concerning the correlation between environmental variability and curiosity is that it is the provision of variety that is the relevant factor in the environment, not the quality of the home nor the economic level. The fact that variability, even with such a crude measure, has been shown to correlate with curiosity, supports the concept, derived from earlier research as outlined by Fowler, that curiosity results from variations in the environment, specifically in the
amount of information thereby provided. It is apparent from these findings that it is not just money and possessions that benefit the child, but that variety is a crucial factor. Therefore, although the advocates of increased facilities for pre-school education (e.g. the U.S. Head Start programme) are correct in assuming that curiosity is stifled by environmental conditions that lack stimulation and variety, the possibility is raised that the association of such "cultural deprivation" with areas of low socio-economic status obscures the real reason for such inhibition of curiosity. The Plowden Committee, as discussed, showed appreciation of the fact that deprivation can occur at any level and that the child from the highest stratum of society may be just as deprived in terms of the necessary ingredients for intellectual and emotional growth as the child from the worst slum conditions who may be lacking in nutrients essential to physical development. However, although it is tempting to accept the interpretations resulting from the lack of significant relationships between curiosity and socio-economic level, too much reliance cannot be placed on these results. This is not only due to the unreliability of the measures, but also because the sample was biased towards the higher socio-economic levels.
It must therefore be acknowledged that, although these results present an interesting argument, the possibility exists that the results are spuriously high. It seems extremely probable that if conditions were available in Christchurch to compare with the worst slum conditions in America, the correlations would show some relationship between socio-economic level and curiosity, and between socio-economic level and environmental variability. In addition, the relationship between socio-economic level and variability was the only one approaching significance (.30) which tends to suggest that a relationship exists which the measures used were not sensitive enough to detect. Commonsense also supports the view that there should be a relationship, as finance must affect some of the home variables that were measured. Research in this area is therefore necessary, both to confirm or reject the possibility that a relationship between socio-economic level and home variability exists, and to enable parents to be guided as to factors which they can vary without increased finance.

Consequently, although the findings support the two hypotheses that environmental variability and parental permissiveness are related to curiosity and do not confirm any relationship between curiosity and socio-economic level,
these findings must be viewed with caution and can be regarded as tentative only. Although support is given to the view that environmental deprivation resulting in reduced curiosity behaviour may be effective at any socio-economic level, the suggestions from pre-school educators that low socio-economic level results in less curiosity cannot be regarded as disproved. The view is put forward that the findings in relation to home variability and parental permissiveness may best be explained in terms of parental adjustment to the role of parenthood and to other personality factors, but this is in the nature of a further hypothesis, derived from the present findings.

Of the subsidiary findings, the correlation between curiosity and intelligence is the most significant, and is of considerable interest to education. The widely-held belief in the association between the two, unconfirmed by all but one investigator, is thus supported.

The suggestion that the failure of previous research in this area to find correlations may be due to differences in tests used was seen to be a possibility. Only one of the investigators mentioned used four-year-olds, (Penney, cf p.42) and found no correlation using the Peabody Picture Vocabulary. The Columbia Mental Maturity Scale (C.M.M.S.) was used to test the hypothesis that the lack of correlations
between curiosity and intelligence reflected differences in the intellectual abilities measured by the tests, and as Penney found no correlation, the finding of a significant correlation of .40 for this study tends to confirm the hypothesis. Consequently it is suggested that there is, in fact, a relationship between intelligence and curiosity, as expected on the basis of theory and educational opinion, but that this relationship has been obscured in the investigations so far conducted by the nature of the intelligence tests. This is shown by a comparison of the Peabody Picture Vocabulary, which requires the ability to remember the spoken word, with the C.M.N.S. which requires discriminative ability similar to that which has been considered to arouse curiosity, namely the match-mismatch mechanism between stimulus input and previous input, considered to be the causative factor in curiosity behaviour by the information theorists. It was considered highly probable that the tests would be correlated for this reason, and the fact that a correlation was found also lends support to the view that similar match-mismatch processes are operative in both. Incidental confirmation is also given to the theory that curiosity is a result of discrepancy arising from a match-mismatch process in the nervous system.
An additional reason for the lack of correlation between intelligence and curiosity behaviour found by previous investigators is provided by Sontag, Baker and Nelson (1953), who report that "irregularity of pattern of I.Q. change" is a characteristic of individual growth, and that periods of greater I.Q. change are interspersed with periods of lesser change. They found that two shifts occur between 3.6 and 4.6 years, and three shifts between 4.6 and 5.0 years, consequently differences in correlations between intelligence and other individual variables, could be high at one age level and low at another due to different patterns of I.Q. change.

Findings from the other control variables, although small and insignificant, nevertheless serve as indicators of areas which could yield significant correlations if more reliable measures were used. This is particularly true of the negligible correlation found between anxiety and curiosity which should have been negative on the basis of previous research. A relationship between independence (n Ach) had been expected, at least for boys, from Lucco's findings (cf p.49) and from Beller's uni-dimensional theory (cf p.92) a negative correlation between curiosity and dependency was expected. That these correlations, although small and insignificant, were nevertheless in the
expected direction, lends slight support to the two
standpoints.

However, since all the ratings made by directors on the
control variables provided insignificant correlations with
curiosity, despite strong expectations that anxiety, at
least, should be highly significant, the conclusion is that
these measures are probably not reliable, although high
reliability between staff is reported. It was not
possible to train the raters to any degree of sophistication,
and it is considered that this may have affected the results.
Consequently the expectation that significant correlations
exist between these variables and curiosity is still
considered to be tenable.

C. SUGGESTIONS FOR FUTURE RESEARCH

One of the most urgent requirements which this
investigation has confirmed, is the need for the development
of more reliable measures of curiosity. Maw and Maw, and
Medinnus and Love (cf p. 144) both mentioned this need,
and it is evident that little progress will be made in the
understanding of such behaviour until it is possible to
measure it with some degree of accuracy. Although some
of the measures tested during the development of the curiosity
test used in this study had reported quite high reliability
coefficients, the techniques used were not found to be satisfactory with pre-school children. Correlations as high as .94 were reported for the technique used by Medinnus and Love, which was found to be unsuitable because of difficulties experienced with scoring. The similar method used by McReynolds, Acker and Pietila (cf p. 144) with the curtained box was found to contain an element of fear, necessitating the rejection of this technique, also, despite a reliability reported for the method, of .87. The stages in testing these methods are described in more detail in Appendix A, but it should be mentioned here that doubts are held concerning the effectiveness of the two methods mentioned, due to the fact that they both used as stimuli items that could have been classified as familiar - and familiarity has been effectively demonstrated by Cantor and Cantor to elicit lesser amounts of curiosity behaviour. Some of the objects used by Medinnus and Love, e.g. clothes peg, ballpoint pen, plastic utensils, balls, and toys were found during the preliminary testing to evoke very little investigatory behaviour. Medinnus and Love reported themselves that they did not consider that their test measured the kind of curiosity defined by Maw and Maw. They based this decision on the results of correlations between their curiosity test and teacher rating scales.
based on Naw and Naw's definition. It should be added that the results of the curiosity test used in the present investigation showed a similar negligible correlation with a teacher rating scale based on the same definition. As the present investigation attempted to ensure that all stimuli designed to elicit curiosity behaviour were as novel as possible, it is difficult to see why there should be no correlation found between the test and rating scales based on children's reaction to novelty. Several reasons can be put forward to account for this, and it is in this connection that future research would be desirable.

First, is the possibility that the stimulus items compared with the novel items may not have been familiar enough to all the subjects and that the novel items may not have been novel enough. It is suggested that the familiarity of the items could be ensured by familiarization sessions prior to testing. However, research is needed to ascertain that novel items used in a test of curiosity are capable of eliciting curiosity behaviour. The results of this study indicated that some items that were known to be completely novel to all the subjects elicited less curiosity behaviour than objects with more puzzling aspects. This is explained by Berlyne's collative stimuli (cf p.41), and it is possible that test items that isolate
these stimulus factors are less meaningful than items that combine several. However, if tests are to be constructed that will be capable of eliciting curiosity behaviour from large samples it is evident that research is needed to determine the combinations of stimulus factors that are the most effective, as well as the comparison items with which they are best paired, if a comparison method is to be used.

The second area to which research should be directed concerns the method of scoring. The present investigation used Lucco's method of obtaining the proportion of time spent with one stimulus compared with the length of time spent with both. This involved the measurement of length of time only. Although this was meaningful, it is possible that amount of investigatory activity measured in terms of manipulations or verbal response would produce a more accurate account of curiosity behaviour, as length of time on its own gives no indication of the quality of the behaviour indulged in during that time. Therefore, research should be directed towards the determination of the most meaningful method of scoring the various behaviours classed as curious. It is possible that the most useful measure would tap a number of investigatory activities, e.g. number of questions asked, quality of
questions, orienting behaviour or looking at or scrutinizing a stimulus, as well as the more conventional manipulations. A test battery similar to some intelligence tests could be the most effective method of measuring curiosity behaviour.

Consequently, it is necessary to develop such measures before further research can be implemented in the field of curiosity behaviour. However, other areas in which investigation could well be carried out have been suggested from the results of this study.

The most interesting investigation which is envisaged concerns the relationship between curiosity and intelligence. The results of the correlation between the two variables clearly demonstrates the need for more research in this area, as the suggestion that the findings so far reported in the literature may be a function of either curiosity or intelligence measures has been supported by the significant correlation found. It is suggested, therefore, that a useful study would correlate the results of several intelligence tests with the results of, perhaps, several curiosity tests. Such a study should also investigate these relationships at different age levels as the suggestion has been made by Sontag, Baker and Nelson that changes in intelligence are more obvious at different ages.
A further area for research is related to the theory that parents who are more accepting of their role are able to provide an environment that facilitates curiosity behaviour. Such an investigation should correlate personality variables related to security in the parent with curiosity behaviour in the child as well as variability in the home environment.

Finally, as the results from this investigation were affected by the lack of reliable measures of environmental variability as well as the unreliability of the curiosity test, a suitable measure needs to be developed to measure such home variability. Attention should be concentrated on the factors in the home environment that are related to curiosity behaviour, but not to socio-economic level, to clarify the issue concerning the relationships still likely to be found between socio-economic level, curiosity and environmental variability.
D. SUMMARY AND CONCLUSIONS

Although the results of this investigation have led to several conclusions of importance to education, their interpretation is tempered with caution due to the unknown reliability and validity of the measures used. Their use is justified, as has been previously discussed, (p. 107) by the necessity for research in the behavioural sciences to proceed in the absence of proven methods in order to open up areas for more scientific investigation.

The field of curiosity behaviour has only comparatively recently been subjected to anything more than isolated studies, and the proliferation of research on the subject over the last eighteen years has produced very few methods suitable for assessing curiosity behaviour. Although much has been done on the causative stimulus factors, these have not generally been organized into tests suitable for large-scale investigation of curiosity behaviour.

The development of the test used to measure curiosity in this investigation showed some of the difficulties encountered in the measurement of such behaviour at the pre-school level. The test developed is considered to be a step towards the development of a more reliable instrument and suggestions for its improvement have been made in Appendix A.
The stated purpose of the study was to investigate areas of possible influence of curiosity behaviour, and the pre-school level was selected as being an age at which any influences on such behaviour would be more likely to have a marked effect. Curiosity had been shown to be important to education for its motivational and information attainment functions, and it was considered, therefore, to be of value, educationally, to delineate factors which could lead to the individual differences in curiosity behaviour noted by several investigators. As curiosity had been shown to be concerned with information attainment, and was considered to be associated with functioning of intelligence, it had been the subject of concern to those concerned with the results of environmental deprivation, considered to inhibit the development and expression of curiosity. The variables investigated, therefore, centred round environmental factors which could influence curiosity.

The major hypotheses postulated relationships between curiosity, socio-economic level and environmental variability as well as parental permissiveness, with socio-economic status being hypothesized as an underlying causative factor for both. Subsidiary hypotheses postulated relationships between curiosity and intelligence, anxiety,
independence and need for achievement.

Findings supported the hypothesis that environmental variability is associated with curiosity, but the hypothesis that socio-economic status would also be related was not confirmed. It is tentatively concluded, therefore, that economic factors are of less importance than the provision of a varied, changing, stimulating environment for the development of curiosity. This finding gives support to the theoretical view that curiosity is the response of the organism to variations in the environment. The suggestion was offered that the acceptance of the parental role by the parent could be an important factor in the provision of an environment favourable to the development of curiosity.

The third major hypothesis, that parental permissiveness would show a relationship with curiosity was confirmed in part, as the behaviour of fathers, but not mothers, was found to correlate with curiosity. The direction of the correlation was, however, surprising as the correlation between the father's ratings, both actual and attitude, were highly significant in a negative direction. These results were interpreted in the light of findings from previous research, not corroborated by the present study, that anxiety inhibits curiosity, and the suggestion was
made that the more restrictive behaviour of the father may provide the security necessary for the expression of curiosity behaviour. The theory that parental security is a factor in the expression of curiosity in the child was considered to relate to the finding of the positive effect on curiosity of restrictiveness by the father. It was suggested that a parent who is secure in the parental role would be better equipped to supply the balance between freedom and control which leaves a child free to explore, by defining the extent of opportunities for investigation as well as establishing the limits within which exploration must be confined. The differing effects of parental behaviour on the child's expression of curiosity was related to indications from other research that fathers tend to be more strict.

Of the subsidiary hypotheses, only the correlation between intelligence and curiosity was found to be significant, a finding which confirms expectations arising from the literature that they should be related but which had not been found by previous investigators. Confirmation was thus considered to be given not only to the contention that curiosity and intelligence are closely linked, but also to the hypothesis tested in this study that any failure to find such an expected relationship
would be a function of the test measures used rather than a reflection of true differences. The intelligence test chosen required discriminative abilities similar to those considered by some theorists to operate in the eliciting of curiosity behaviour, namely the match-mismatch process. The fact that such a test was found to correlate significantly with the curiosity test used was felt to give support to the views arising from information theory that such a process operates in the arousal of curiosity. The findings in this respect are considered to be of significance to education as they suggest that individual differences in curiosity or intelligence, may be due to the functioning or otherwise of the match-mismatch neural mechanism. The arousal of curiosity as a motivational aid is thus seen to implement the attainment of information by activating the very mechanism whereby information is obtained, i.e. the match-mismatch mechanism.

Other subsidiary findings were not significant, but the almost non-existent correlations between dependency and need for achievement, being in the expected direction, were regarded as indicative of relationships that might show more significantly if more reliable instruments were used to measure the variables. That no correlation was found between anxiety and curiosity, and as evidence in favour
of such a correlation was unanimous from prior research, it was felt that the finding reflected on the reliability of the techniques used and was not considered to refute the results of others.

Educationally, the significance of some of the results of this study are felt to be considerable, notwithstanding the tentative nature of the conclusions necessitated by the nature of the measurement used. One of the major conclusions is that individual differences in curiosity are a function of the environment in which the early life of the child is centred. This had been emphasized by several educators concerned with the influence on later education of early environmental conditions, and the results of this study indicate that these formative conditions may be due more to the attitude of the parents than to purely economic factors. The provision of an environment in which curiosity can be expressed was felt to spring from the security in, and acceptance of, the parental role. It was felt that such adjustment was reflected in interest and enjoyment in the home and that this would inevitably provide the variability in the home environment which arouses curiosity, as well as the ability to give realistic limits to the child's investigations by a balance between permisiveness and restrictiveness. Consequently it is hypothesised that
individual differences in curiosity behaviour, shown to relate to environmental variability and restrictiveness of the father, are a function of personality characteristics of the parents.

Such an hypothesis is of importance to education as the arousal of curiosity is seen to be less a matter of just providing stimuli known to elicit such behaviour than the understanding of the total life of the child and the home milieu in particular. If individual differences in curiosity reflect home conditions, and the arousal of curiosity is important to the attainment of information, then the educator must be aware of the nature of the child's life in totality before education at any stage can be meaningful. This is the obligation of the teacher as seen by Dewey (cf p.32), namely to be aware of the continuing nature of experience.

Of further importance to education is the subsidiary finding that curiosity and intelligence are related, since it becomes evident that the performance of the individual at maximum potential can also be affected by the functioning or otherwise of the built-in motivator - curiosity. However, it is also possible that the relationship is reciprocal, and that the operation of curiosity is dependent on the intellectual abilities available. The suggestion
raised by Pribram et al (cf p.21) is that curiosity has a neurological basis, which suggests dependence on genetic factors, which could also be the interpretation drawn from the correlation found with intelligence. However, Pribram (1964, p.86) has offered evidence that environmental experience can alter neural growth, and this, coupled with the results of investigations that have shown that increases in intellectual as well as physical development are affected by environmental conditions leads to the conclusion that curiosity, like other human abilities, is the result of the interaction of environmental as well as genetic factors.

The results of this investigation, therefore, give tentative support to the hypothesis that individual differences in curiosity behaviour are the result of early, and continuing, environmental factors. These have been identified as a certain measure of restrictiveness on the part of the father, and variability in the home environment, both of which have been found to be independent of socio-economic status.

Although the findings from this investigation are applicable to education at any stage, they are particularly relevant to the pre-school level. The hypotheses were derived mainly from studies and writings concerned with early childhood education and have direct reference to that level.
As pre-school education is closely connected with home life, being considered to be an extension of the home where teachers and parents together enrich the life of the child, these results can be utilized in both spheres of influence. From the finding concerning the relationship between environmental variability and curiosity, the provision of a varied and stimulating environment, regarded by pre-school educators to be an essential part of any kindergarten or nursery school programme, can be seen to influence intellectual development, to an extent that is often not appreciated. The tendency to overlook intellectual development in favour of more social, physical or emotional aspects, has been criticized by Wann, Dorn and Liddle (cf p.57) while Isaacs (1930) effectively demonstrated the importance of the environment to intellectual development, as Piaget has also done.

Therefore, the present findings do not contribute anything new to knowledge concerning the importance of the environment to intellectual functioning. They do, however, support a theoretical interpretation of the functional mechanism whereby such intellectual development is facilitated. Curiosity has been conceptualized as the partly innate partly learned reaction of the individual
to a changing, varied environment, which results in the acquisition of information. The present findings support the theory that curiosity is the response to variations in the environment. Therefore, by providing a rich, varied environment, educators, whether parents or teachers, facilitate the process of intellectual development.

The relation between restrictiveness of the father to curiosity also has practical implications, as many parents and teachers are led to believe that restrictiveness of any kind is damaging. The findings corroborate indications from previous studies that a certain amount of restriction is desirable for healthy development. It is felt that anxiety is reduced by the provision of a certain amount of limitation on the child, who is free to act within such boundaries. Since curiosity is known to be inhibited by anxiety, the importance, to the development of curiosity, of judicious control and firm discipline coupled with freedom to investigate within the limits, becomes apparent. Therefore in the administration of kindergartens and nursery schools, as well as in the home, educators would facilitate curiosity behaviour and intellectual development by imposing limits where necessary while at the same time providing freedom to explore.
It is concluded, therefore, that individual differences in curiosity behaviour at the pre-school level can be attributed to social and physical environmental variables, associated with environmental variability and a certain amount of restrictiveness in child-rearing practices.

Although these conclusions can only be regarded as tentative, and generalization beyond the test sample should be exercised with caution, the results of this investigation have implications for educational techniques both at home and at pre-school institutions, to which further research could profitably be directed.

This investigation is therefore offered as a contribution towards the understanding of environmental influences at the earliest stage of the educational process.
REFERENCES


APPENDIX A.

THE CURIOSITY MEASURES

I. THE CURIOSITY TEST

A. REVIEW OF THE LITERATURE

One of the major difficulties in the study of curiosity in humans is the lack of suitable methods of measurement. The consequence, as Maw and Maw (1961) pointed out, has been a dearth of investigations involving children in this field. As no standard measures of curiosity are available, investigators have had to build their own, and a wide variety of measures have thus been reported. They have covered subject questionnaires, rating scales for teachers and peers, thematic apperception tests, observation and recording of behaviour, scoring of stories, and more formal tests of curiosity involving looking at, or manipulation of, objects.

Foremost in the field of curiosity measurement have been Maw and Maw who, working with elementary schoolchildren have developed a useful classroom technique, which consists of a combination of three ratings by teachers, peers and the subjects themselves, on special scales based on their own definition of curiosity (ibid.).

A different type of measure was reported by McReynolds, Acker and Pietila (1961), with children whose mean age was
11.5 years, who used a measure of object curiosity, as well as teacher rating scales. Their object curiosity technique concerned exploratory behaviour with objects, and curiosity scores were obtained by observing each subject in a special test situation, which was a modification of a technique previously used by McReynolds (1958). The technique involved "systematic observation of the subject's exploratory behaviour when presented with a number of interesting objects". The experimental material comprised a box, covered in the front by curtains, and open at the back, and a free-play box, similar to a crate with cubicles, and 35 small toys. The objects were placed in the curtained box one at a time, and the subject tried to find out what they were by manipulating them without seeing them, while the experimenter scored his manipulations. After each discovery, the subject was allowed to play with the toy, and, after the test had been completed, was given ten minutes with all the objects in the free-play box, and scored again. A split-half reliability (Spearman-Brown) of .87 was reported.

Medinnus and Love (1965) developed a technique similar to that used by McReynolds, Acker and Pietila, but different in that the subjects drew the toys from the curtained box, instead of feeling them. The experimenter scored the
subject's manipulations on a mimeographed score sheet on which were listed all possible manipulations for each toy. A stop watch was used to measure the time spent by the subject with each stimulus. The toys used were twelve relatively common toys and household objects, chosen for their interest to four-year-olds, and also because they would allow for varying amounts of manipulation and exploration. Two scores, manipulation and time, were obtained. Split-half reliability for the manipulation scores was .86, and for the time scores .94 (Spearman-Brown formula corrected for half-length). Correlations between the pooled teacher ratings and the curiosity test were .13 for the manipulation score and .02 for the time score. The objects used were a magnet, toy motor cycle, harmonica, rubber ball, toy taxi, spaceship whistle, small rubber doll with moveable arms and legs, plastic fork, ballpoint pen, pair of pliers, corncob pipe, and a wooden clothes peg. The results of their experiment did not confirm their hypotheses, and the authors concluded that the curiosity measures did not measure the kind of curiosity defined by Nave and Nave, which was used as a basis for the teacher ratings.

Three measures, substantially different from the previous studies, were used by Maddi, Propst and Feldinger
(1965), one termed a measure of curiosity, and two designed to measure external and internal curiosity. The measure of curiosity assessed "the degree to which a story expresses the process of asking questions or posing problems and attempting to gain new additional information". The stories were scored for expression of curiosity. The measure of internal exploration involved introspection, but the third measure, of external exploration, which showed a correlation of .38 with curiosity, took a more 'naturalistic' approach. They described the technique as follows:

On arriving at the laboratory each subject was led to believe that the study would not begin for another fifteen minutes and was taken to what was described as the office of a child therapist in order to wait. The room contained standard office equipment ... and ... a number of playthings. The subjects were told to feel free to do anything or nothing. Two concealed B's recorded his behaviour at 5 sec. intervals by indicating whether or not he was manipulating an object, and if he was, by designating the object. The scores achieved perfect agreement on 92% of recordings.

The two measures of external exploration were the number of objects manipulated and the total amount of time (in 5 second blocks) spent in such activity.

A similar procedure was used as part of a battery of measurements developed by Lucco (1967), to test the relation between curiosity and independence behaviour in secure and insecure situations using nursery school children. The measurements, which were only briefly reported, were different
for both secure and insecure situations and no reliability or validity correlation coefficients were given. In the secure situation, twelve pairs of visual stimuli were presented in a viewing box. Curiosity scores were based on the proportion of time spent viewing the more varied stimulus in each pair. Six groups of stimuli were used with two pairs in each group, and the test was given with the examiner sitting beside the box, and speaking to the child only between presentation of stimuli. In the insecure situation, the subject was taken into a room, containing a table on which were arranged eleven pairs of toys, and a small portable observation booth with a one-way window. While the examiner was in the observation booth, supposedly to get some pictures ready, the subject was left free to play with the toys. Detailed observations were made of the subject's behaviour. Indices were developed for the secure and insecure situations, as follows: (quoted in part).

Secure situation:

1. Average time (for 12 trials) spent viewing more complex stimuli divided by time spent viewing both stimuli.

2. Average time spent viewing more complex stimuli divided by time spent viewing both stimuli in the two pairs where the complex figure is a highly detailed symmetrical version of the simple.
3. Average time spent viewing more complex stimuli divided by time spent viewing both stimuli in the two pairs where the complex figure is a highly asymmetrical stimulus.

Insecure situation:

1. Number of different investigatory responses made during a 10-minute observation period.

2. Total amount of time spent investigating objects by looking and touching but not manipulating.

3. Total amount of time spent investigating the usual properties and possible manipulations of an object.

4. Total amount of time spent investigating unusual aspects of an object and/or combining several objects to create new objects.

5. Total time (spent in investigatory activity) over three types of activity.

In addition to the above measurements, Berlyne (1966) has developed many visual patterns, representing the collative stimulus variables, which he has used in experiments on exploratory and curiosity behaviour in adults, children and infants, but these were designed to determine the stimuli that elicited such behaviour and were not developed specifically as tests of curiosity. He also reports one study (Berlyne and Frommer, 1966), in which the subjects were kindergarten, grade 3 and grades 5 and 6, where stimulus items consisted of stories, pictures and stories accompanied by pictures. These were presented to the children who were invited to ask questions after each one.
Novel surprising and incongruous items were found to elicit more questions than others, but Berlyne did not describe this technique as a test of curiosity.

B. TESTING OF SUITABLE MEASURES

Only two of the curiosity tests reported were used with children under five years of age (Lucco, 1967, Nedinnus and Love, 1965), and, of these, only Nedinnus and Love report reliability coefficients. Although they expressed doubt about the correlation between the test and Haw and Haw's definition (1961), the reliability coefficients were high enough to give confidence in the method. Since their method closely resembled that used by McReynolds, Acker, Fietila (1961), who also reported a fairly high reliability coefficient, it was decided to test the method on a small sample of children attending one kindergarten (N = 12).

The curiosity test developed used a box and a variety of toys and household objects. These included a ball, miniature fir tree, small plastic doll, toy car, plastic ice cream spoon, wire and tin grasshopper, china elephant-jug, magnet, wooden clothes peg, toy spaceship, toy clock, plastic bulldozer, scissors, candle, ballpoint pen, bulldog clip, plastic flowers, metal flute, plastic aeroplane, and matchbox.
These were presented to the subjects one at a time in the box, who took them out and were allowed to play with them. No time limit was set, and the experimenter sat beside the box and recorded the number of different manipulations and the total number of investigatory responses made, as well as the length of time taken.

A major difficulty with this technique occurred with scoring, however, as the manipulations made by the subjects were extremely rapid, and it was difficult to observe and record accurately. This did not improve with practice, and an added difficulty was that the features on the objects were often small, which made the manipulation of them difficult to identify. In order to determine whether objects with more definite and pronounced features would eliminate some of the problems, two papier mache models were made. These consisted of a hillside with "tracks" and "rabbit holes", and a glove puppet clown, with holes for eyes, ears and mouth and bulbous nose (pair No. 11). With these, identification of exploratory movements was easier, but some subjects were still too rapid in their movements, and use of both hands for investigation added problems as two investigatory movements were often made at the same time.
The curtained box technique of McReynolds, Acker and Pietila (1961) was tried, using the same objects, but different subjects, but it was found that they were hesitant about putting their hands into the box through the curtains and, if they did, usually just placed their hand over the object with little or no manipulation. It was concluded that this method contained an element of fear, and was therefore unsuitable.

Lucco's (1967) viewing method was tested on six subjects, but responses were unsatisfactory as they were more interested in playing with the objects than viewing, even when allowed to play after looking. It was also found that more timid children just sat and looked, and did not give any indication of when they had finished. His second technique, used in the insecure situation, was not used due to the difficulty of establishing observation booths in kindergartens and homes, and because this, also, would have added insecurity to the test situation.

Other methods tried and rejected were the "free play box" used by McReynolds, Acker and Pietila (op.cit.) which was found to increase scoring difficulties, (as did presentation of objects on a table), and Berlyne's cards with incongruous and ambiguous pictures. These were enlarged from a set illustrated (Berlyne, 1966), but they
were found to be unsuitable as the children tested ($N = 8$) spent very little time looking at them and the differences in scores between normal and incongruous items were often hardly measurable.

Consequently, as viewing time and recording of manipulations had both been found unsatisfactory, it was decided to develop a method using length of time spent manipulating objects presented singly, since presentation of larger quantities at once had also been found difficult.

C. THE TECHNIQUE USED

The first indice used by Lucco (1967) in the secure situation was followed, based on the proportion of time spent viewing one stimulus when a pair was presented. It was decided to use pairs of stimuli as this would give a comparison, and also give the subject a choice, for the reason that if a child is given an object he will usually play with it if there is nothing else available and any score based on manipulation of a single object could have been a measure of interest or attention span rather than curiosity.

1. Selection of test items: Novelty was selected as the critical factor, owing to the large number of studies which
had shown that it was effective in eliciting curiosity
behaviour (Cantor, 1964 a., 1964 b.), Smock and Holt (1962),
Harris (1965). Complexity had been used by Lucco, but
Cantor (1963) had expressed doubts about the relationship
between complexity and curiosity, and although several
others had found a relationship, the evidence did not seem
as conclusive as that for novelty. Objects used in the
curiosity tests reported, included "interesting objects"
(McReynolds, Acker and Pietila, 1961), "a number of play-
things" (Maddi, Propst and Feldinger, 1965), and Medinnus
and Love (1965) used "12 relatively common toys and house-
hold objects ... chosen that would be interesting to four-
year-olds, and that would allow for varying amounts of
manipulation and exploration". The fact that Medinnus and
Love (ibid.) used "common" objects could cast doubt on the
validity of their results, since it has been clearly
demonstrated that it is unfamiliarity that evokes curiosity
and exploratory behaviour. (Cantor and Cantor, 1964 a and
b). This became evident during the preliminary testing
when it was found that some of the more common items such
as spoons, pegs, clips and even dolls, cars and space toys
were very familiar to the subjects and elicited much less
overt curiosity than relatively unfamiliar ones. As one
study (Morgan, 1965) had reported that response rate was
significantly higher under high novelty than low novelty conditions, it was decided to select items that were highly novel at least, and completely novel if possible. These were to be paired with objects that were familiar in the home or kindergarten environments of the subjects.

(List of stimuli presented on following page.)
<table>
<thead>
<tr>
<th>Pair No.</th>
<th>Novel</th>
<th>Familiar</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Toy clock</td>
<td>Plastic elephant</td>
</tr>
<tr>
<td>B</td>
<td>Miniature book</td>
<td>Plastic cow</td>
</tr>
<tr>
<td>1 (N)</td>
<td>Wooden rattle</td>
<td>(K) Castanet or finger casta</td>
</tr>
<tr>
<td>2 (N)</td>
<td>Fossil &quot;snail&quot; in two parts</td>
<td>Stone</td>
</tr>
<tr>
<td>3</td>
<td>Novel bottle opener made from shell</td>
<td>(K) Scissors</td>
</tr>
<tr>
<td>4</td>
<td>Polystyrene</td>
<td>Foam plastic</td>
</tr>
<tr>
<td>5 (N)</td>
<td>Model of cottage with hinged roof</td>
<td>(K) Toy train (3 different ones used)</td>
</tr>
<tr>
<td>6 (N)</td>
<td>Computer typing head</td>
<td>Box with dice</td>
</tr>
<tr>
<td>7</td>
<td>Small &quot;gonk&quot;</td>
<td>Small doll</td>
</tr>
<tr>
<td>8 (N)</td>
<td>Hand paper-weight</td>
<td>(K) Dough cutter (2 plastic animal ones, 1 metal &quot;man&quot;)</td>
</tr>
<tr>
<td>9 (N)</td>
<td>Star and snake puzzle</td>
<td>Padlock</td>
</tr>
<tr>
<td>10</td>
<td>Key-ring with shell, in liquid</td>
<td>Shells in bottle</td>
</tr>
<tr>
<td>11 (N)</td>
<td>&quot;Rabbit holes&quot; with small rabbits</td>
<td>Puppet</td>
</tr>
<tr>
<td>12</td>
<td>Kaleidoscope</td>
<td>Christmas tree</td>
</tr>
</tbody>
</table>

A and B were two pairs of practice items. K denotes objects borrowed from the kindergartens. N denotes objects that were, as far as could be determined unique, and therefore completely novel to the subjects. (See Plate I).

Plate I (between pp 156 and 157) shows the two pairs of practice items, and the twelve pairs of test items. Novel stimuli in each pair are shown on the left. Three familiar items are shown for pairs 5 and 8, and two for pair 1, these being the objects obtained from different kindergartens.
The novelty or familiarity of the items was assessed from the preliminary testing with earlier curiosity tests, and in pairing the objects an attempt was made to equate the items on general appearance in order to eliminate choice bias due to greater attractiveness of the novel stimuli.

Novel items, 1, 3, 5 and 8 all proved difficult to equate with household objects or toys that would be familiar to all the children, so objects were borrowed from the kindergartens, each subject being presented with the objects from the kindergarten attended, or one that was identical. There were some slight variations between some of these items, but it was not considered that they would affect the selection available to the subjects.

In order to counteract the possible effects of fatigue, the most interesting pairs, based on the reactions of a small test sample, were placed at the end of the sequence, and the order of each pair was determined by the items preceding and following (i.e. items that were coloured were presented between metal ones, and small ones next to larger ones), in order to keep the sequence varied. During the actual testing, however, no signs of fatigue were noticed, and the test did not prove to be too long. Times varied from 10 minutes to forty-five minutes, but most took 20 - 30 minutes.
Two practice items were added to the beginning of the test, to familiarize the subjects with the test procedure, and the test was presented to eight children. The procedure was found to work satisfactorily, and the novelty and familiarity of the stimuli was confirmed.+

2. **Test Procedure:** The 12 stimulus pairs, together with the two practice items, were concealed in 14 labelled calico bags, and each pair was presented to the subjects, in order, in one of two cardboard boxes with hinged lids. A small box was used for small objects and a larger one for large items.

+ During the testing of the experimental sample, however, two girls were found to be familiar with a novel item, the kaleidoscope, to an extent that would have affected their scores. They were consequently eliminated from the sample. Two other subjects mentioned that friends had kaleidoscopes, but their scores were high, and their behaviour indicated curiosity, so they were retained as it was not considered that their scores were affected. The polystyrene which had been included in the test series because the smaller sample of subjects had shown great interest in it, was not completely novel to some. However, the polystyrene had a pattern cut into it, which added novelty, it was also retained. Of the familiar items the box and dice was the only one that appeared unfamiliar, to some subjects, but the block shape of the dice was considered to make them more familiar than the unusual shape of the computer head.
Recording during testing was done using a small portable tape recorder with a remote control microphone. With each stimulus pair presented to the subject, the length of time spent with each object was recorded by tapping once on the microphone whenever the subject looked at, picked up or manipulated the familiar stimulus, and two taps were recorded for the novel stimulus. The microphone was turned off, by pressing a small button, whenever the attention of the subject was not directed towards either stimulus.

The tape recorder, boxes, and bags of stimulus items were all packed in a red suitcase which looked attractive and tended to arouse the child's interest at the beginning. (Plate II).

Layout in the test situation, whether at kindergarten or in the home of the subject, was essentially the same - the examiner and subject sat half facing each other beside a table with the suitcase beside the examiner. In most

* Plate II (between pp 159 and 160) shows the experimental material as presented to the child. The tape recorder was concealed in the suitcase, with only the microphone visible (held in examiner's hand). Stimulus pairs were presented in the box, with lid closed.
cases both sat on chairs, with the test material on a low table or chair, but some subjects preferred to sit on the floor, in which case the examiner and test apparatus were also on the floor. This did not appear to influence the response in any way.

After rapport had been established, the bags containing the test materials were taken from the suitcase and the stimuli were placed in the box in pairs, while the lid prevented the subject seeing what went inside. The lid was then closed, and the box presented to the subject. The tape recorder remained concealed in the suitcase, with the microphone held unobtrusively in the examiner's hand. The microphone was turned on as soon as the subject lifted the lid of the box, and turned off when the lid was closed. Taps on the microphone, as described, recorded the time spent on each stimulus pair.

Instructions given with the first practice pair were as follows:

"I am going to put some things in this box and give it to you - like this. You may lift up the lid (examiner did so) and look at the things in there. You may take them out, but while you have one out, leave the other one in the box. Just have one at a time". When the subject had finished investigating the examiner continued, "When you
have finished with them; put them back in the box and put the lid down, and then I will put some more things in it for you". (The objects were referred to as 'things' rather than toys, because they were not all toys, and a word had to be used that would be understood by all the children).

With the second practice pair, reminders were given, with encouragement: "Lift up the lid ..... that's right. Just take one out at a time .... good. Leave the other in the box. When you've finished put them back .... that's the way, and put the lid down".

For each test pair the only instruction given was:

"Lift up the lid" or "See what's in there now", or "Here's some more". This was done, partly to encourage the subject, and partly to mark the beginning of each pair on the tape recording. (The child's name was also mentioned at the beginning and end of each test, as part of normal conversation, in order to facilitate identification of subjects when the tapes were played back). Similarly at the end of each pair a suitable finishing comment was made e.g. "Finished?" "Put down the lid", or "Thank-you" (as box was returned).

During testing the examiner spoke as little as possible. Comments were made to maintain rapport if it was felt that continued silence was becoming oppressive, and likely to
affect the subject's response. If the subject asked questions, answers were non-committal and referred the problem back to the child, e.g. "What do you think?"

In a few cases, where a child persisted in asking for a direct reply, answers were given briefly, again to maintain rapport, and were framed in a manner that would not preclude further exploration of the stimulus.

No time limit was placed on investigation, but instances in which the subject started playing with the stimuli were not recorded. This was done, in spite of one interpretation of play as curiosity (Maddi, Propst and Feldinger, 1965) as it was considered that the imaginative and dramatic play, developed with the test materials, could not be classified as curious. Curiosity behaviour was defined as looking, touching, manipulating, asking questions, and experimenting, but play was identified by its imaginative quality, e.g. a subject who "walked" some stimuli round the table before returning them to the box, a subject who pretended that the cottage was his house and spent fifteen minutes describing the meal being eaten inside it, while another went for "flights" round the room, pretending that the bottle opener was a rocket. The identification of curiosity behaviour with information-seeking (Fowler, 1965, p.71) was used to guide decisions in this respect.
3. **Scoring**: Time spent on each stimulus was measured with a stop watch when the tapes were played back. Two methods of obtaining the proportion of time spent manipulating the novel stimulus in each pair were possible.

a) Calculation of the proportion of time spent manipulating and looking at the novel stimulus for each of the 12 test pairs, and the average of these 12 proportions obtained for each subject.

b) Calculation of the total time spent with all the novel stimuli, divided by the total time spent with both stimuli, to give the total proportion of time spent with the novel stimuli, for each subject.

The second method is the one used by Lucco (1967) and as it tends to give a more stable score (differences in proportion being averaged out) this was the method used.

D. METHODS USED TO DETERMINE RELIABILITY AND VALIDITY

1. **Reliability**: Two methods of assessing reliability were considered - the split-half technique and the test-retest method. It was decided that the test-retest method was unsuitable under the circumstances since novelty, being the critical factor, would be operant on the first test, but the second would suffer from a familiarization effect and would therefore not be the same test. The effect of familiarization
has been demonstrated by Cantor and Cantor (1964 b) who found that familiarity, evident after only two exposures in some cases, was the same following five minute and two day intervals. They also found (ibid) that response speeds were significantly slower to a familiar rather than an unfamiliar light, and Morgan (1965) found that the effect was greater for a high amount than for a low amount of familiarization. Research evidence was thus considered to support the contention that the curiosity test, if given a second time to the same group of children, would constitute a different test on the second occasion. The finding by Cantor and Cantor that such an effect was greater for high than low amounts of familiarity was felt to be particularly relevant, since the curiosity test had no time limit, and it was therefore considered reasonable to assume that the child had satiated his curiosity about both familiar and unfamiliar stimuli when they were replaced in the box. A retest after an interval of several months would possibly show less familiarization effect, but for the purposes of this study an interval of such length was impracticable as most of the subjects would have been on holiday, and unobtainable, at the time most suitable for a retest.
For these reasons, the split-half technique was used to determine reliability, following the precedent set by McReynolds, Acker and Pietila (1961), and Medinnus and Love (1965). Difficulty was experienced in obtaining two equivalent halves, and the split used did not give comparable results. This was due to a major error in test construction, as the test was not given to enough subjects in the small pre-test sample to enable the equivalence of the two halves to be established. To determine the best method of splitting the test, proportions (of time spent exploring novel stimuli) were calculated for each stimulus pair using the scores of all the subjects. These proportions, together with total times spent investigating novel stimuli in each pair, are presented in Table XIV.

<table>
<thead>
<tr>
<th>Pair No.</th>
<th>Total Time (in secs.)</th>
<th>Average Proportion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>43.19</td>
<td>.62</td>
</tr>
<tr>
<td>2</td>
<td>23.37</td>
<td>.74</td>
</tr>
<tr>
<td>3</td>
<td>25.63</td>
<td>.67</td>
</tr>
<tr>
<td>4</td>
<td>20.23</td>
<td>.57</td>
</tr>
<tr>
<td>5</td>
<td>33.37</td>
<td>.73</td>
</tr>
<tr>
<td>6</td>
<td>41.69</td>
<td>.54</td>
</tr>
<tr>
<td>7</td>
<td>26.57</td>
<td>.58</td>
</tr>
<tr>
<td>8</td>
<td>19.92</td>
<td>.68</td>
</tr>
<tr>
<td>9</td>
<td>38.21</td>
<td>.44</td>
</tr>
<tr>
<td>10</td>
<td>34.65</td>
<td>.60</td>
</tr>
<tr>
<td>11</td>
<td>113.71</td>
<td>1.3</td>
</tr>
<tr>
<td>12</td>
<td>46.42</td>
<td>.60</td>
</tr>
</tbody>
</table>
It can be seen that Item 9 gave an extremely low proportion, while Item 11 gave an exceptionally high one. The Table also indicates that the odd-even items, adjacent in the order of presentation, were not equivalent. From a comparison of average total times with average proportion of time spent with the novel stimuli, it can be seen that length of time did not correlate very closely with the proportion of time. This is clearly indicated with pairs 8, 9 and 11. An odd-even split gave the proportions for each half as indicated in Table XV.

**TABLE XV**

PROPORTIONS FOR THE TWO HALVES OF THE TEST ON AN ODDS-EVEN SPLIT

<table>
<thead>
<tr>
<th>Pair No.</th>
<th>First Half Proportion</th>
<th>Second Half Proportion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.62</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>.67</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>.73</td>
<td>6</td>
</tr>
<tr>
<td>7</td>
<td>.58</td>
<td>8</td>
</tr>
<tr>
<td>9</td>
<td>.44</td>
<td>10</td>
</tr>
<tr>
<td>11</td>
<td>1.3</td>
<td>12</td>
</tr>
</tbody>
</table>

The Table indicates that eight pairs were nearly equivalent, i.e. 1 and 10 (or 12), 3 and 8, 5 and 2, 7 and 4. The two extreme items, 9 and 11, both occurred in the same half, and their average came to .87. This was not equivalent to the remaining items in the other half, 6 and 12, whose
average was .58. Nevertheless, as this was the only split that gave nearly equivalent halves, the reliability for the test was calculated using an odds-even split. Using the Spearman-Brown formula, corrected for half-length (Garrett, 1958, p.339) and tied ranks (Siegel, 1956, p.206), the reliability coefficient was .25, which was significant at the .05 level.

In order to determine whether this could be improved by eliminating the two extreme pairs, 9 and 11, the halves were rearranged placing stimulus pairs 1, 3, 5, 7 and 12 in the first half, and pairs 2, 4, 6, 8 and 10 in the second half. Using the same formula a coefficient of .33 was obtained, which was only a slight improvement. This reduced test failed to spread the scores out as evenly as the whole test did, and many scores were located in the centre of the distribution with many tied ranks. As this was considered to render correlations with independent variables liable to reduction, it was decided to use the whole test with its low reliability. Consequently, any results using the test cannot be regarded as reliable, and must be suggestive only.

2. Validity: An attempt was made to assess validity of the test by correlation with two rating scales of curiosity given to teachers and parents. (See Section II of this Appendix, p. 175). Table XVI shows the reliabilities of these scales between parents and staff.
TABLE XVI

RELIABILITY COEFFICIENTS (SPEARMAN-BROWN) OF RATINGS
USED TO VALIDATE CURiosity TEST

<table>
<thead>
<tr>
<th></th>
<th>rho</th>
<th>t</th>
<th>df</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Directors and assistants</td>
<td>.682</td>
<td>5.11*</td>
<td>30</td>
<td>32</td>
</tr>
<tr>
<td>Mothers and fathers</td>
<td>.59</td>
<td>5.98*</td>
<td>67</td>
<td>69</td>
</tr>
<tr>
<td>Directors and mothers</td>
<td>.088</td>
<td>.76</td>
<td>67</td>
<td>69</td>
</tr>
<tr>
<td>Directors and fathers</td>
<td>.074</td>
<td>.63</td>
<td>66</td>
<td>68</td>
</tr>
</tbody>
</table>

** significant beyond the .01 level

The Table shows that significant correlations were obtained between staff and between parents separately, but not between staff and parents together, which indicates that although parents were in agreement about the curiosity behaviour of their children, their assessments were not corroborated by the directors, even though assistants agreed with directors. As both scales were based on the same definition of curiosity and were practically identical, it is doubtful whether either is a reliable measure. As parents are not generally regarded as reliable judges of their children's behaviour it is possible that the ratings of the directors are more accurate. Correlations between the curiosity test and the ratings of directors, fathers, and mothers are presented in Table XVII.
TABLE XVII
CORRELATIONS (SPEARMAN-BROWN) BETWEEN PARENTS AND
DIRECTORS RATINGS OF CURiosity

<table>
<thead>
<tr>
<th></th>
<th>rho</th>
<th>t</th>
<th>df</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Directors</td>
<td>.128</td>
<td>1.06</td>
<td>67</td>
<td>69</td>
</tr>
<tr>
<td>Mothers</td>
<td>.045</td>
<td>.37</td>
<td>67</td>
<td>69</td>
</tr>
<tr>
<td>Fathers</td>
<td>.018</td>
<td>.15</td>
<td>66</td>
<td>68</td>
</tr>
</tbody>
</table>

As none of the correlations between the curiosity test and ratings by directors and parents, as shown in Table XVII, were significant, it must be concluded that the test and the ratings were not measuring the same behaviour.

Consequently the validity of the curiosity test is not established, although it is not clear that the test is not measuring curiosity as the correlations between parents and staff are also not in agreement. A method of determining the maximum validity possible for a test is described by Cronbach (1949, p.73), "The maximum validity a test can have is the square root of the reliability coefficient". As the square root of .25 is .50 it does not appear that the test would prove to have a very impressive validity.

In this connection, Medinnus and Love (1965) said that "an important task for future research is to develop valid laboratory measures of curiosity - measures that correlate satisfactorily with outside criteria".
E. ASSESSMENT OF THE CURIOUSITY TEST

This study attempted to create a curiosity test containing wholly novel or wholly familiar items, but failed to produce an adequate test due to the small number of subjects used in the pre-test trials, and failure to develop equivalent halves. It was not until almost all the sample had been tested that it became evident that some subjects were familiar with some novel items. Therefore a more reliable test should be thoroughly pre-tested on a large sample in order to establish familiarity and novelty of items.

A major difficulty in the development of a test of this nature is in the difficulty of finding items that will be familiar to all subjects. The selection of objects from the kindergartens in this test was an attempt to overcome this difficulty, which appeared to function satisfactorily, but with a test designed for use with large numbers of subjects establishing familiarity of items could prove difficult. A series of familiarization tests with the stimuli to be used as comparisons with novel stimuli prior to the test could provide such familiarity.

The need to control stimulus variables other than the one under investigation also became evident through the use of this test, and was shown particularly with pair 9, (the
star and snake as the novel object with the padlock as the familiar one). The results indicated that most children in the test sample found the padlock to be more novel than the puzzle, which was completely novel to all the subjects as it was unique. The possibility arises that a factor was operating that conflicted with the tendency to approach novel stimuli, and it is suggested that the padlock could have been regarded as more of a problem or puzzle than the actual puzzle. Therefore the need to control factors such as the degree to which the stimuli can be regarded as problems to be solved is evident. In the construction of the test the factors of complexity and attractiveness were equated with the novel stimuli as far as possible, but the results showed that more control is necessary.

<table>
<thead>
<tr>
<th>Pair No.</th>
<th>Proportion</th>
<th>Item</th>
<th>Familiar Comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>1.3</td>
<td>(N) Rabbit holes</td>
<td>Puppet</td>
</tr>
<tr>
<td>2</td>
<td>.74</td>
<td>(N) Fossil</td>
<td>Stone</td>
</tr>
<tr>
<td>5</td>
<td>.73</td>
<td>(N) Cottage</td>
<td>Train</td>
</tr>
<tr>
<td>8</td>
<td>.68</td>
<td>(N) Hand-weight</td>
<td>Dough-cutter</td>
</tr>
<tr>
<td>3</td>
<td>.67</td>
<td>Bottle-opener</td>
<td>Scissors</td>
</tr>
<tr>
<td>1</td>
<td>.62</td>
<td>(N) Wooden rattle</td>
<td>Castanet</td>
</tr>
<tr>
<td>10</td>
<td>.60</td>
<td>Key ring</td>
<td>Shells in bottle</td>
</tr>
<tr>
<td>12</td>
<td>.60</td>
<td>Kaleidoscope</td>
<td>Christmas tree</td>
</tr>
<tr>
<td>7</td>
<td>.58</td>
<td>Gonk</td>
<td>Doll</td>
</tr>
<tr>
<td>4</td>
<td>.57</td>
<td>Polystyrene</td>
<td>Foam Plastic</td>
</tr>
<tr>
<td>6</td>
<td>.54</td>
<td>(N) Computer head</td>
<td>Box and dice</td>
</tr>
<tr>
<td>9</td>
<td>.44</td>
<td>(N) Star and snake</td>
<td>Padlock</td>
</tr>
</tbody>
</table>

N = completely novel
Table XVIII shows the novel items arranged in order of the proportion of time spent with each, compared with the familiar item compared with it. Although most of the completely novel objects elicited most curiosity behaviour, two are at the bottom of the list. Comparison with the list of familiar items suggests that for those items near the bottom, the difference between novel and familiar was not as great as for some of the others. It is possible, therefore, that the test construction was faulty in this respect. However, the "rabbit holes" were clearly the item that produced the most investigatory behaviour, in spite of the attractive puppet that was paired with that item. The rabbit holes were designed to provide opportunities for exploration, and all the holes opened out into a "cave", at the back so that it was possible to see right through. Five miniature rabbits were also provided one less than the number of holes, some of which went easily through the holes while others did not. These were intended to give further opportunity for investigation. Although many manipulations were possible with this item, the familiar puppet was also capable of being manipulated in many different ways, and the hat was removeable to balance the moveable rabbits.
A correlation between the rabbit holes and the curiosity test as a whole was .555 (significant beyond the .001 level) which suggests that the item accounted for a considerable amount of the curiosity behaviour, and this was corroborated by the lack of spread in the scores when a split-half reliability coefficient was calculated minus the rabbit hole item. However, this stimulus item gave a negative correlation (-.06) with directors ratings of curiosity, which suggests that the type of investigatory behaviour elicited by this test item is not the sort most noticeable to teachers. This item also produced the most noticeable verbal response by the subjects. It is therefore suggested that a more meaningful test of curiosity could utilize items of such a nature, i.e. completely novel to the subject with provision of opportunities for various exploratory behaviours.

Presentation of the objects in a box was found to be completely successful, facilitating both an interesting procedure for the subject and ease of recording for the examiner. Use of the tape-recorder was also found to be a successful recording technique, with the advantage that the examiner was less obviously recording, thereby allowing the test situation to be more relaxed. In addition, questions and comments by the subjects were also recorded, which could have been analyzed if necessary.
In this respect, therefore, the test was successful. The major difficulty thus lies with the establishing of reliability and validity. As the test-retest method, with novelty as a critical factor, has been discounted as a reliability measure, the only remaining methods are the split-half and parallel forms, both of which could be suitable. From the results of the ratings by parents and teachers, it is doubtful whether these methods could be used to validate any test. Assessment of curiosity level by observation and rating form behaviour in natural surroundings would possibly provide a more meaningful criterion for validation.

It is concluded, therefore, that the test as used was neither reliable nor valid as a scientific measure, but its use has indicated several means whereby a more reliable test can be developed. Measures used by other investigators were tested and found wanting and doubts are consequently cast on the usefulness of the findings from such research. It is suggested, therefore, on the basis of the findings from the development of this test, that the test procedure followed is easy to administer and is interesting to four-year-olds. Some indications have been given as to the type of stimuli that could be used, i.e. that are completely novel and provide opportunities for active investigation.
The major difficulty encountered was with the establishment of reliability and validity, and suggestions have been made concerning these. The test as developed is offered, therefore, as a contribution towards the development of a test of curiosity with pre-school children.

II. CURIOSITY RATING SCALES

Two similar rating scales were developed for use with parents and teachers. The scales were based on the definition of curiosity used by Maw and Maw (Chapter I, p.10), and items in each were the same except for minor changes in wording to suit different circumstances, e.g. in question 1 "Notices anything different" is followed by "at home" in the parents scale, and "at kindergarten" for the staff one.

Scoring techniques were different for each one, however. Both scales were originally intended to be the same, but after a trial sample of six parents and six teachers had tried the scales, it was found that unsophisticated parents preferred a four-point scale, and it was accordingly decided to reduce the parents scale to a four-point design. Two staff members also reported difficulty in deciding where children should be placed on the seven-point scale, but
as the staff who were to use the scale had already had experience on the seven-point dependency and n Ach scales the staff curiosity scale was left as originally intended.

The scoring technique for both scales awarded no points for the "never" category and the scales were scored as follows: (numbers in brackets refer to the score for each category).

Parents: Always (3) Often (2) Sometimes (1) Never (0)

Teachers: 7 (6) 6 (3) 5 (4) 4 (3) 3 (2) 2 (1) 1 (0)

THE RATING SCALES *

A. CURIOSITY RATING SCALE FOR PARENTS

The following 10 statements refer to aspects of children's behaviour, after each statement are the words -

Always Often Sometimes Never

Decide which word describes your child best, for each statement, and underline it.

a) Notices anything different or new at home
b) Likes to try out anything new
c) Is fascinated by anything strange or unusual
d) Examines and explores his surroundings
e) Is observant of small details
f) Enjoys the unexpected or surprising
g) Shows interest in visitors
h) Wants to know the reason for requests or actions
i) Asks questions
j) Eager to find out how things work

* Items in questionnaire had the words after each question as in instructions.
B. CURIOSITY RATING SCALE FOR TEACHERS

Name of child: Rated by:

INSTRUCTIONS:

The following 10 statements refer to aspects of children's behaviour. After each statement are the numbers 7 6 5 4 3 2 1 which can be interpreted as follows:

Always Often Sometimes Never
7 6 5 4 3 2 1

Decide which number on the scale describes the child best, for each statement, and put a circle around that number.

N.B. Use the "always" end of the scale when you feel that the behaviour mentioned is definitely characteristic of the child, and the "never" end when the child has never, to your knowledge, exhibited that particular piece of behaviour.

RATING SCALE *

1. Notices anything different or new at kindergarten (e.g. pictures, objects on nature table, teacher's dress)

2. Is the first to try out any new activity

3. Is fascinated by anything strange, mysterious, or unusual

4. Examines and explores his environment

5. Is observant of small details

6. Enjoys the unexpected or surprising (e.g. in stories)

7. Shows interest in visitors (e.g. asks who they are)

8. Wants to know the reasons for other people's requests, or actions

9. Asks questions

10. Eager to find out how things work.

* Items in the questionnaire had the numbers after each statement as in the instructions.
REFERENCES


Cantor, Joan H., and Cantor, Gordon N., 1964 a, "Observing Behaviour in Children as a Function of Stimulus Novelty", Child Develop. 35 : 119 - 128


McReynolds, Paul, Acker, Mary, and Pietila, Caryl, 1961, "Relation of Object Curiosity to Psychological Adjustment in Children", Child Develop. 32 : 393 - 400


APPENDIX B.

MEASUREMENT OF INDEPENDENT VARIABLES

The measures used were included in a questionnaire sent to parents which contained questions relating to the sample characteristics as well as the parents' curiosity rating scale. The questionnaire was divided into five major sections as follows:

1. Orientation. Data for this were obtained from questions 1 to 9 inclusive, and related to sample characteristics such as position of the subject in the family (after Newson and Newson, 1968), age and sex of other family members, age and education of parents, and other people living in the family. In addition, questions 5, 6 and 7 were included to give additional information which was to be used if the anxiety rating scale gave a sufficiently large correlation. They were not, however, used in the final analysis as the anxiety correlation was low, and the number of subjects with many changes in early life was negligible.

2. Socio-economic scale. Data for this scale was obtained from questions 10 and 11. Question 10 gave the occupation of the father, which was rated on a seven-point scale, as described by Havighurst (1954). Question 11 was divided into three sections designed to yield information which
would allow houses, flats and boarding houses to be rated for the House Rating, also as described by Havighurst. Question 11c gave the data for rating houses on age, and question 11d gave information for rating on size.

Information for the third category in the house rating, condition, was obtained by observer ratings, as discussed in Chapter III, p. 86). Parts a, b, and f of question 11 were included to give information which was to be added to the measure of home variability, but as they were poorly designed and difficult to score, they were not included. Scores for the three categories in the House rating (age, size and condition) were multiplied, the totals were assigned ranks on a seven-point scale and these were added to the seven-point occupational ranks to give the measure of socio-economic status. (Part of Havighurst's 1954 scale).

3. Environmental variability. Information for this scale was obtained from questions 12 to 17 inclusive. Scoring consisted of giving one point for each item mentioned in questions 12 to 16, and a half point for those in question 17 (to avoid undue bias in that category). The scale as developed is not considered to be precise, but is an attempt, in the absence of any other similar measure, to obtain an indication of differences in the home environment.
The method of scoring is probably doubtful, as a technique involving weighting of items would possibly give a more meaningful score. The use of a rating scale for use by an observer-visitor to the home was considered, but rejected as impracticable owing to the difficulty of obtaining access to some of the information, e.g. instruments, child's play materials, plants during different seasons. The scale was therefore designed as an approximate measure which would give an indicative result only.

4. The curiosity scale. As described in Appendix A.

5. The measure of parental permissiveness. Question 19 was the "actual" scale, designed to measure child-rearing practices, while question 20 was the "attitude" scale which measured parental child-rearing attitudes. Items 1, 2, 3, 12 and 13, in question 19 were taken from Harris et al (in Martin and Stendler, 1954), but all the others were based on general areas mentioned by Maccoby and Gibbs (1964), Sears et al (1953), Becker et al (1964), and Schaefer and Bell (1958), to be associated with dimensions of permissive/restrictive parental behaviour. Scoring for question 19 consisted of summing the circled numbers for each item, the scores for which are shown beside the items in the scale, although the scale as given to parents had the numbers 1, 2, 3 after each item. A score of 3 denoted
permissiveness and a score of 1 denoted restrictiveness. For question 20, A was scored 1 (restrictive), a scored 2, b scored 3 and B scored 4 (permissive).

The complete questionnaire was tested on a representative sample of six parents in order to determine whether the questions were easily understood, and whether any were ambiguous or likely to be embarrassing. The result was generally satisfactory and no major alterations were necessary, although a few minor changes in wording were made, and the curiosity rating scale was altered from a seven-point scale to a four-point one. However, after the parent sample had been given the questionnaire, it was found that the wording of several questions was awkward, as double negatives resulted when some words in the answers were associated with certain statements, e.g. items 9 and 22 in question 19. Only a few parents noticed this, and it had not been mentioned by the small test sample. It did not affect the scores, as parents were given the chance to discuss any questions they had found difficult with the investigator when the questionnaires were collected, and when the double negatives were pointed out, no parents who had not already done so, said that they found them difficult. Consequently it is not felt that the wording of any items in the questionnaire had any adverse effect on scores.
Newson and Newson (1968) report the same difficulty with their interview schedule, in that questions found to be satisfactory on the pilot sample were found later to be poorly worded.

---

**THE QUESTIONNAIRE SENT TO PARENTS**

(1) Please list your children on the following table, beginning with the eldest, at the left hand side, and continuing in order of birth. Place their sex in the top line, birth-date in the middle row, and in the bottom space put F if the child is foster, D if deceased, and S if stillborn.

<table>
<thead>
<tr>
<th></th>
<th>Eldest</th>
<th>Youngest</th>
</tr>
</thead>
</table>

**Name**

1) Sex

2) Birth date

3) F, D, or S

---

(2) Age of mother at present time is ________ years

Age of father at present time is ________ years

---

(3) List any relatives living in your household. Name them in relation to the child, e.g. grandmother, uncle, cousin

---

(4) List anyone else living in your household, e.g. boarder. Under 'age group' put child, student, young adult, middle-aged, elderly.

<table>
<thead>
<tr>
<th>Sex</th>
<th>Age Group</th>
<th>Approx. amount of time spent each year in your home</th>
</tr>
</thead>
</table>

---

(5) List any changes of home the child has experienced since birth, under the headings as indicated:

- **Year**: include months only if several shifts in one year.
- **Type**: e.g. flat, rooms, house, with relatives.
- **Duration**: e.g. one month, year, etc.
- **Location**: indicate whether same district or a new one, similarly with regard to city and country.

<table>
<thead>
<tr>
<th>a) Home at birth</th>
<th>Type</th>
<th>Location</th>
</tr>
</thead>
</table>

* Spaces for large answers have been omitted from this sample to save space and questions 18, 19 and 20 had numbers or words after each item as in the instructions.*
b) Changes of home: Year Type Duration Location

c) Home at present: Type Location

(6) List any changes in care received by your child since birth. (i.e. any person, persons, or agency who looked after the child in the absence of one or both of the parents). Use the headings as indicated:
Person replaced: father, mother, or both
Person replacing: e.g. grandmother, aunt, friend, Karitane
Reason: e.g. death of parent, illness of parent or child
Duration: e.g. week, month, permanent (only if still caring for child).
Parent | Person Replaced | Reason | Duration | Age of Child | Did Child leave home | Did any other relation go too
--- | --- | --- | --- | --- | --- | ---
Parent | Person Replacing

Yes/No

(7) What is the longest period that the child has been separated from his parents?
a) mother
b) father

(8) How much secondary education did the parents have?

<table>
<thead>
<tr>
<th>Number of Years</th>
<th>Sch. Cert.</th>
<th>U.E.</th>
<th>University</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) mother</td>
<td>Yes/No</td>
<td>Yes/No</td>
<td>Yes/No</td>
</tr>
<tr>
<td>b) father</td>
<td>Yes/No</td>
<td>Yes/No</td>
<td>Yes/No</td>
</tr>
</tbody>
</table>

(9) What was mother's occupation before marriage?
Has mother continued paid employment since the birth of child? Yes/No

If "Yes" - a) How old was child when mother started?
b) What were the hours of work?
c) Who looked after the child while mother worked?
d) If mother is not now working, when did she stop?

How many voluntary organizations does mother belong to?
How many meetings do these involve per month?
Approximately how many hours per month would these require?
(10) What is father's present occupation?

What are his hours of work? (e.g. 9 - 5 weekdays, nightworker, shift-worker, seasonal etc.)

If his work requires father to be absent from home apart from usual hours, please state when, (e.g. weekends, two nights per week, one week a month, whole months etc.)

If father has other paid employment apart from regular work, please state how many hours per week this involves.

How many voluntary organizations does father belong to?

How many meetings do these involve per month?

Approximately how many hours per month would these require?

---

The following questions are concerned with the play space, and opportunities for learning available to your child.

(II) If you live in a house, please answer these questions:

a) What is the size of the section?

b) Is the house detached (i.e. standing in its own section), or semi-detached (i.e. one of two joined together) ?

c) How old is it? If you are unsure, decide which of the following age-groups is most appropriate, and underline it:

   i) pre - 1890  iii) 1935 - 1950
   ii) 1890 - 1935  iv) 1950 - 1968

d) How many rooms? (excluding kitchen, bathroom and wash-house)

e) How many of these are bedrooms?

f) Approximately how much lawn space have you? Underline appropriate amount.

   i) front lawn : 1/4, 1/3, 2/3, 1/3, entire, none
   ii) back lawn : 1/4, 1/3, 2/3, 1/3, entire, none

If you live in a flat, please answer these questions:

a) Is it self-contained, or do you share some amenities such as bathroom, kitchen and washhouse?

b) If self-contained, do you have your own separate entrance? Yes / No
For the following questions, please answer as for those under 'house' above.

c) How old?  
d) How many rooms?

e) How many bedrooms?  
f) How much lawn: front  
back

If you are living in rooms, please answer these questions:

a) Into which one of these categories does it fall - underline appropriate one:  
boarding house, apartment house, rooms with relatives, other

b) How many other families or residents are living in the same building?

For the following questions, please answer as under 'house' above:

c) How old?  
d) How many rooms?

e) How many bedrooms?  
f) How much lawn: front  
back

g) What restrictions are there on children?

(12) Which of the following do you possess as part of your household? (Underline appropriate ones).

car, caravan, camping gear, boat, launch, bach,  
T.V., radio, record player, swimming pool,  
paddling pool, slide, see-saw, sand pit, cameras,  
binoculars, microscope, telescope, lathe,  
musical instruments (please state which)

other scientific or mechanical instruments (please state which)

pets (please state which - including domestic birds or animals)

a) present  
b) past

(13) How many of the following places has your child visited (to the best of your knowledge) since the age of three years: (underline)

beach, farm, mountains, snowfield, large river,  
seaport, railway station, airport, bus depot,  
church, museum, library, aquarium, zoo, art  
gallery, botanic gardens, swimming pool, North  
Island, another country, another major N.Z. city,
fair, circus, cinema, live theatre, concert, fire station, service station, hospital, dentist/nurse, school, father's work, bush, lake, island, caves, thermal area,

Mention any other places of interest the child has visited:

(14) How many of the following has the child travelled in since the age of three years? (Underline)
    car, bus, taxi, tram, trolley bus, cable-car, aeroplane, train, railcar, ferry, small boat, yacht, launch, any other ...

(15) Does the child belong to a library? Yes/No
    How many books taken out each time?
    How often changed?
    How many other family members regularly take out library books?
    How many magazines and periodicals come into your household each month?
    How many of these is the child allowed to see, either when new or when finished with by family members?

(16) What hobbies does the child see other members of the family doing?

(17) a) Which of the following play materials does the child usually have available for him to play with at home? Include materials belonging to brothers or sisters only if the child is allowed to use them whenever he likes. Underline all appropriate words.
    poster paint, paint box, crayons, coloured pencils, lead pencils, felt nibbed pens, ballpoint pens, coloured paper, plain white paper, cardboard, scrapbook, old magazines, scissors, paste, glue, sellotape, string, clay, plasticene, modelling wax, dough, sand, water, mud, buckets and spades, old pots and pans, chalk, blackboard, dressing-up clothes, jigsaws, take-apart toys, blocks, construction sets, card games, gardening tools, carpentry tools, dolls, soft toys, doll's pram, doll's bassinet, doll's pushchair, toy kitchen apparatus, toy household apparatus - iron, mop, broom, brush and pan, furniture, teaset, doll's house,
cars, planes, ships, trains, guns, space toys, farm animals, clockwork or mechanical toys, balls, cart, tricycle, pedal car or other pedal toys, scooter, sport sets, junk, e.g. planks, boxes, sacks, tyres.

b) Underline any of the following which are on, or bordering, your property, and also available to your child for play:

trees which can be climbed, shrubs which can be crawled under, hedge higher than three feet, stream, pond, long grass, area of grass approx. half the size of a tennis court, area of concrete or asphalt as big as that required by a garage (not garage or path), garage, shed, play-house, gravel path, large rocks or boulders

c) i) Approx. how many different flowers or flowering shrubs do you have in bloom each year?
   ii) Approx. how many different kinds of vegetables do you grow each year?
   iii) How many trees (not fruit) six feet or higher do you have?
   iv) How many trees less than six feet?
   v) How many shrubs? How many fruit trees?

(18) The following 10 statements refer to aspects of children's behaviour, after each statement are the words ... always often sometimes never. Decide which word describes your child best, for each statement, and underline it.

a) Notices anything different or new at home
b) Likes to try out anything new
c) Is fascinated by anything strange or unusual
d) Examines and explores his surroundings
e) Is observant of small details
f) Enjoys the unexpected or surprising
g) Shows interest in visitors
h) Wants to know the reason for requests or actions
i) Asks questions
j) Eager to find out how things work

(19) The statements below describe some common practices used by parents in bringing up their children. Each one is followed by the numbers 1 2 3 which mean:
1 - Usually, i.e. very few exceptions
2 - Sometimes, i.e. on occasions which warrant it
3 - Rarely, i.e. practically never.
For each statement, decide which number best fits the way you are dealing with your child at present and put a circle round that number. Only put what you usually do, not what you think you ought to do, or what you would like to do.

1. I am strict and firm with my child
2. I expect unquestioning obedience from my child
3. I prefer a quiet child to a chatterbox
4. I am very strict about table manners
5. My child must not play in the living room
6. I allow my child to play in his bedroom
7. My child is allowed to go into his parents' bedroom
8. I allow my child to spread his toys around when he is playing
9. I do not help my child pick up his toys
10. My child must never touch anything in the house that is not his
11. My child is allowed to play with dirt and mud
12. I enforce the rule that a child should be seen and not heard
13. My child is expected to be neat and tidy in the house
14. I refrain from asking my child to do something for me if he is busy with something of his own
15. I allow my child to talk at mealtimes
16. I allow my child to use his fingers with his food if he needs to
17. I let my child help me whenever he wants to
18. I expect my child to keep his room tidy
19. I prefer a child who doesn't ask too many questions
20. I expect my child to do as he is told after one telling
21. I encourage my child to find things out for himself
22. I do not allow my child to upset the orderliness of my home
23. I give reasons when telling my child what to do
24. My child takes part in making decisions affecting the whole family.

(20) These statements are about the things you think parents ought to do. After each one are the letters A a b B which can be interpreted as follows:
A - I strongly agree with this statement
a - I mildly agree
b - I mildly disagree
B - I strongly disagree
For each statement, decide the extent of your agreement or disagreement and circle the appropriate letter.

1. Good parents teach their children to obey them immediately
2. Children should always play where their parents can see them
3. Children should not be allowed to investigate each other's bodies
4. Children should sometimes be allowed to destroy things to see how they work
5. Children should always be ready to do what an adult asks
6. Children need plenty of space at home in which to play
7. Children should be encouraged to play with one thing at a time and to put away things not being played with
8. Parents should realize that children can't play properly without getting pretty dirty
9. A house should be kept neat and tidy whether there are children in it or not
10. Having to put up with a lot of noise when children are around is inevitable for parents
11. Parents should leave children alone to play whenever possible
12. Children should be told to keep out of the way when parents are busy
13. A child should never be permitted to set his will against that of his parents
14. Parents should recognize that children often get so engrossed in their play that they don't hear what is said to them
15. Curiosity about sex is natural for a child and should be encouraged
16. A good parent tries to answer children's questions as accurately as possible as soon as they are asked
17. Parents should give up any idea of having a tidy home until children are grown up
18. Children should be encouraged to play quietly as much as possible
19. Parents should always be ready to talk to their children
20. It is best to have furniture that can stand up to the wear given by children
21. It is a shame to bother a child about clean hands unless he is eating
22. Children should never be allowed outside the gate by themselves to visit neighbours and shops
23. Parents should not be expected to put up with children's mess.

24. Children should be discouraged from bothering parents with questions while parents are working.

25. It is impossible to expect children to be tidy while playing.

26. Children should be given warning before having to stop playing.

27. Children should be allowed to get away from adults for a while.

28. It is necessary to allow children to dig in the garden and pick flowers.

29. Children need to be allowed to poke around in things.

30. Children should be allowed to experiment and try things out as long as they are not in any danger.

31. Children shouldn't be discouraged when they want to help their parents.

32. Parents should encourage children to find things out for themselves.

33. Children should always keep out of the way when parents have visitors.

34. Children should not be encouraged to be interested in things that are none of their business.

REFERENCES

Becker cf. References. Chapter II.

Havighurst cf. References. Chapter II.

Maccoby & Gibbs cf. References. Chapter III.


Sears et al cf. References for Chapter III.

Schaefer and Bell cf. References for Chapter III.
APPENDIX C.

RATING SCALES USED TO MEASURE VARIABLES TO BE CONTROLLED

1. **Anxiety Rating Scale**

Mendel's (1965) rating scale was used, with no alterations.

The numbers between the opposing statements show the scores assigned to positions on the scale, but numbers on the scale as given to teachers were 3 2 1 1 2 3 as mentioned in the instructions.

**INSTRUCTIONS:**

Here is a list of statements used to describe people. As you can see, they are paired off into opposites. I would like you to decide where each child is in terms of each pair of statements. Between each two statements are the numbers 3 2 1 1 2 3

Decide which of the two statements describes the child better, and circle one of the three numbers next to that word as follows:

1. a little more on this side
2. definitely on this side
3. very much on this side

compared with children of his age.

**EXAMPLE:**

Tall 3 2 1 1 2 3 Short

If the child is very tall you would circle the 3 right next to the word "Tall". If he were a little on the short side, you would circle the 1 closest to the word "Short", and so on, circling one number for each child for each statement.

Please rate all the children on each statement before proceeding to the next statement.
THE ANXIETY SCALE WITH ITEMS AS SCORED FOR LEVEL OF ANXIETY

Anxiety Scoring Key
1 = low anxiety
2 = medium anxiety
3 = high anxiety

1. Plays actively 211 233 Plays inactively
2. Talkative 321 123 Talks little
3. Has trouble making up his mind 332 112 Makes quick decisions
4. Worries often about things at home 332 211 Rarely worries about things at home
5. Gets into fights and arguments often and easily 321 123 Avoids fights and arguments
6. Enjoys playing alone most 332 211 Enjoys playing with other children most
7. Unconcerned about mussing up clothes 112 233 Afraid to get clothes mussed up
8. Almost never cries 112 233 Cries often
9. Likes to follow others, imitates 321 123 Likes to "run the show," is imitated
10. Assertive, stands up for his rights 211 233 Does not assert himself
11. Hides feelings 332 112 Shows feelings
12. Neat and orderly 321 123 Not neat and orderly
13. Almost never gets angry 332 112 Gets angry often and easily
14. Seeks a lot of contact with teachers 322 113 Seeks very little contact with teachers
15. Is fidgety, squirming, restless 321 123 Is very calm and quiet
16. Worries 332 211 Does not worry
17. Goes to the toilet more often than most children his age 331 122 Goes to the toilet more rarely than most children his age
18. Behaves affectionately and enjoys affection 112 233 Does not show affection and does not enjoy affection from others
19. Impulsive 321 123 Plans carefully
20. Has many fears 332 211 Has no fears
21. Often takes blame, admits error 321 123 Blames others, does not admit error
22. Feels superior to other children 321 123 Feels inferior to other children
23. Is concerned about always being "good", anxious to please 331 122 Is a "naughty" child, provokes irritation
24. Expects the best most of the time 112 233 Expects the worst most of the time

Scores for each subject were obtained by summing the values
for each item.

2. Scale for Dependency and Autonomous Achievement Striving
   (n Ach.)

The scales were those developed by Beller (1958) and
followed the sample given in his journal article. The
dependency scale comprised items 1, 3, 5, 7 and 9, while the
achievement scale was made up of items 2, 4, 6, 8, and 10.
The method of scoring consisted of summing the circled
numbers for each item, and separate scores were obtained for
each of the two scales. As well as the scale, instructions
as to its use, teachers were given the Key to Interpreting
Questions to assist them in making decisions.

INSTRUCTIONS:

On this sheet are 10 questions relating to children's
behaviour. Following each question are the numbers 7 6 5
4 3 2 1. These can be interpreted as follows:
Very often and Often and Occasionally and Very rarely and
very persistently persistently little persistence without persistence
7 6 5 4 3 2 1

For each question, decide which number on the scale best
describes the child and place a circle round that number.

1. How often does the child seek help?
2. How often does the child derive satisfaction from his work?
3. How often does the child seek recognition?
4. How often does the child attempt to carry out routine
tasks by himself?
5. How often does the child seek physical contact with
the teacher?
6. How often does the child attempt to overcome obstacles in the environment by himself?
7. How often does the child seek attention?
8. How often does the child take the initiative in carrying out his own activity?
9. How often does the child seek to be near others?
10. How often does the child complete an activity?

KEY TO INTERPRETING QUESTIONS

1. By help is meant any form of assistance from another person, e.g. doing something for the child like dressing, washing, finding a toy for him, pushing him in the swing, protecting him against another child when he is attacked or something is taken away from him etc., giving instructions and guidance, like demonstrating how to build, play, paint, etc., giving what he asks for, e.g. a toy to play with, colour to paint.

2. Satisfaction can be judged from the following behaviour: the child finishes its activity, e.g. painting, building, play etc., without asking teacher for comment; without making derogatory comment on the work of other children; or without showing disturbance or irritation by bullying other children, dashing off wildly, destroying his own work, etc., but instead moving away from a completed activity and getting ready for a new one.

3. By recognition is meant any sort of praise and approval: Child comes running to teacher showing her what he did, e.g., exclaiming, "I washed my hands"; telling her that he had carried out a command or request by the teacher; e.g. "I put the blocks back", "I drank all the milk", etc. Calling on the teacher to see what he did, e.g. in the sand-pit, at painting, while playing, etc. Shouts to teacher, "Watch me", when on the swing, when on a cart, when feeling he is especially good, doing something praiseworthy, etc.

4. Routine tasks: e.g. dressing, washing, eating, toilet behaviour, etc. The rater is to put special emphasis on the child's attempts to carry out these routine tasks by himself. The occurrence of such attempts can be observed directly by seeing the child trying to dress by himself, to dress or undress at toilet or swimming pool, trying to get the water running for washing etc. (while the teacher assisted another child), or the child may be found doing any of these
in a clumsy way but doing them as best he can. (The rater must be careful to not let her feeling of a self-evident duty to assist the child in all routines when the child needs assistance interfere with an objective appraisal).

5. Physical contact: wants to be picked up, holds on to teacher's dress, huge adult's knee, holds or reaches for teacher's hand, puts arm round teacher's neck (while teacher demonstrates to child, reads to group, on the playground etc.)

6. By obstacle we mean missing a necessary tool or object in play or work, having misplaced a towel, a toy, clothing apparel etc., desired objects that are placed out of reach, etc. The extent of the child's striving to overcome such obstacles by himself can be seen when, after his turning away from an ongoing activity (play or work), he returns and continues after having overcome the obstacle. This is distinguished from reaction to such obstacles which are characterized by the child's interrupting his play or work to join other children or another child, to scream out loud - "I need a hammer", "I need another truck" - to go from child to child begging, demanding and finally grabbing the desired object, or simply beginning to daydream, wandering off aimlessly or crying. How often does the child seek or strive to overcome obstacles in the environment on his own without getting distracted from his ongoing activity?

7. Attention: How often does the child manage to keep others occupied with him? Getting another person to occupy herself with the child, e.g. talking to him (answering questions, explaining, watching the child, giving approval, praising the child, scolding, punishing, etc.) Try to ignore whether the child does it in a pleasant or unpleasant way, whether he is clever and skillful or clumsy or inefficient (a nuisance) in his efforts to draw attention, e.g. talking a lot, asking questions, volunteering answers, making a noise, making faces, being unco-operative, disobeying, excelling others, etc. Use as your basic criterion how often he manages to keep others occupied with him.

8. Initiative: When the child comes into the playroom, art room, or playground he knows what he wants to do and proceeds to do so, e.g., sandpit, carts, swing, building a ship or tunnel with the blocks, etc. This can be distinguished from going out into the playground and looking around for someone to join, clinging to the teacher, standing or
wandering around aimlessly until teacher takes the initiative, asking someone to play with him, or mostly wanting toys or tools which other children have already begun to use. It does not matter whether another child enters his activity occasionally, the main criteria being whether he has his own ideas and proceeds to carry them out.

9. By being near we mean just what it says. The child manages to sit near the teacher or another child, to play where the teacher is, or where another child or children are, regardless of whether he interacts with the other person or not. If the child is active and skillful, it may express itself in the form of playing with, working with, talking to, offering help, asking for help; on the other hand, if the child is quiet and timid he may just hang around, watch, stand or sit near another individual child, teacher, (observer) or near a group. This differs from attention because it refers just to proximity and does not say anything about the relationship between the child rated to other children or to the teacher when they interact.

10. Completion: Once the task is set by the teacher or selected by the child, the child carries it out to completion, e.g., construction, play, art, etc. This is to be distinguished from giving up easily, getting quickly bored, disinterested or distracted. It is also to be distinguished from rigid perseverance, i.e., a child just keeping on doing one thing regardless of whether it is successful or unsuccessful. Use as your basic criterion how often the child carries an activity to completion.