

CHILDREN'S DEVELOPING UNDERSTANDING OF THE MEANING OF TECHNOLOGY

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ABSTRACT

This paper documents the developing understanding of the meaning of technology of seven children over their first six years at primary school. The children were asked their understanding of the word technology on starting school at five, and on four occasions during of the next six years they were asked to complete two of the Rennie and Jarvis (1995) instruments exploring children's understanding of technology. The children's responses are analysed both as groups and as individuals and the paper concludes with a discussion of the implications of the findings for technology education teachers.

1. INTRODUCTION

This paper focuses on one particular aspect of two three-year-long longitudinal ethnographic studies of a group of children in an inner city Auckland school. The first study (Mawson, 2005; 2006) documented and discussed the progression of technological literacy of a group of 20 children during their first three years of primary schooling. In the second study the progression of technological literacy of seven of these children during their next three years of school (Years 4-6) was documented. As part of both studies the children's understanding of the meaning of the word technology was documented on five occasions, and this data provides the subject matter of this paper.

This paper focuses on two questions, what were the children's understandings of technology and where might these have come from, and what implications this might have to technology educators. Children's conceptions of technology and technology education have been seen as an important question since the reconceptualisation of technology began in the 1970's. The most significant development in this area was the development of the Pupils' Attitude Towards Technology (PATT) instrument in the Netherlands. Use of this instrument became more widespread with the development and validation of an USA instrument in 1988. As the PATT instrument is not tied to a particular curriculum it has been able to be translated and adapted to examine a wide range of possible attitudes and perceptions about technology in a range of diverse settings (e.g. Ankiewicz, Van Resenburg, & Myburgh, 2001; Becker & Maunsaiyat, 2002; Volk, Yip, & Lo, 2003).

The PATT instrument was designed for middle school/junior high school students (boys and girls) in Grades 6, 7, and 8 (ages 11-14). As the children in my study were five years old at the beginning of the first study and only ten years old at the end of the second study, the PATT questionnaire was not appropriate for my purposes.

There was however a different data collection instrument that had been developed by Rennie and Jarvis in Australia that was appropriate for this age group, and that was used in the studies reported in this paper. Rennie (1987) had adapted the PATT questionnaire for use with children aged 10 to 12 years and this was further developed by Rennie and

Jarvis to provide an appropriate instrument for younger children (Rennie & Jarvis, 1996). They had used this on a number of occasions in the 1990's (e.g. Jarvis & Rennie, 1998; Rennie & Jarvis, 1995) and this data provided assurance that their instrument was appropriate to use with the children in my study.

This study differs from other reported studies in two important ways. Firstly, all other studies are snapshots of children at a particular time and this study provides evidence of the growth of individual children's understanding over a six-year period. Secondly, this study documents the understanding of younger-aged children than the PATT literature.

2. RESEARCH METHOD

The original research project (Mawson, 2005) focused on a cohort of 25 children who enrolled at the primary school on or just after their fifth birthday during the period January to June 2000, and who were placed in the same class. An inner city primary school was chosen as the research site because it had a socio-economic and ethnic make-up that was representative of its geographical area, and it had a commitment to cover all seven areas of the New Zealand Technology curriculum (Ministry of Education, 1995) over a three-year cycle.

The second research project followed seven of the original children through their next three years at the school. The seven were chosen as representative of the range of technological literacy identified in the first research project, and the second project used the same research questions and methodology as the initial project.

As a part of both pieces of research the children were administered two elements of the Rennie and Jarvis instrument. The Rennie and Jarvis instrument has three parts to it. The first is a sheet of paper on which the child is asked to write and or draw what the word technology means to them. The second task has 28 pictures of objects and the child is asked to indicate which of them they believe has something to do with technology. These two instruments were administered in their second, third, fifth and sixth year at school. The third element of the Rennie and Jarvis instrument has two sections. The first section is headed "What is technology" and has 10 statements for children to respond to on a likert scale. The second section is headed "What do you think about technology" and also has 10 statements for children to respond to on a likert scale. This third element was not administered to the children involved in the research reported here.

3. FINDINGS

On entry to school (March-July 2000) the children were asked during an initial interview if they had the word 'technology' before. Only one child, Colin, answered "yes", and in response to the question "what does it mean?" answered, "You can make stuff".

The children's responses to both of the Rennie and Jarvis instruments have been tabulated to enable patterns to be more easily distinguished and comparisons made.

Table 1 Participant response – What does technology mean to you?

Name	9/3/01	11/10/02	5/11/04	19/10/05
June	someone skipping (June drew a picture of person	tecstge (texture)	tecnolcole thinking tecnoligy is a	Technology is when you do experiments with food/ bio

	skipping)		tecnobcel mashin or a pice of tecnocle work. (June drew a picture of the electronic game she had made as a year four activity with me)	technology. Making stuff out of wood and other materials desinging or drawing/planing electric circuits and electric games.
John	hang gliding (John drew a picture of person hang gliding)	Things that John and Mr Mawson have done together like circits	John drew a picture of a table with 6 electronic appliances on it, labelling three of them dvd video, play station, x box. The wires from all of them were attached to multiplugs which were connected to the wall socket	technology us not something they had in the old days, some guy came up with the idea of electricity and power about 1740 and it went from there with a light to now days with '60' inch plasma lcd screens with surround sound and DVD/video players. What a leap that was
Patsy	No written or pictorial response	No written or pictorial response	technical thinking	I think of technology . . . anything electric e.g. computers, tv's, stereos., lights, telephone, clock, calculator
Jenny	It means you have to do book reading	I think it means work	Technology in some ways are like sinince (science) because you can do some things the same way	A piece of electronic device or equipment like computers, batteries radio and many more. Technology is some wires batteris all stored together
Mark	Computer (Mark drew a picture of computer)	bilding work	Technology is building find way to do it planing how to make it sometimes you can put it together.	When I hear the word technology I think of matching wires together, quizzes and making things
Colin	wrote No (N.B. 20/7/00 "Have you ever heard of the word technology?" - "yes". "what does it mean?" - "You	no record	Technology means to me to build something or build something with electronics	Technology means to me advanced stuff that use machines and have motors and gears and medicines because people put

	can make stuff')			technology into making them
Sarah	Computer (Sarah drew a computer)	No written or pictorial response	technologe is somethink that you think of or somethink you make that his. That you think of	When I here the word technology I think of circuits and battareys and elatarcity

Table 2 Participant response – Picture recognition task

Name	9/3/01	11/10/02	5/11/04	19/10/05
June	bedroom	computer clock music book	telephone, aeroplane computer clock microwave factory plan mine windmill book gun advertisement	bridge, telephone, aeroplane computer clock microwave factory bedroom mine gun plan jeans windmill old stone axe
John	computer telephone, clock gun book gun music playground advertisement windmill fish and chip shop statue	factory telephone, aeroplane computer clock microwave statue plan mine	telephone, aeroplane computer clock microwave factory bedroom mine windmill fish and chip shop	telephone, aeroplane computer clock microwave factory bedroom mine gun fish and chip shop
Patsy	computer	computer microwave	telephone, aeroplane computer gun clock microwave	telephone, computer clock microwave
Jenny	computer telephone, cup cheese gun music rose platypus windmill fish and chip shop mountain	factory	telephone, aeroplane computer clock microwave factory plan mine windmill fish and chip shop	telephone, aeroplane computer clock microwave factory bedroom mine windmill fish and chip shop
Mark	computer	telephone, aeroplane computer clock microwave factory plan mine statue book music	telephone, aeroplane computer clock microwave factory plan mine windmill very old stone axe	microwave, telephone, aeroplane computer mine plan
Colin	No record	No record	telephone computer clock microwave aeroplane mine	telephone computer clock microwave factory mine fish and chip shop plan.

Sarah	cup, computer, telephone, plan	telephone, computer microwave	cup telephone computer clock microwave	telephone computer clock microwave bedroom factory mine fish and chip shop.

4. DISCUSSION

The no-response level in 2001 (28%) and 2002 (42%) is in line with the finding of Rennie and Jarvis in 1995. Rennie and Jarvis (1995) asked 314 primary school children in England (age 7 to 11 years) and 745 children of similar age in Western Australia to draw and/or write their understanding of the word technology. About one-quarter of the children were also interviewed with the focus on their responses to the activities. In England 22% of the boys and 22% of the girls offered no response to the activity, and the lack of response was even higher in Western Australia (30% of the boys and over 40% of the girls). In their study older children were more likely to respond to the activity than younger children and this is the case in this study as all children made a response in 2003 and 2004.

Drawing was not a preferred method of indicating their understanding of technology. Drawings were only used to complement the written response on six of 28 occasions, and where used they tended to represent electronic media. This may be a reflection on the limited use of drawing in the technology units that they were experiencing in their school programme and the lack of formal instruction in the different genres of drawing that can be used in the design process.

The focus of the children tends to move from a personal view of technology to a more socially focused high technology view. At age six (2001) the children were writing about hang-gliding and skipping and providing drawings of themselves taking part in the activity. This personal focus was still present the next year (2002) when John wrote "the things that John and Mr. Mawson have done together like circuits (sic)." By age 10 (2004) some children were able to take quite a universal view. John expressed a historically focused view of technology when he wrote "technology us not something they had in the old days, some guy came up with the idea of electricity and power about 1740 and it went from there with a light to now days with '60' inch plasma lcd screens with surround sound and DVD/video players." Colin also was able to express the idea of people using technology to develop new products, writing "Technology means to me advanced stuff that use machines and have motors and gears and medicines because people put technology into making them."

The technological activities they had experienced in school, both through the formal, taught technology units and the activities they did with me as part of my research appeared to be the major influence on their understanding of technology. In both areas they had done quite a lot of work with electrical circuits and that is strongly reflected in their later responses, particularly so in their last year at primary school (2004). This may have resulted in some confusion as to what was technology and what was science. Jenny made this point in 2003 when she wrote "Technology in some ways are like sinince [science] because you can do some things the same way."

Although both wider research projects into the children's technological literacy showed that there was a strong relationship between the children's out of school experiences and their level of technological knowledge and understanding and technological capability, these out of school experiences do not appear to be reflected in their responses to these investigations into their understanding of the meaning of technology.

The number of pictures identified as "having something to do with technology" tended to increase as the children got older. The only real exception is Jenny who went from 11 responses in 2001 to only one response in 2002. However, in subsequent years she conformed to the general trend.

The children were reasonably consistent in the pictures they identified from one year to the next. The most commonly chosen pictures in 2001, the computer and the telephone, were chosen by all seven children in 2005. This may reflect the ubiquitousness of these items in their everyday life. After the first year there is a growing identification of industry-focused pictures as the factory and the mine increasingly come to be chosen. The most commonly chosen pictures as the children aged are very similar to those identified in the Jarvis and Rennie (1998) study.

There was no apparent gender differences in the children's responses to the question "what does technology mean to you?" but there was some slight gender difference in their choice of pictures of technology. In this situation the girls were more likely to select domestic items such as the bedroom, cup and jeans than the boys,

The strong influence of the children's school experiences on their view of the nature of technology would seem to have important implications for teachers of technology. A greater focus on bringing children's attention to the wider social implications of technology would seem to be needed if their view of technology is to become more comprehensive. If the experience of these children is comparative to that of other children in New Zealand schools there is likely to be a range of different school-centred understanding to be found.

A more accurate and deeper understanding of technology would strengthen the foundations on which children's developing technological literacy is built. The introduction of the new strand "The Nature of Technology" in the Technology curriculum within *The New Zealand Curriculum: Draft for consultation 2006* (Ministry of Education, 2006) would seem to be a major step in creating the opportunity for such learning to take place. A key element in achieving this will be teachers understanding of the new curriculum, and their willingness to move beyond a product-outcome focus to a wider, more conceptual view of teaching technology.

5. REFERENCES

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