

# Teacher Feedback on Delivering Computational Thinking in Primary School

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## ABSTRACT

We report on the preliminary results of an ongoing study examining the teaching of new primary school topics based on Computational Thinking in New Zealand. We analyse detailed feedback from 13 teachers participating in the study, who had little or no previous experience teaching computer science and related topics. From this we extract key themes identified by the teachers that are likely to be encountered deploying a new curriculum, including unexpected opportunities for cross-curricula learning, development of social skills, and engaging a wide range of students.

## CCS Concepts

• **Social and professional topics** → **Computational thinking**; *Computer science education*;

## Keywords

Computational thinking; teachers

## 1. INTRODUCTION

In July 2016, the New Zealand Ministry of Education announced the expansion of the ‘Digital Technologies’ subject in the NZ curriculum and its extension to every year level, beginning in year 1 of primary school<sup>1</sup>. Before that it was covered only in the final three years of high school. The new extended ‘Digital Technologies’ subject will cover Computer Science (CS), Programming, and Computational Thinking (CT) topics. The goal is to have this implemented in the two NZ curriculums, the *New Zealand Curriculum* and *Te Marautanga o Aotearoa*, by 2018. This area will be new for the majority of primary school educators, and resources will be needed to support them.

<sup>1</sup><https://www.beehive.govt.nz/release/nz-curriculum-include-digital-technology>

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WiPSCE '16 October 13-15, 2016, Münster, Germany

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ACM ISBN 978-1-4503-4223-0/16/10...\$15.00

DOI: <http://dx.doi.org/10.1145/2978249.2978266>

We have collated potential approaches and resources to support teachers to deliver this content. A study, initiated in 2015 and building on prior work in 2014 [2], is currently in progress to evaluate these methods, and teachers’ ability to deliver this material. We are working with a group of NZ primary school teachers, providing them with professional development and classroom resources, and collecting feedback on their experiences teaching these materials in class.

We report on the preliminary results of the study, which at the time of writing involved 22 teachers and approximately 1000 students in 9 schools.

We collected a series of activities for teachers to use with their classes. These are largely based on existing material, including the CS Unplugged activities [1], exercises in Scratch and ScratchJr programming<sup>2</sup>, and challenges using the Bee-Bot devices<sup>3</sup>. The activities were adapted for each school context and age group.

The broad topics being covered were based around algorithms, programming, and data representation. A complete digital technologies curriculum should also include aspects such as keeping yourself safe in a digital environment and learning to *use* computers effectively, but we have chosen to focus on the new technical concepts as they are likely to present the greatest challenges for introduction to the classroom, as the other topics are already covered to some extent in NZ schools.

## 2. FEEDBACK FROM TEACHERS

A feedback form was shared with participants, and they were asked to complete this form each time they taught a CT or CS focused session with their class. Teachers were asked to report the year level of their class, a summary of the lesson, any comments and observations they wished to include, and then asked to rate their levels of confidence teaching the lesson, and their professional opinion on how challenging and engaging students had found the lesson.

The feedback reported here is based on 48 responses from 13 different teachers. The classes reported on come from 9 different schools and cover year levels 0/1 to 8 (from age 5 through to 12).

**Teacher confidence:** The teachers we have worked with throughout this, and previous studies, are frequently anx-

<sup>2</sup><http://scratched.gse.harvard.edu/>, <https://www.scratchjr.org/>

<sup>3</sup><https://www.bee-bot.us/>

ious about teaching CS and programming, and doubt their ability to teach these. Teachers who have begun giving feedback however are more commonly reporting that they feel confident. In Table 1 we show the distribution of the most common answer each teacher gave (mode).

**Table 1: Most common response of the 13 teachers**

Very unconfident	1
Moderately unconfident	2
Moderately confident	6
Very confident	4

**Level of challenge of concepts taught:** A natural concern around introducing CS and programming into primary school curricula is that these topics might be unsuitable for primary students. However according to the feedback to the question “How challenging/engaging do you think students found it?” analysed in Table 2 this is not the case.

**Table 2: How challenging/engaging for students?**

Far too easy	0
A little too easy	1
A good challenge level	44
A little difficult/frustrating	1
Far too difficult/frustrating	0

These are extremely encouraging results as they indicate that across a wide group of teachers and year levels of students, the concepts and activities could be adapted to suit the age and ability of students.

**“This really engaged them”:** A recurring theme in teachers responses, such as the following was an emphasis on how much students enjoyed the classes, and the high level of engagement and focus they displayed:

- “This task brought out the best of those that normally don’t share - I saw a side to children that I rarely see.”
- “My class were truly engaged the whole lesson. They loved writing their name in Binary and also went on to create a secret message for a class mate and some even went home and made a secret message for their parents!”
- “This was good fun! The children’s understanding of data representation is growing every day and they are continuing to extend it by doing their own research and teaching their families.”
- “They were very focussed. It had a competitive element! They loved using the codes”

This feedback reflects anecdotal evidence we have observed throughout the study, starting from the very first class taught in 2014, where the teacher remarked that they had never seen their class as engaged as when they taught the CS Unplugged Binary Numbers activity.

**Communication and teamwork:** Teachers commented on teamwork, cooperation, and communication many times, and noted that computing was helping to teach social skills. There were several occasions when teachers noted that students who don’t normally contribute joined in, and the students who most found social skills challenging were being greatly impacted. Comments included:

- “I was really impressed at the way they worked so well in teams and their attention to detail.”
- “This was a fantastic lesson... I loved hearing from those children who would normally sit back and watch.”
- “I was amazed at how well the children worked together to solve the problems”
- “It was particularly pleasing to see some of the ‘quieter’ children having a go and showing they had some really effective strategies.”
- “... the less able children concentrated hard on the task and were quite methodical in their approach, whereby some of the very able children tended to rush into it and make errors.”

## 2.1 Cross-curricula integration

Within Primary school education it is important that new CT material can be integrated with other subjects, as teachers have a limited amount of time to cover all the subjects required in the already “crowded curriculum”. Integrating CT with other subjects can enhance learning in these areas, and make other learning more applicable in our digital world. Several teachers highlighted the cross-curricula learning they had achieved, with subject combinations including Maths, Physical Education, Literacy, Numeracy, Creative Writing, and Art.

## 3. CONCLUSION

As new curricula covering CS, CT, digital technologies and related areas are being introduced many teachers are having to undergo professional development in order to deliver the new material. The initial feedback from our pilot has indicated that teachers are able to deliver the material in a way that engages the students, often more effectively than expected, and engaging students who may not have otherwise been engaged or are regarded as ‘difficult students’. Teachers found many opportunities for cross-curricula teaching, and reported that students exercised social skills and teamwork in unexpected ways.

## 4. REFERENCES

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