



TIME FOR TALK:

The drawing-telling process



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describe how a combination of drawing and telling can help teachers better to discern and respond to students' developing understandings of clocks.



Background

When children start school, they bring with them a variety of background skills and informal knowledge that can enrich their learning of new concepts and ideas. A major tenet of many learning theories is that the more children are able to connect a new concept with their existing knowledge and understandings, the more they feel confident and able to engage actively in a new task (Bobis, Mulligan, Lowrie & Taplin, 2009). Such informal understandings can provide rich information for teachers but only if, and when, students have the opportunity to show what they know.

Currently, there are a number of useful programs across educational sectors that assist teachers to identify children's mathematical ability as they enter their first year of school. The Schedule for Early Number Assessment (SENA) in New South Wales and the Early Numeracy Interview in Victoria are two examples (see Stanley, 2008). Since the focus for these assessments has been predominantly on number concepts, there is a danger that other significant understandings and informal knowledge may go undiscovered. Although the information gained from these early assessments is undeniably valuable, their

focused nature means that they may not allow students to demonstrate the richness of their background knowledge.

Also imperative for a balanced approach are forms of open-ended assessment that complement existing assessment processes by revealing additional information that may not be gained in a diagnostic interview. In classrooms, teachers are continually making decisions about students' knowledge and understanding of mathematical concepts in order to plan relevant and meaningful learning activities. It makes sense for teachers to give students opportunities to show what they know in multiple ways. To do this effectively, teachers need to develop strategies for tapping into the ways in which their students are making meaning. This requires students to be able to represent their internal understanding in external ways (Cobb, Yackel & Wood, 1992; Goldin & Kaput, 1996).

Eliciting students' drawings or work samples is one established way of representing internal understanding externally. However, current work related to multiliteracies emphasises the importance of giving students a variety of opportunities for making meaning using multi-modal methods (Wright, 2006). When a teacher begins a new topic in mathematics, for example, he or she is aware that the extent of students' prior knowledge will vary greatly depending on their social and cultural backgrounds. As a consequence, it seems important that teachers do not limit the ways in which students can represent what they know.

Open-ended tasks

In this article, we talk about how open-ended tasks can complement existing methods for identifying students' prior mathematical understanding. Guided by the work of Sullivan and Lilburn (2006), we refer to

an open-ended task as a classroom activity that:

- requires students to do more than recall known facts or reproduce a skill;
- has an educative component in that the task allows students to learn from the process of doing the task and informs teachers about students' capabilities; and
- has more than one acceptable solution.

In general terms, a 'good' open-ended task is one in which a teacher receives enlightening responses — work samples that provide insights into students' understandings that could not have been predicted.

Drawing a clock task

The particular task we used to explore the diversity of students' responses was the task of drawing a clock. Gaining insight into children's perceptions of clocks held as internal representations or mental images can help teachers to capture the processes through which children make sense of the concept of time and to identify the kinds of background knowledge that children bring to a new concept (Woleck, 2001). The idea of asking children to create or draw a clock is not new. The most widely-referenced use of this task can be traced to the work of Helen Pengelly (1985, cited in Clarke, 1998), who asked children aged 3 to 7 years to create a clock face using a variety of resources. The aim of Pengelly's work was to identify stages of development in regards to children's understanding of the clock. Her work resulted in the identification of five developmental stages:

- early impressions of a clock;
- awareness of the numerals on a clock;
- awareness of the importance of the twelve numerals;
- partitioning of the twelve numerals becomes significant; and
- recognition of minute markers.

In more recent years, Aldridge and White (2002) used a similar task with Year 2 students (aged 7 to 8 years), again looking at the developmental characteristics revealed in the children's drawings of a clock and the implications for teaching about time. Clarke (1998) also extended the work of Pengelly by giving students a similar task but was more interested in the students' choice of drawing a digital or analogue clock (very few students chose to draw a digital clock). Other studies in this area have emphasised the difficulties students often encounter when learning about time. Researchers, including McGuire (2007) and Harris (2008), have identified some of the reasons children encounter difficulty when learning to tell the time, and have offered practical suggestions for supporting students with these difficulties in the classroom.

While we acknowledge the findings in these studies, our use of the "draw a clock task" varied in its objectives and the information revealed. Over a number of months we have asked approximately 100 children aged 4 to 6 years to think about a clock and make a picture of it in their heads. We then asked them to draw a clock and put as many features as they could in their drawing (all clocks had been removed from the contexts). We were particularly interested in what children chose to include in their drawings and what seemed to influence these choices. As well as identifying the existing developmental stages in the clock drawings, our analysis revealed additional characteristics and insights such as a fixation on the role and movement of the hands and the prior experiences and contextual knowledge children draw on when asked to represent a clock.

An important consideration that underpinned this study was the acknowledgement that a drawing is only one aspect of the representation process. Wright (2007) found that the process of "drawing-telling" gives students the opportunity to create and share meaning

in two modes. This type of multi-modal approach became a focus for our work with these children. By asking students to "Tell us about your drawing," we provided an additional opportunity for students to reveal their understandings in different but complementary ways. The information revealed during this drawing-telling process proved to be far more informative than the drawing was on its own. The following examples of students' work highlight the importance of combining the processes of drawing and telling in order to gain the richest information possible about students' background knowledge and factors that can influence children's learning.

Finding out first

The first set of examples are shown in Figures 1 and 2. They show how the drawing-telling process can provide an opportunity for an educator to "find out first" what background knowledge and understanding a student has before beginning formal instruction on a topic. The clock in Figure 1 was produced by Jessica, a 5-year-old in a prior-to-school setting. The clock in Figure 2 was produced by Ethan, another 5-year-old in a different prior-to-school setting. Clearly, these children would bring very different skills and knowledge with them when they begin their formal schooling. At first glance, Jessica's drawing (Figure 1) may seem limited in terms of content knowledge, although clearly there is some prior understanding of the features of a clock such as its shape and hands. However, through the process of drawing-telling, Jessica revealed a far more developed awareness of time. The story that accompanied her drawing was, "A clock is for telling the time. It goes tick tock. It tells numbers. You have to put clocks up in the kitchen. Clocks move, those two bits [hands] move. Can you please draw the numbers?" In this case, Jessica has a far more developed understanding than her fine-motor skills allow her to represent.



Figure 1. Jessica's clock.



Figure 2. Ethan's clock.

Although Ethan's representation of a clock (Figure 2) provides evidence of a more developed understanding of the features of a clock, his story provides even more information and insight about factors that have influenced his learning. Ethan told us that, "It is 6 o'clock because one hand is on the twelve and one hand is on the six. I only know times with a twelve in them. I have a little Shrek clock in my bedroom and it looks like that. [My brother] helped me learn some times." Even though Ethan's drawing shows a considerable amount of information, his story assists the teacher to "find out first" about the sources of his knowledge and ability in terms of what has influenced his learning. Influential factors revealed in Ethan's story relate to: additional content knowledge about clock features (the role of the hands and o'clock); drawing on contextual/background information from home; and the informal teaching provided by his sibling outside school time. This type of information is invaluable for teachers who want to develop a more holistic picture of the learners in their classroom and who understand the vital role of making connections between home and school learning.

Second chance learning

Another advantage to the drawing-telling process revealed in our study was

the opportunity for teachers to scaffold students through a process of self-correction. Figures 3 and 4 illustrate two work samples both produced by Bailey, a 6-year-old student nearing the end of his first year of school. The two work samples were collected 10 minutes apart on the same day. Bailey's drawing, shown in Figure 3, was his first attempt at drawing a clock. When the teacher asked him to, "Tell me about your clock," he very willingly told her, "This is my Nan's clock. The big hand and the little hand turn around." However, the teacher had noticed the space left between the 12 and the 1 and asked Bailey to, "Tell me about this part." Bailey's next response was surprising. He proceeded to tell his teacher that he had forgotten that the 1 went up there (pointing to a position to the right of the 12) when he began drawing his clock so he "just kept going." Figure 4 shows Bailey's response when asked if he would like to draw another clock.

An important point here is that no formal teaching was given to Bailey after the first attempt. The drawing-telling process created the opportunity for Bailey to self-assess his own work and for his teacher to gain a deeper insight into his knowledge and ability. This type of second chance learning is a very powerful process that should not be underestimated as a valuable source of learning for students and their teachers. It is also interesting to note that Bailey chose to

put hands on both his clocks that appeared to be differentiated in length, but neither of the drawings placed the minute hand in a typical “o’clock” position and he did not choose to mention a time in his stories.



Figure 3. Bailey's first clock.



Figure 4. Bailey's second clock.

Implications for teaching the concept of time

From the perspective of teaching time, traditionally a very difficult concept for young students to grasp, the task of drawing a clock and telling a story about the drawing can establish a concrete connection that makes the idea of time less abstract and more personalised. It can also reveal new insights into the ways in which children perceive what is required for telling the time. One aspect of telling time that emerged in many of the students' drawings or tellings was a fixation on the role and movement of the hands of a clock (or handles, legs, pointers or bits as they were sometimes called). This was not one of Pengelly's (1985, cited in Clarke, 1998) original developmental understandings, but may be a promising way of exploring time, even at a very early age. Ethan's comment that he “only knows times with a 12 in them” illustrates a recurring theme that emerged in our discussions with children in this study. When individual “times” are taught, and the focus is on the “big” hand being on the 12 to make it “o’clock,” children

tend to believe that each “time” is a separate fact that needs to be learned.

What if the initial focus for introducing time were to shift? Explorations that include observing and noticing the role and movement of the hands on a clock before

formal “times” are introduced may prove fruitful. Questions such as, “How many hands do you notice?”, “What are the names of the hands?” and “How do they move around the clock?” could form the basis for introducing the concept of time. Further questions such as “Is one hand more important than the other?” and “If your clock could only have one hand on it, which one would you need?” promote a deeper understanding of this concept. If this approach were adopted then using the terms “hour” and “minute” hands from an early age instead of “long” and “short” hands or “big” and “little” hands may make it easier for children to understand conceptually the role and movement of the hands and what they measure. Taught in this conceptual way, the need for students to learn individual “times” would be removed and they would be more likely to become empowered to interpret the time for themselves, no matter where the hands might be pointing.

The drawing-telling process has long been a common classroom practice when children begin to read and write. Our study has shown that the same process can be just as valuable for developing

mathematical concepts like time that can be difficult to teach. There is no reason why, in a busy classroom, the focus of a story writing session cannot be based on eliciting information about a mathematical concept. Through the repeated use of open-ended tasks and questioning techniques that support the process of drawing-telling in mathematics, teachers can:

- “find out first” about the ways in which students construct their understanding of a concept;
- identify the factors that influence student learning such as prior knowledge about a topic, connections between home and school contexts or other support mechanisms for learning outside school, such as a sibling;
- allow students to self-correct and further develop their ideas about a mathematical concept;
- provide opportunities for students to connect a mathematical concept with tangible, real-world applications; and
- encourage students to see themselves inside mathematics that is meaningful and personalised.

Of course, there is always a need to be critically reflective about any teaching strategies we use with students. Children’s external representations of what they know and understand — such as the work samples and language elicited from the drawing-telling process — are always influenced by their ability to draw and the vocabulary they already possess. In addition, students’ inclination or willingness to draw or speak and their sensitivity to interpreting what the task or the teacher is asking in the first place can equally affect their responses. Such socio-cultural factors must always be taken into account. However, one thing that can be said is that the opportunities for students to demonstrate what they know and understand should never be limited to one source of information. Establishing a balance between formal diagnostic assessments

and more informal open-ended tasks and questioning techniques will ensure that children’s voices are heard and a richer understanding of the skills and knowledge they possess can be gained.

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