Dialogue & Feedback

Assessment in the Primary Mathematics Classroom

Assess (v. tr.) Estimate the size or quality of.
(Readers Digest Oxford Complete Wordfinder, p. 80)

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reminds us of the importance of establishing productive dialogue with students in order to build on their existing understandings.

This definition encompasses two aspects of educational assessment. The 'size' of the learning that has occurred is, in essence, what summative assessment of learning aims to measure. Such assessment has its place. Large scale assessment, for example, can be used to inform curriculum development, provide information to systems and schools about strengths and weaknesses in their programs and monitor changes across time. Assessing the 'quality' of learning, however, is better situated in the classroom, where teachers make judgements on a day-to-day basis about what their students know and can do. This kind of consideration is known as 'formative' assessment and both teachers and students should change what they do as a result.

Systems acknowledge the importance of classroom-based assessment and there is a plethora of advice for teachers about 'assessment for learning' (Assessment Reform Group, 1999). Despite the many publications, projects and studies, however, assessing the quality of mathematical learning remains elusive, and formative assessment has not delivered the promised improvements (Stiggins, 2007). In essence, successful teaching and learning is about dialogue and feedback. The teacher sets up a dialogue with the students, and provides feedback based on what the students do. This is a simple recipe, but more difficult to achieve in practice than it may appear.

First, a task or activity is needed to engage students. The task must establish a productive dialogue, which can be developed in different formats, grow in a variety of directions, and allow for all students to participate at their own level. A page of 'add-ups' or 'guzintas' may provide much-needed practice but is not productive in terms of dialogue.

Second, the feedback must provide students with two essential pieces of information: affirmation of what they can currently do and what they need to do next to improve their understanding. One potential approach is to involve the class in setting criteria and standards against which both students and the teacher can 'estimate the quality' of mathematical learning. This approach has been used with students in the middle and upper primary years, but may be more difficult in the early years of primary school (Black, Harrison, Lee, Marshall & Wiliam, 2004). Students need to be able to act upon the feedback provided by teachers, but if they do not understand the feedback, or do not recognise what they need to do next, they are unlikely to be able to act on the information provided.

To illustrate these points, consider a task given to Grade 1 children. The children were asked first to shut their eyes and to picture walking through their house. In particular, they tried to see where each room was in relation to the others. This idea was discussed with the class. The children were then asked to imagine looking at their house from a different view — as if they were seeing it from above, like a bird flying overhead. Finally, they were asked to draw what they thought the bird would see. The task was sufficiently open to promote a rich discussion between teacher and students and among the students themselves, promoting dialogue. While the children were carrying out this task, the teacher was moving round the room, talking to and encouraging talk among the children. The questions and statements were tailored to the individuals' apparent understanding, based on the pictures they were producing.

The pictures produced by the students were surprising in their range and variety. Adrian's house, shown in Figure 1, was a classic representation of the front elevation. There were clues, however, that he was trying to shift that representation to a bird's-eye view such as the doors to the rooms.

Figure 1. Adrian's house.

Several children drew houses like Adrian's. Of these children, the teacher asked questions such as, 'If you looked down on your table from above, what would it look like?' aiming to help the children visualise from a different perspective. Later she indicated that she would be providing a further task for these children where they could draw the contents of a shoe box by looking down into the box. The dialogue provided by the task, in the form of the pictures produced, gave feedback to the teacher that these students needed more practice with bird's-eye views before undertaking the difficult house-drawing activity.

Sue produced a slightly more sophisticated picture as shown in Figure 2. She still needed the elevation outline, complete with chimney. Inside, however, she drew the rooms, disconnected but showing some relationship. The way in is clearly marked and the garage appears to be on the ground floor of the two-storey house, indicated by the staircase.

Figure 2. Sue's house.

To children producing this kind of disconnected representation, the teacher asked questions such as, 'How do you get from the lounge to the kitchen?' or 'How does the hall join the bedrooms together?' In this way the feedback focussed on the parts of the task that were moving towards the bird's-eye view representation, providing reinforcement of the developing understanding.

Sam's house, shown in Figure 3, shows interesting development. The outline, roof and chimney are gone. The rooms are connected by a hallway and obviously have some positional relationship to each other. They are clearly labelled but there is no sense of scale, or of these spaces being confined within an external wall. Interestingly, this kind of representation, called a bubble diagram, is sometimes used by architects at the start of the design process.

Figure 3. Sam's house.

The teacher's feedback focussed on the connections within the picture, such as, 'Do you have a hallway between the kitchen and the dining room or are they like one large room?' She also asked, 'Does your house have walls on the outside? What would they look like from above?'

Louise's house (Figure 4) was the most sophisticated representation produced by the class, and she was the only student to produce a picture of this type. Unlike Sam's house, this house has an external boundary and the rooms are drawn more like a conventional house plan. Some of the furniture is shown in bird's-eye view but other aspects, such as the door and the chair in the bedroom, indicate that Louise is still developing understanding. The scale is problematic, with a very large hall (labelled 'hool') but the bathroom and 'loo' are relatively smaller than the bedrooms, and the lounge room ('long room') is the largest room in the house. In general, this could be regarded as a very high level response from a child in Grade 1.

Figure 4. Louise's house.

It was the feedback to Louise that helped her reach this standard. At the start of the task, Louise was struggling. She was becoming quite frustrated with her inability to draw what she wanted to. Observing this, the teacher asked her, 'Have you ever built a Lego house?' Louise said that she had. 'What does it look like when the roof is taken off and you look down on it?' That simple question produced a 'magic moment' for both

the teacher and Louise. Suddenly it was clear what she had to do, and in a very short time Louise drew her house. This is an example of the best form of feedback producing a significant gain in understanding. What was also interesting was that the child sitting next to Louise, who had been included in the conversation, was still unable to produce the plan representation.

Each of these pictures can be seen as part of the dialogue between the teacher and the children, mediated by the task. There are obvious differences in the quality of the responses and it is easy to rank these in order. Telling Louise, however, that her house picture is the best in the class, and saying to Adrian that he does not understand the task, does not produce motivation or provide feedback on which the child can act. Neither does it help the teacher plan the next steps in the learning process. Nor, for that matter, does recording that a particular student has, or has not, met some externally defined outcome lead to further learning.

Mathematics learning proceeds in small steps. Moving a child's understanding of a bird's-eye view from a bubble diagram to a plan view will not feature in curriculum outcomes, but is a necessary stepping stone to understanding the many two-dimensional representations used in mathematics.

Mathematics learning is also idiosyncratic. Although there are broad developmental sequences, not every child takes the same pathway. Asking the Lego question of the student next to Louise, for example, did not produce the same outcome. Feedback has to be tailored to the student and the context, and there is no simple set of instructions that can be followed to ensure that it always provides a positive result.

Perhaps it is time to stop worrying about the technical aspects of assessment and consider what it is that helps students learn best: dialogue and feedback.

References

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