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21 April 2009

The Technology for All Pilot Programme

Working paper No. 11

Getting more learning value from the Design stage of a project

Introduction

During the projects we have done with Grades 5 and 6, we had a great deal to focus on and so we had not evaluated the impact of the design stage on the learning. In this stage, teachers had accepted learners' ideas uncritically; their portfolio pages were assessed mainly for the clarity of the text and drawings, and sometimes for having more than one design idea.

We are currently busy with the Grade 7 Processing project (*Babies & Bags – Processing fabrics*). It is based on the context of 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. She will probably have to use public transport.

The 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 reflected in their **making** stage. The quality of thinking in the **design** stage will also show up in the **evaluation** stage.
- 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.

Andrew Stevens of Rhodes University's Technology programme introduced us to the work of Richard Kimbell and the Technology Education Research Unit¹ (TERU) at Goldsmith's College, London University. In particular, he pointed out work by the TERU on assessing designing, through portfolio evidence.

This changed the way that we planned the next workshop in the project.

Workshop 4 in the *Babies and Bags* project

Workshop 4 of the term programme focuses on the design stage of the current Grade 7 project. This was held at Crown Reef Primary on 5 March 2009. In the previous workshops and lessons the teachers and then their learners had investigated various possibilities for constructing bags, with stitching and other ways of fastening and had investigated various features they could add. These activities had produced bags made with newspaper.

Using these paper bags in the workshop, Thembeke asked the participants to elaborate their ideas on paper, adding plenty of explanatory notes.

The next step was to exchange drawings with a partner; each partner then commented on the design and added remarks, advice and questions.

After some time, the partners then handed back the design pages to each other and discussed the reasons for their comments and questions.

C Jones (Gauteng Co-ordinator Technology) M Coetzee and K Mdlalose at the workshop. The discussion is about design, using the paper bag that was made as a part of the Investigation stage (as a resource task)

Marius, one of the teachers in the group, said afterwards, "When I was looking at my partner's design and writing questions on it, I had a lot of new ideas about my **own** design that I would not have thought of, if I had not looked at someone else's design. And if we had had three people looking at each other's designs, we would have got even more ideas!"

Several people echoed that remark and we could see how it would raise the level of learners' thinking about their designs.



Follow-on in the pilot schools, after the workshop

This last comment from the workshop was turned into action the next week. The teacher taught a Grade 7 class and extended the "exchange, remark and pass back" technique.

The learners had previously made their "investigation" bags out of paper, to investigate sewing methods and try out some ideas². In this next lesson, each learner drew their favourite idea on a sheet of paper, adding notes to explain the reasons for features in the bag.

¹ TERU: <http://www.gold.ac.uk/teru/about/> See the project called *Assessing Design Innovation*.

² In the earlier (Curriculum 2005) Technology Learning Area Statement this would have been called a "resource task"

Then, working in threes (based on Marius's comment in the workshop), they each passed their drawings to the person next to them. This learner looked carefully at the drawing and suggested improvements in a new drawing with notes. The new work was labelled "Improvements by [name]". You see an example of this first two stages in **Figure 1**. Notice the feedback from Blessed: "I have made your joints strong so that the bag cannot fall, I have used the back stitch to make it strong."

Then this design page went to a third person who also made comments and returned it to the original designer. It now had a number of additional ideas as you can see in **Figure 2**.

This lesson produced some very good co-operative group work. Learners were fully engaged in the thinking task, and were positive about each others ideas (possibly because they too wanted positive comments from their partners). The task generated far more ideas than any one learner would have come up with on her own.

We give details of the learners' response to the lesson below, but it is important to note the way the lesson was introduced.

The lesson introduction – asking the right questions to get the right kind of thinking

It is very important to note the way that the teacher began the lesson. Had she not begun in this way, the designs would not have had the detail and reasons which we can see in them.

The teacher told the class what they have to keep in mind when they are designing:

- the **person** they are making the bag for,
- the **reason** why they are making the bag and
- **where** is the bag going to be used.

She made the learners understand that their design had to be clear so that another person could follow it with understanding, and make the bag.

So the design page should have as much detailed information as possible

The teacher used questions like:

- Who is the bag for? (*The bag is for Linda's mother.*)
- Why does Linda's mother need a bag? (*She is going to have a baby and she will need the bag to carry her things and the baby's things to work*)
- What things will she need to carry when she goes to work? (*For herself, a lunch box, money and some make up. For the baby, she will carry food, baby clothes, milk, bottle, nappies, medicine*)
- Where will she carry the bag? (*She will carry the bag in the taxi, or the bus when she goes to work*)

The TFAPP programme uses "PPP" as the way to remember the basic design requirements – "PPP" reminds learners to think of **Person** (the person who will use the product), **Purpose** (why the person needs it) and **Place** (where the product will be used, or what the impact will be on the environment where it will be made or used).

In Grade 7 we add in safety, cost and appearance as design criteria.

This discussion was handled effectively and so it set the stage for a successful lesson. Figure 1 and 2 are a sample of over 45 well-annotated designs that the class produced.

Note the suggestions for improvements, marked with red arrows.

(See pages 5 to 7)

The learners' response to the lesson

Thembeke asked the learners afterward what they had thought of the lesson.

Thembeke How do the specifications help you?

Learner: Specifications help me to think about the shape, if the bag is suitable, about the place the mother is going, will the mother be able to carry the bag. Specifications make me aware if I make a small bag then the mother will not be able to put all things she needs inside.

Thembeke: When somebody looked at your bag design and improved it, how did that make you feel?

Learner 1: At first I felt bad, because they 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.

Learner 2: When they 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

Learner 3: When they improve [my bag] you feel a little bit nervous and happy at the same time. You took a lot of time designing your bag -- when they show you [something more] it is helpful. You think you have put everything, but they show you, you need to put more.

Learner 4: B – and T— showed me a lot of things and it feels good.

Learner 5: S — had to show me what to do and I wanted him to show me more than T — has added already.

Learner 6: It feels good, because you learn from other people and you do more

Learner 7: I feel happy, because they show me how to work better.

In one school, the learners were not introduced to the lesson in this way, but were just asked to draw three designs. Later, they did it again, after discussing the “people, purpose and place” issues. Their comments illustrate how the quality of their design has been improved by the discussion.

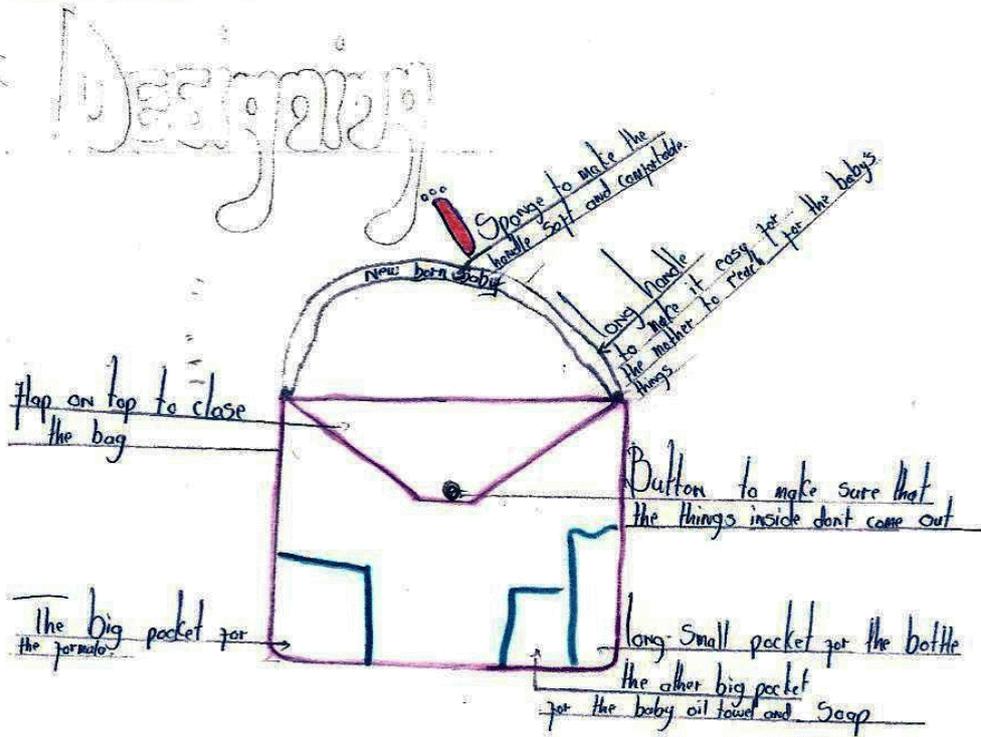
Learner A: [My first bag] had no handles, no flap, no button, sponge, decorations. We were told to write our own ideas and choose one. [Now I think about] think about people, purpose and place and think if the bag will be suitable for the mother to carry.

Learner N: . . . we were told to choose the one that was suitable. [Now, we think about] people, purpose and place and the mother. We thought about the materials as well, like cotton wool, water proof, strong joints and the size.

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

Figure 1 The original design by B ----- and improvements suggested by a partner

Beksi Mancino (7)



Improvements suggested by

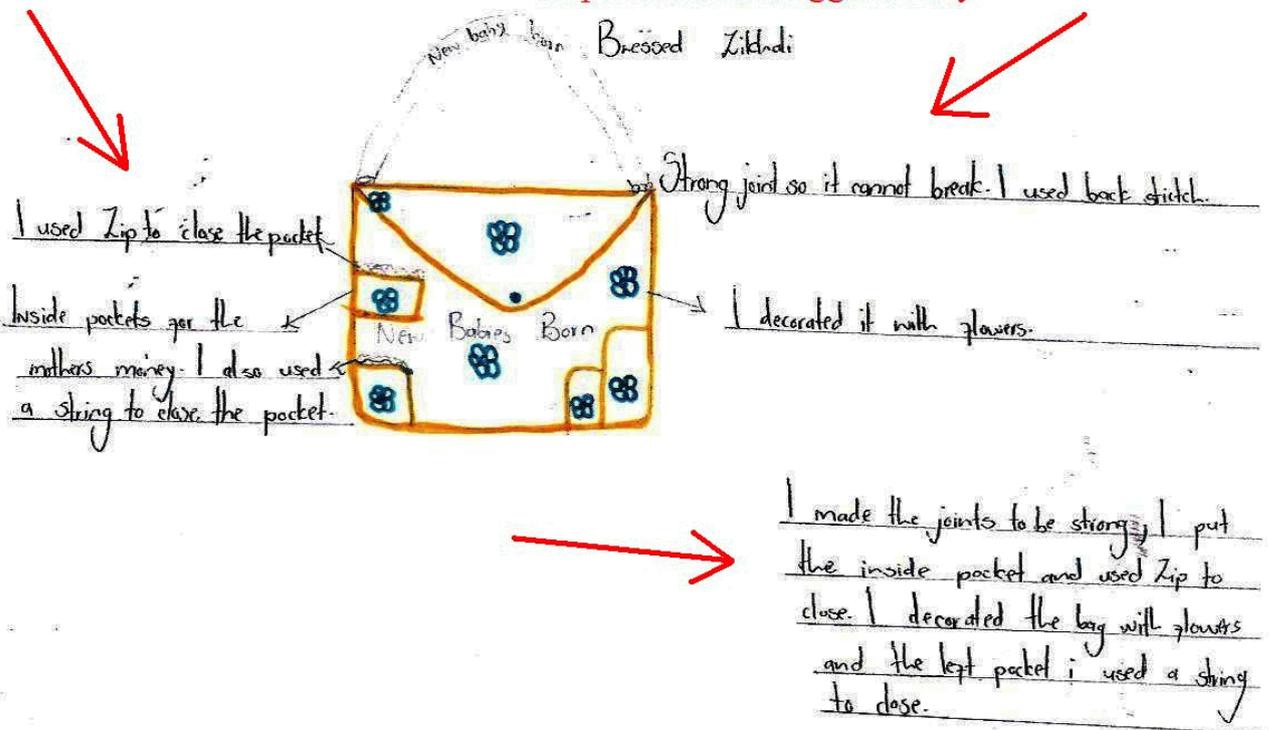
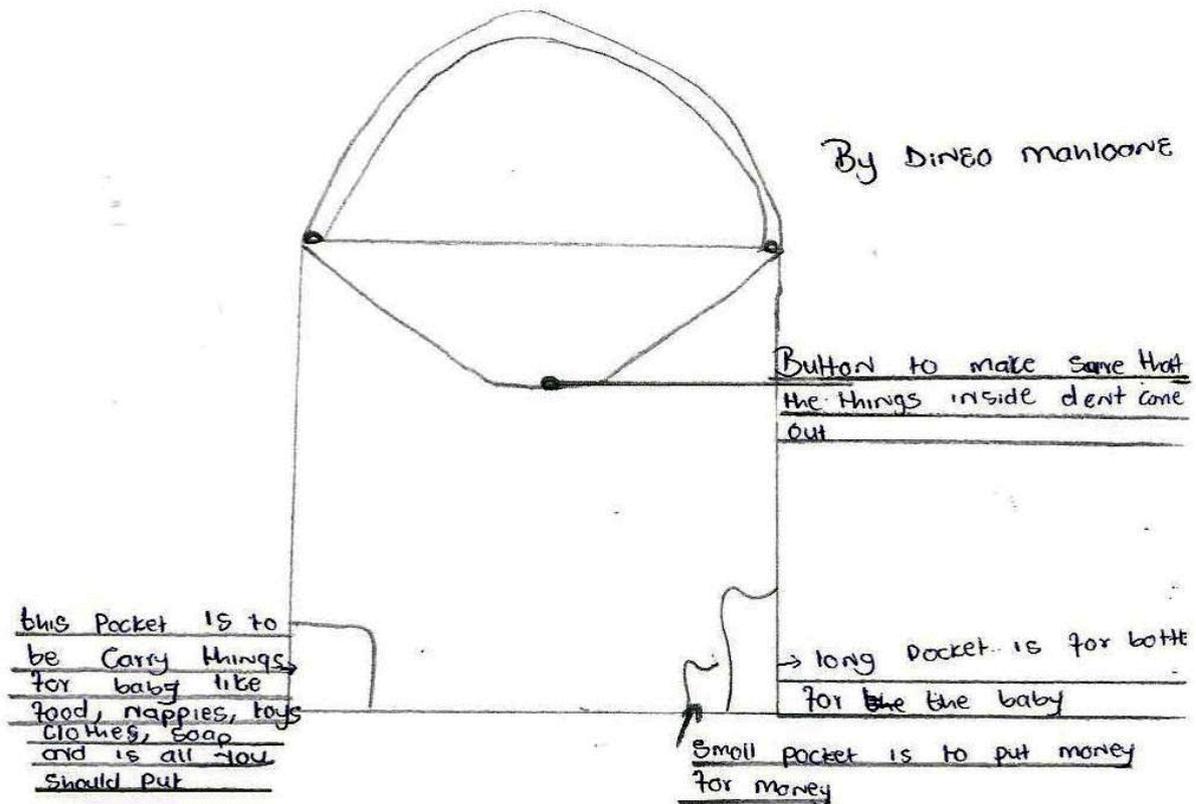


Figure 2 The suggestions from the third learner who worked on this design



On the next page, in **Figure 3**, you see the final design which this learner did after Blessed and Dineo had commented on her original design.

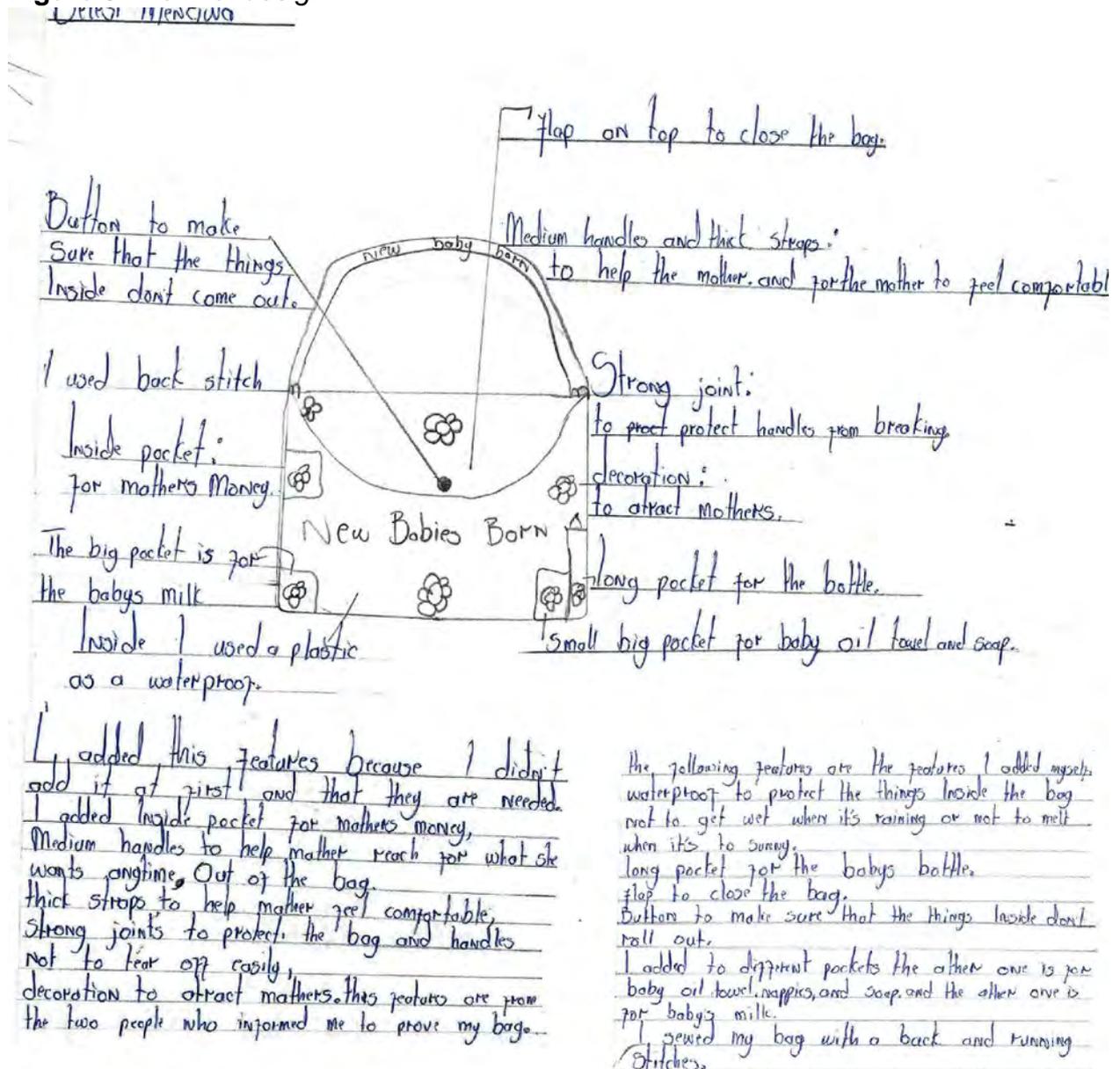
There is much more detail, and evidence of thought. She has written in the advice which she got from her two partners, and she acknowledges them in the words, "This features are from the two people who informed me to improve my bag"

- *inside pocket for mother's money*
- *medium handles to help mother reach for what she wants anytime out of the bag*
- *thick straps to help mother feel comfortable*
- *strong joints to protect the bag and handles not to tear off easily*

and then "The following features are features I added myself"

- *water-proof to protect the things inside the bag not to get wet when it's raining or not to melt when it's to sunny*
- *long pocket for the baby's bottle*
- *flap to close the bag*
- *button to make sure the things inside don't roll out*
- *I added to [two] different pockets, the other one is for baby oil, towel, nappies and soap, and the other one is for baby's milk.*
- *I sewed my bag with a back and running stitches.*

Figure 3 The final design



What has this approach to teaching the design stage achieved?

The approach we developed in the workshop for teaching the design stage seems to produce more learner thinking and insight than if we had asked them to work alone to generate two or more designs. By changing our approach in the classroom we seem able to get design outcomes that link strongly to the original problem definition. 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.

While group work can often be unproductive, here we found that as the three learners in each group were analysing each other's ideas, they were intensely involved in the task.

Another aspect is that the learners are writing much more than they used to. This is important because the amount and quality of their writing is a big part of our assessment evidence. And of course improved writing is a skill that helps them in all Learning Areas and in later life.