

Abstract - short paper prepared for presentation at SAARMSTE 2010

Moodie, P. and Xipu, T. Setlhare Science Curriculum Trust, RADMASTE Centre, Wits University

Formative assessment in the design stage of a project

This presentation is drawn from the work of a curriculum project that is trying to implement the NCS for Technology in all its facets in order to evaluate issues of INSET and learner performance that are implied in the policy document. The work is in seven primary schools and has run for three years. During the projects we had done with Grades 5 and 6, we had not evaluated the impact of the design stage on the learning, because we had much else to focus on. Teachers had accepted learners' design ideas uncritically and assessed their portfolio pages mainly for having more than one design idea, irrespective of the quality of those ideas.

Issues around the assessment of designing are

- It is in the design stage of a project that the learners bring together their understanding of the problem, their investigation of products, methods and new things they need to learn. These aspects determine the quality of the design and the thinking that is evident as the learners begin making their models. The quality of design thinking also shows up in the evaluation stage as the specifications are compared against the product that emerged.
- Ability in designing, in the sense of generating a range of ideas to solve a problem, is one of the hallmarks of a person who is competent in technology.
- Design is difficult to assess because the teacher must try to get insight into a thinking process that may have happened without leaving clear traces.
- We rely on what learners put into their portfolio pages to form an impression of the thinking that went into their design, but often they don't write clearly enough or draw enough for us to do this. Their written expression sets a limit to the amount of evidence we can collect.
- It is difficult for a learner working alone to generate "at least two alternative solutions . . ." as the Assessment Standards expect him or her to do. In the project we have found that learners quickly settle on a single design idea and they find that to develop another idea is a disagreeable chore.

In addressing this issue, the programme drew on the work of the Technology Education Research Unit1 (TERU) at Goldsmith's College, which Richard Kimbell presented at SAARMSTE 2009.

As a snapshot of the approach we use in the programme, we take lessons from the Grade 7 Processing project (Babies & Bags – Processing fabrics). The context is a mother who is expecting a baby and who needs a bag that will help her move all the baby's required things, as she takes the baby to work, using public transport.

The learners had had the project brief, there had been discussion of what specifications should be included, and they had made initial paper models of their carry-bags. Now, for their portfolios, they were asked to draw annotated diagrams of their designs. They were grouped in threes. Each learner passed his or her annotated diagram to the learner on the right, for comments, queries and ideas. This was repeated so that each learner then received his or her

design page back with the comments of two others in the triad.

We will present graphics of one original design idea followed by the improved version that shows the effect of the formative assessment that resulted from the interaction with peers.

It was clear that the peer assessment had given the learners insight into their design thinking to an extent that a teacher could never do through discussion and feedback to a class of 45 learners. The specifications are much more detailed and reflect a deeper consideration of the needs of the user of the product.

We will also present records of learners responses to two similar lessons. Some of their responses were at the level of personal feelings about having their work commented on by a peer

When they [the two other learners in the triad] improved my bag I felt a little bit sad, because I felt I did not take enough time to do my design, then I felt happy when they showed me how to make the bag attractive

At first I felt bad, because they [the two other learners] were putting a lot of effort on my drawing. But I looked at it and learned from it and it feels good. They showed me my mistakes. I think it was best for them to show me my mistakes.

Other responses were at the level of their own insight into the design quality

The first [drawing] did not take a long time to do, because it was about our own ideas only. [Now this commented] second one took me long to do, because I thought about the mother and the baby and what they need..

Note that this peer assessment is aimed not at giving a mark for design but at improving the quality of learners' thinking about their designs. The interaction provides rich opportunities for teachers to tune in to the discussions and ask questions that prompt further thought. Black and Wiliam in their influential papers on formative assessment point out that peer assessment is a crucial element in raising the level of learning, because learners themselves must and can develop a sense of high-quality and low-quality work.

However, the teacher who must record a score and needs evidence for it, is also able to infer a good deal about an individual learner's thinking by looking at the first and second versions of the portfolio pages.

In later lessons, we also found that the quality of the learners' evaluation was much better. The reason for this is probably that the design stage lessons had focused their thinking on the specifications that they had developed. (We will present some video evidence for this)

While group work can often be unproductive, the three learners in each group and hence the whole class, were intensely involved in the design task as they were analysing each other's ideas.

Another result is that the learners are writing much more than they used to. This is important because the amount and quality of their writing is both a big part of our assessment evidence, and crucial for addressing the literacy issue that is a pressing concern in South African schools.