

Manahi's red chocolate sunglasses: the impact of a learning experience outside the classroom on a five-year-old student's technological practice



Louise Milne

University of Waikato
PB 3105, Hamilton
New Zealand
Phone: 07 838 4680
louisem@waikato.ac.nz

Abstract

Knowledge of expert practice is a key element of Technology Education, and this paper which is part of a larger study, investigates the impact a learning experience outside the classroom has on one student's technological practice. This student, who is in his first year at school, visits a chocolate factory with his class to find out how to make a chocolate gift for Mothers' Day.

This study uses a qualitative case study methodology (Stake, 2006). Data were collected and analysed from three interviews, before, after, and six months after the visit to the factory. The student's drawings and stories recorded after the visit were also analysed using themes emerging from the literature of Education Outside the Classroom (Anderson, 2003; Falk, 2004), Technology Education (Compton, 2009; de Vries, 2012; Jones, Bunting, & de Vries, 2013) and the characteristics of young students' learning (Cohen, 2013; Siegler & Alibali, 2005).

The findings from this study identify a significant increase in the student's context specific oral language, his understanding of the individual phases of technological development, and an ability to transfer these understandings to other contexts including those presented six months after the visit. Whilst these developments showed an encouraging improvement in Manahi's technological understandings, there existed a lack of continuity and connectedness (Moreland & Cowie, 2011) through the development of his chocolate gift. This impacted negatively on his perceptions of the purpose of the visit and the final goal of his practice.

Keywords

Technology education, primary, technological practice, education outside the classroom, connectivity

Introduction

The New Zealand national curriculum comprises eight learning areas, one of which is Technology education. This curriculum aims to develop a broad technological literacy through students participating in learning programmes in which they engage in technological practice, and in so doing develop technological knowledge to inform their practice, and gain an understanding of technology as a domain in its own right. Experiencing and exploring contemporary examples of technological practice is recognised as an effective way of developing technological literacy and in this study, students visit a chocolate factory (Candyland) to find out how to make a chocolate gift for Mothers' Day. The broader study, from which this paper is drawn, describes the development of an intervention model which aims to provide guidance for teachers of very young students when planning a technology unit that includes a visit outside the classroom. The intervention model is divided into three chronological phases, preparation before the visit, organisation during the visit and follow-up after the visit.

Themes	Domain
Understanding that the gift is for the students' mother Number of identified steps in a technological process Knowledge of materials and their properties The purpose of modelling	<i>Technology Education</i>
The purpose of the visit to Candyland	<i>EOTC</i>
The use of context specific language Ability to extend learning to new contexts	<i>Characteristics of 5-year-olds</i>

Figure 1. Themes for data analysis relevant to this paper

This paper describes the experience of Manahi, a five-year-old student of Maori (indigenous New Zealander) descent, as he progresses through the three phases of the technology project. Manahi is one of 16 students participating in the broader research project and the findings noted that whilst he embarked on this project with a good level of oral language, and a range of prior experiences which supported his engagement with the project, there was a lack of continuity and connectivity (Moreland & Cowie, 2011) between the stages of the product development. This prevented him from fully understanding the purpose of the visit, the links between the phases of the project and realising the final goal of the project.

Key ideas which inform the research

A review of the literature which informs this paper is drawn from three fields of study, Education Outside the Classroom (EOTC), Technology Education, and Child Development specifically the characteristics of 5-year-olds. As outlined in the early work of Falk and Balling (2001) the most valuable and memorable learning experiences outside the classroom are 'novel' experiences – those which are new, high interest experiences. Anderson (2003) argues that this type of memory is "overwhelmingly dominated and mediated by the socio-cultural identity of the individual at the time of the visit" (p. 405) and the lens through which the experience is viewed, strongly influences what is noticed and what is remembered. Building on these ideas, Falk and Adelman (2003) conclude that, closely aligned with student interest in a visit, is their enjoyment the experience. Anderson, Thomas and Ellenbogen (2003) agree but caution that these memories will be influenced by the age of the students, what is important to them and the emotional engagement they experienced at the time.

Research in the field of EOTC suggests that prior knowledge of exhibits at a site and a clear purpose for the visit, helps give focus to the experience and enables a student to engage more readily with the displays that s(he) encounters. Lambert and Balderstone (2000) argue for teachers creating a 'need to know' factor amongst students prior to going on a visit – effectively arming them with an authentic research purpose to be accomplished during the visit. However it is well known that these 'big ideas' can easily be lost on young students in-amongst the busyness of a junior classroom (Benson & Raat, 1995; Moreland & Cowie, 2011). Moreland and Cowie (2011) explore the challenge of maintaining a sense of continuity and connectedness throughout an entire project. Five-year-old students are known to view each phase of a technology project as an end-point in its own right, and do not always grasp the concept that each phase, each activity is but one step in a more extensive process.

The links between the final outcome, the visit, and the research tasks carried out prior to constructing the final outcome, are likely to be strengthened if the supporting adults draw students' attention to the connections between one technological activity and the next, for example, the student's survey and design drawing are intended to inform their final outcome. In this way the links between each phase of the process are maintained.

Method

The research from which this paper is drawn employed a qualitative case study methodology which included interviews with two classes of five-year-old students before their visit to the chocolate factory, after the visit, and again six months after. The students' drawings, stories and models were also analysed according to themes drawn from the literature and from the data. This paper investigates the

impact of the learning experience outside the classroom on Manahi's technological practice. In particular evidence which suggests the visit to Candyland influenced his conceptual and procedural understandings of making chocolates, his design decisions, and whether he made a connection between the visit and his technological practice. Data analysis also considered whether there was any significant development in his understanding and use of context specific vocabulary.



Figure 2. The pre-visit activities

Manahi's visit to Candyland was a 'novel' experience. Data gathered prior to the visit indicated that this was the first time he had visited the factory, he was very excited at the prospect of going to the factory and was clearly interested in the context of chocolate-making. However, as a five-year-old boy, what he would be interested in and what he would notice during the visit would impact on the learning that took place.

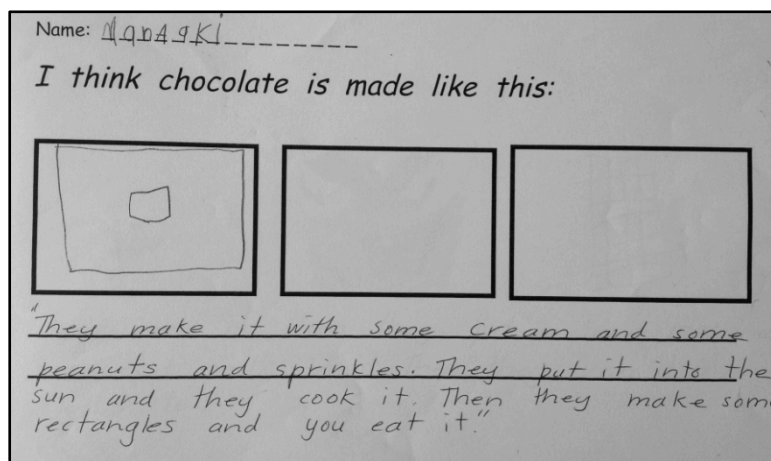


Figure 3. Manahi's prior knowledge of making chocolates

Figure 2 shows some of the activities which were planned as part of the intervention model, and which were intended to prepare students for their visit to Candyland. A key feature was to introduce students to the issue of their technology project. Mothers' Day was approaching and the students were asked what they could do to help celebrate this.

The teachers steered their students in the direction of creating a chocolate gift, and Candyland was identified as a place to visit to find how the students could make their chocolates.

The first document which was analysed was Manahi's drawing and scribed story. This is shown in Figure 3 and detailed his existing knowledge of how chocolates are made. He explained, "They make it with some cream and some peanuts and sprinkles. They put it into the sun and they cook it. Then they make some rectangles and you eat it".

A brief analysis suggests that Manahi had a small number of conceptual and procedural understandings associated with making chocolates. His description indicates that he had had previous experience with baking, and knew that some chocolate products contain peanuts and sprinkles. He was familiar with the use of cream and had possibly seen it used when making other food-stuffs. He associated the sun with melting chocolate and he also appeared to associate heating and cooking ingredients with baking. His reference to rectangles may indicate something of his previous experiences and how he conceptualises chocolate.

The first interview before the visit offered some key information. Manahi and the students from his class were generally unclear about the purpose of their visit to Candyland and appeared to have made no connection between the task of finding out how to make their chocolate gift and physically making it. An important link between these early stages of the project had unfortunately been overlooked.

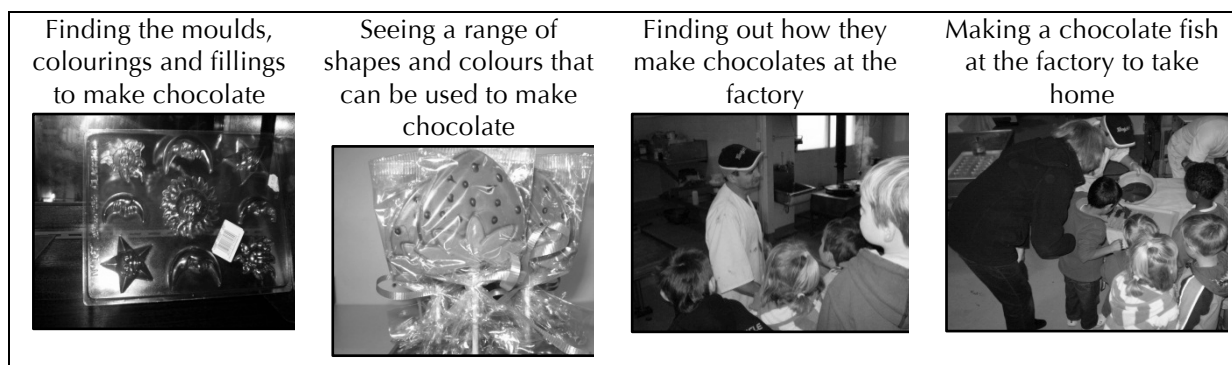


Figure 4. Student activities during the factory visit

The visit to the factory progressed smoothly and Manahi and his classmates explored the facility viewing the ingredients and equipment required to make chocolates, and the extensive array of shapes and colours of chocolate products which were on display. They gained further information about the process used in the factory to create chocolate products and this concluded with an opportunity for the students to make a small chocolate fish to take home. See figure 4.

A final part of the factory tour was to participate in a presentation in which the factory presenter showed them how to make a lollipop on a stick. This was very popular with the students but proved to be a distraction. Manahi's first memory on his return to school was that of the lollipop presentation. He drew a picture (see Figure 5) and he wrote:

I went to Candyland. I got to make a lollipop. The man put some candy mixture into a machine to roll it out. He put some stripes on it. I twisted my piece and turned it around and put a stick in it. Then I put it in a bag to take home.



Figure 5. Manahi's drawing showing how he made a lollipop

As part of the intervention plan, and to enhance students' recall of their visit, Manahi and his classmates were to draw a picture and write a story on their return to school. Whilst this was intended to focus on the chocolate-making presentation, the students in Manahi's class were given an open task in which they could draw "something they remembered from the visit". Seven of the eight students, including Manahi, wrote about the lollipops and this again shifted their focus from the intent of the experience – the chocolate-making. This became a lost opportunity to consolidate their new knowledge and to maintain the continuity of their focus through the unit.

The next phase of the technology unit stepped the students through a review and consolidation of the learning achieved during the visit to Candyland, a simple research component in which they presented a survey to their mothers to find out the type of chocolate that she preferred, and followed by the creation of models and drawings showing the chocolate they would make as their Mothers' Day gift.

Manahi duly took his survey home and reported in his second interview that his mum liked milk chocolate and brown chocolate but did not like dark chocolate. (I interpreted her preferred chocolate as

being milk chocolate and white chocolate.) Manahi also reported that she liked having peanut and caramel filling in her chocolate.

Manahi's drawing and story describing how he was going to make his chocolate gift showed that he had developed slightly more sophisticated context-specific language and a limited but accurate description of the steps he needed to take in order to create the gift. He explained to his teacher that he would need to, "Put the melting chocolate into a mould and put it into a big machine and then wrap it up". This reflected the process he had observed at Candyland, with "the big machine" being a cooling tunnel into which all the students' chocolate fish were loaded for hardening. Manahi's drawing, however, showed a significant broadening of his ideas and an awareness of the possibilities for colour and shape in his design. Manahi had drawn a picture of a pair of red chocolate sunglasses shown in Figure 6.

The making day followed directly afterwards, and a group of parent-helpers were organised to assist the students to make their chosen design. Although the parents had received information about the visit and had given their consent for their child to participate, they had not taken part in the visit. It appeared that the intent of the visit, the students' research task, and how these were to connect with the making of the chocolate gifts were not well understood by these parents, and two of the parents unexpectedly made a change to the students' task. The teacher of Manahi's class said, "I think a couple of mothers have said, "Right you're making one for mum and you can make one for yourself". Figure 6 Manahi's red chocolate sunglasses



Figure 6. Manahi's red chocolate sunglasses

This created another diversion which prevented the students' from experiencing and understanding the links and connections between the individual phases of their technological practice. Whilst the change was very appealing for the students it shifted their attention away from the original focus of creating the gift for 'mum'.

It was also noted that in-amongst the enjoyment of making the chocolates both the parent-helpers and the students failed to take into account the survey information they had collected and the designs they had chosen. Whilst changing design ideas is to be encouraged in technology, this oversight appeared to impact significantly on Manahi. During his second interview he admitted that after he had made his chocolates he had eaten them.

- R** Did you eat it at school?
M Yes.
R Did you? Did you take yours home to Mum?
M No.
R No? Did you eat yours at school?
M Yes. I had both, I ate both of them.
R Did you?
M Yes 'cause I was tricking my mum.

Concluding remarks

The full data set acquired through interviews with Manahi and the analysis of his drawings and stories indicate that over the course of the technology unit he had gained topic-specific language, knowledge of ingredients, machinery and the equipment required when producing chocolate products. He had gained knowledge of the technological process and the steps required to create a product and his drawing of the red chocolate sunglasses for his Mothers' Day gift suggested that he had benefitted from his visit to the factory and had been inspired by the colours and shapes of chocolates that he had seen there. He had not, however, understood the purpose of going to Candyland and was unable to describe any questions he needed to ask during the visit. Whilst he acknowledged that he had learnt "to make the chocolate" during the visit, there was no sense that he connected this with his own practice of

making chocolates for Mothers' Day. The diversion created by the parents when the students made their chocolates was sufficient for him to lose sight of the intended final outcome, resulting in an after school feast for a small boy rather than the giving of a chocolate gift on Mother's Day.

References

- Anderson, D. (2003). Visitors' long-term memories of world expositions. *Curator, 46*(4), 401-420.
- Anderson, D., Thomas, G. P., & Ellenbogen, K. M. (2003). Learning science from experiences in informal contexts: The next generation of research. *Asia-Pacific Forum on Science Learning and Teaching, 4*(1).
- Benson, C., & Raat, J. H. (1995). *Technology in Primary Education: Examples of Technology Lessons in Europe*. City, England: Technon.
- Bruck, M., & Ceci, S. J. (1999). The suggestibility of children's memory. *Annual Review of psychology, 50*, 419-439.
- Cohen, D. (2013). *How the Child's Mind Develops* (2nd ed.). New York, NY: Routledge.
- Compton, V. (2009). Yep - We can do that: Technological response to the curriculum 'needs' arising. *Design and Technology Education: An International Journal, 14*(1), 21-36.
- de Vries, M. J. (2012). Philosophy of technology. In P. J. Williams (Ed.), *Technology Education for Teachers* (pp. 15-34). Rotterdam: Sense.
- Falk, J. H. (2004). The director's cut: Toward an improved understanding of learning from museums. *Science Education, 88*(1), 83-96.
- Falk, J. H., & Adelman, L. M. (2003). Investigating the impact of prior knowledge and interest on aquarium visitor learning. *Journal of Research in Science Teaching, 40*(2), 163-176.
- Falk, J. H., & Balling, J. D. (2001). The field trip milieu: Learning and behaviour as a function of contextual events. *Journal of Educational Research, 76*(1), 22-28.
- Jones, A., Bunting, C., & de Vries, M. J. (2013). The developing field of technology education: A review to look forward. *International Journal of Technology and Design Education*.
- Lambert, D., & Balderstone, D. (2000). Fieldwork and teaching *Learning to teach geography in the secondary school* (pp. 240-251). London: Routledge/Falmer.
- Moreland, J., & Cowie, B. (2011). *A matter of time: A temporal focus on teaching and learning primary technology*. Paper presented at the PATT 25: CRIPT 8, London.
- Siegler, R. S., & Alibali, M. W. (2005). *Children's Thinking* (4th ed.). New Jersey: Prentice Hall.
- Stake, R. E. (2006). *Multiple Case Study Analysis*. New York, NY: Guilford Press.