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USING VIDEO TO HELP CHILDREN REFLECT

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ABSTRACT *In this paper we use the context of mathematics with young learners to suggest that video may provide a powerful means for giving us a window on the learning that is taking place. More importantly, however, we conjecture that the approach of children viewing themselves and their peers on video may be used to help the students reflect on their own thinking, and the thinking of their peers. Relevant vignettes from the videos are presented.*

INTRODUCTION

Investigations into young children's learning about number have occupied researchers and educators for many years. Many of these findings have had a significant impact on how we work with children in the early years of schooling. For example, some curriculum topics are now introduced at an earlier age (e.g. statistics), the usefulness of mathematical games has been recognised (Hughes, 1986), and the need to explore number in realistic contexts is advocated (see, for example, Ministry of Education, 1992).

This study uses Mathematics as its context, but we believe the approach would apply equally well to any curriculum area. The investigation has two parts. First we investigated the thinking of a small, diverse group of five year olds, and in particular looked more closely at whether the children could solve simple addition and subtraction problems with and without manipulatives (much of research in this area was initiated by Carpenter & Moser, 1982). Second, we investigated whether video sequences might be used for teaching and learning purposes. Research in this area has been on-going for many years, and includes how video playbacks may assist learning in a range of curriculum areas including mathematics (Davis, 1989), and how video may be used for self-evaluation and evaluation by others of an assignment (Bennett, 1996). As well, we saw the possibilities for recording the mathematical activities of children as providiing illustrative data on how children construct mathematical meaning, and support for the constructivist model of learning that underpins the university students' mathematics education course. Constructivism's basic tenets are that knowledge is actively created or invented by the learner, that students create new mathematical knowledge by reflecting on their mental and physical actions, and that learning is a social process in which mathematical ideas are cooperatively established by the members of a culture (Clements & Battista, 1990).

The question for the present study was, might children benefit (mathematically) from watching their peers solve maths problems on video?

This study also came from, in part, the work that our School of Education students at the University of Waikato do with children in schools. As part of a mathematics education course, all the university students interview one five year old about some aspects of number. As might be expected, rich descriptive data is gained about children's early number ideas. A frequent comment from the university students is that the five-year-old children have a far greater knowledge of, and feel for, number than the students expected. This supports the findings of many researchers who have investigated early mathematical behaviour (e.g. Wright, 1991; Young-Loveridge, 1991).

Four five-year-olds from one class were looked at more closely. The interviews took place about three months into the school year and were video-taped in a room next to the children's classroom. The video was made using a hand-held camcorder with an attached plate microphone. Each interview lasted approximately 15 minutes. Before each interview the children were shown the video equipment, and were encouraged to ask questions they might have about its use.

The children were chosen by the teacher so that they represented a range of ethnicity, gender, and competence in mathematics. All of the children volunteered as participants, and care-giver permission was gained before any interviewing started. The care-givers were later given copies of the video of their child.

In the individual interviews the children were asked simple addition and subtraction problems both with and without manipulatives. For example, they were asked to add groups of three and two objects together, and say how many there were altogether. They were also asked to write a symbol on an envelope that stood for the number of objects the child had just placed therein (e.g. tickets to the movies).

RESULTS OF THE INTERVIEWS

We found that each child possessed a number of unique ways of thinking about the problems that formed the basis for the interviews. This range is illustrated in the following extracts from the videos.

Cynthia was five at the time of the interview, and had been at school for three months. She attended a local pre-school before starting formal schooling. (In New Zealand children begin school at five.) (I=interviewer; C=Cynthia)

I Cynthia, how many plastic kangaroos have you got there?
C Three
I I'm going to put two more down... (does so)... how many have we got now?
C Five
I Uh huh...so what is three kangaroos and two more kangaroos? What does that make?
C Ah....six
I How did you work that out?
C Umm...'cause...plus five makes six
I Sorry?
C Plus five makes six.
I How do you mean? I don't quite understand I'm sorry.

C Well, take away...
I Take away?
C Take away one leaves three.
I Take away one from what?
C ...from four, leaves three.
I So, what is four take away one?
C Take away one leaves ...two.
I Say I had three kangaroos and one went away...(interviewer removes one kangaroo from a group of three while the child watches)...
C It would have two kangaroos!
I So, what is two kangaroos take away one kangaroo?
C Two!

The difficulties with trying to understand problems in the 'abstract' were compounded by Cynthia's struggle with the language of maths. Amon also had difficulties when the operation was placed in an imaginary context. The rationale for his answer revealed a fascinating search for a statement to fill the gap and (perhaps) satisfy the interviewer. At the start of the conversation, Amon had been using lima beans to solve problems. (I=Interviewer; A=Amon)

I Now, say we had five lollies, then we had two more. How many would we have?
A Eight.
I How did you work that out?
A Because we had eight baked beans before.
I What about this question Amon? What is seven and two more? What is seven and two more?
A Fifteen
I How did you get that?
A Because our classroom (number) is fifteen.

Interview extracts such as the above may be contrasted with the following conversation with Kwan Mei. At the time she was five years four months, and had been attending formal schooling for three months. The interviewer is discussing simple addition. They have some lima beans in front of them. (Kwan Mei called these 'little seeds'.) (I=Interviewer; K=Kwan mei)

I How many little seeds have we got here now?
K Five
I What say I took away three. How many would I have left?
K ...Two
I How do you know that?
K Because two plus three makes five.
(later)
I Let's do something in our heads without the little seeds or blocks or little kangaroos. What about seven take away three?
K ...Four
I How did you get that?

K Because... um... I used my fingers.

After six months we took the unedited video back to the children. The students from the classroom were shown extracts from the videos of Cynthia, Amon, and Kwan Mei. We wanted to see whether or not these video extracts could serve some purpose as a teaching tool. Perhaps the question we were asking was, 'Could young children understand their peers' sense-making?'. As well we were interested in how the children would *react* to their peers' ideas, including whether or not the viewing might encourage self or peer correction.

Permission was sought from the care-givers of the children for the sequences of their child to be shown to other children. As well, the five-year-olds on the video were asked if the sequences could be shown to their friends.

The students were in small groups of six to eight. They were shown the video extracts of their classmates being interviewed. The particular child being interviewed was always present when the video was shown to her/his peers. The film was stopped at places where the interviewee answered a question or made a significant mathematical statement. One of the researchers would ask the children to comment on the sequence that had been just viewed by using questions such as "What do you think of what .... just said?", "Is that what you think the answer is?", "Is there another way of working that out?", "Would anyone like to say something about the piece of video that we have just seen?" Data were gathered through the use of audio-tape.

RESULTS OF THE PEER OBSERVATION AND DISCUSSION OF THE INTERVIEWS ON VIDEO

First, we noticed the intense interest that they showed in watching a classmate interviewed on video. Second, we noted with some pleasure that the children were never critical or scornful of their classmate even when they thought that the response given was incorrect. Third, we could see that the video had potential as a teaching and learning tool.

The following extracts are illustrative of the many times that learning took place when groups of the children watched their peers on video. (I=Interviewer; C=Cynthia)

I (on video) So what is two kangaroos take away one kangaroo?
(.... video paused ....)
I (addressing Cynthia and the group) Cynthia, what is two kangaroos take away one kangaroo?
C Two kangaroos take away one kangaroo is... two kangaroos take away one is two.... ONE!! (correcting herself)
I Let's see (on the video) what you say.
C (on video) Two
(.... video paused ....)
I Why do you think your answer here (on video) is a little bit different to what you are saying now?
C Because I was five then and now I am six ... so I might know better.
I You might know better?

C Yep...

Amon was also five at the time of the video, and was almost six when the video was shown in the group situation. (I-Interviewer; A=Amon; E=Emily; J=John)

I (on video) Now, say we had five lollies and we had two more, how many would we have?
A (on video) Eight
I (on video) How did you work that out?
A (on video) 'Cause we had eight baked beans before.
(.... video paused ....)
E It makes seven!
I How did you work that out?
E seven...because I counted that...One, two three, four, five, six, seven.
I (to John) Why do you think its seven?
J Because I used my fingers.

In another part of the video, these young children were asked to write a symbol on an envelope that would show how many 'tickets' they had earlier placed in the envelope. We found that the children were reluctant to write anything on the envelope except for the usual numerals. We had imagined that the children might show the number of tickets in the envelope with tally marks, combinations (e.g. 3 + 2), or their own invented symbols. This segment of the discussion with the five year olds also reminded us that the contexts we (as adults) perceive as relevant, interesting, and challenging may not be viewed in that way by the children themselves. (I=Interviewer; C=Cynthia)

(Cynthia has written the numeral 5 on the envelope)
I Why have you written 5 there?
C 'Cause there was five there (in the envelope).
I Is there any other way ...say I said don't write a 5, you write something else on there that will tell me that there are five bits of paper in there... to help us remember...
C (writes the digit 4 on the envelope)
I What's that?
C Four
I Is that the same as five?
C No...
I But that's not right then?
C No, it's not...
I If I come back tomorrow and I see four there, I'll think there are four bits of paper in there (the envelope).
C Yeah...
I Does that matter?
C ... No...

DISCUSSION

One of the central issues for us was whether or not video extracts of young children solving simple maths problems could be used as a teaching and learning tool. The results suggest that this is possible. The following points seem relevant.

1. There must be a climate of tolerance and support in the classroom if the video is to be used succesfully. Children need to be used to listening to others' views (often alternative views) with genuine interest and acceptance.

2. The children seemed extremely interested in viewing video of their peers (and themselves). We noticed how they attended closely to what was said, and to the actions captured on tape. They were keen to compare their ideas with those expressed on the video.

3. Careful listening was needed when the video was replayed in order that both the teacher and the students could make sense of what they were viewing. This activity may help communication in the classroom, as the viewers make a genuine effort to make sense of what they see and hear. This links well with communication in the mathematical processes strand of *Mathematics in the New Zealand Curriculum* (1992) and in the essential skills area of the *The New Zealand Curriculum Framework* (1993).

   In the video excerpts in this study the children were doing most of the talking and explaining. Consequently, the viewers were listening to *children* describing how they they solved problems, rather than listening to the *teacher's* methods for solving a problem. In this regard Davis (1989) noted that when we do this "we are going one step further in the decentralisation of the researcher, and moving a step closer to placing children, their actions, thoughts, and constructions closer to centre stage" (p. 39).

   It has been shown that the patterns of communication can change in a classroom when teachers listen more carefully to the children themselves (Chambers, 1995; McGee, 1994). In this case, the video sequences meant the teacher watched the children explain their ideas. We were 'forced' to listen - it was no use interjecting! Research suggests that once teachers are aware of children's thinking, then classroom practices may change - particularly when based upon a constructivist model of teaching and learning (Greenes, 1995; Schifter, 1996).

4. The video assisted the children to reflect not only on their peers' thinking, but also on their own ideas, as they compared these with those expressed on video. This led to the opportunity for self-correction (as the sequence with Cynthia revealed), for taking an increasing control of their own learning, and for having a chance to reflect on their own thinking in a non-threatening atmosphere. As well, in the post-viewing discussion, they contributed their ideas, and explained their responses, often with counters or other equipment that was available. All of this was helping them to think about their own

thinking - an aspect of learning that we, as teachers, are encouraged to foster in our students. In other words, we are encouraging the development of metacognitive processes.

5. There are ethical issues in this type of work. The students on video must feel comfortable about others watching them. In the present study, permission was sought from the school, the teacher, the parents, and the child herself/himself before the video was shown. Teachers and researchers would have to use the established procedures for gaining ethical approval.

6. The filming and the subsequent viewing was economical in terms of the time it took. The video was shown without editing. This was perfectly satisfactory for the purposes of the teaching and learning described in this article.

The interviews and subsequent viewing by the children in this study were structured around some key questions and ideas. In other contexts it may be more useful to use a tighter script - this will ensure that every child has the same questions and has the same opportunity to respond (Davis, 1989).

Overall, we felt we confirmed for ourselves that this particular use for video has potential (cf. Davis, 1989). In the context of mathematics education, showing the students *themselves* to their classmates (and friends) as they solve problems (that reveal their strengths and limitations) may provide another way of helping them learn. When children try to understand the reasoning of another, then they are revealing to us their own thinking processes and providing us with important information.

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