Perturbating the Assessment of Individuals and Groups: Listening for Challenges to Mathematics Teacher Educators

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In this article I begin by focusing on different ways in which the term assessment can be understood and practised. Having done this, I turn my gaze onto one particular teacher education situation and explore student teacher assessment as they are prepared for a career in teaching. In describing some of the particular ways in which I try to heighten the awareness of this particular group of student teachers regarding assessment and evaluation, I reflect on the experience and pose questions for teacher educators in general to consider about their own practice.

Introducing Assessment

Assessment is regarded by many in South Africa as the backbone of Outcomes Based Education and considerable time, effort and money is being spent on ensuring that educators are properly trained in assessment procedures (IEB ASSET, 2003). In the following sections I take a brief look at some different aspects of assessment in an attempt to broaden the field of vision. Having done this, I will use the rest of the article to focus on one particular class of university students as a means of obtaining data that will allow a further exploration of some of the ideas and issues which have been raised in the introduction.

Assessment as Evaluation

The dominant form of assessment is as evaluation where schools and teachers are evaluated on the basis of marks obtained by individuals. One of the main purposes for this form of assessment is as a means of satisfying others that the promised skills have been delivered to the satisfaction of national standards. The assessment is usually framed by checklists, which are based on explicit criteria and a form of quantification. This approach is concerned with tallying, which shares the same etymological heritage of teaching as telling (Davis 1996: 230)

Formative Assessment

Black and Wiliam (1998) provide a broader understanding of assessment in that they consider it to refer to all activities undertaken by teachers and by students in assessing themselves, which provide information, to be used as feedback to modify the teaching and learning activities in which they are engaged. Such assessment becomes formative assessment when the evidence is actually used to adapt the teaching work to meet the needs of the students. Their research survey shows that innovations, which include strengthening the practice of formative assessment, produce significant and often substantial learning gains.

In seeking ways in which to improve formative assessment they include the necessity for feedback to any learner being based on the particular qualities of his or her work, as well as advice on what he or she can do to improve, avoiding comparisons with other learners. They state that the dialogue between learners and a teacher should be thoughtful, reflective and focused to evoke and explore understanding, and conducted in such a way that all pupils have an opportunity to think and express their ideas.

This approach to assessment has as its main aim the improvement of the teaching-learning interaction, and it cannot be prescribed by outsiders or by pre-set schemas. It is an interactive process for which an extended view of the classroom situation is needed.

Assessment as Sitting Beside

Davis and Sumara (1997) invoke learnings from Complexity Theory to draw a distinction between the terms 'complicated' and 'complex'. They use 'complicated' to describe the modernist tendency to use machine-based metaphors to characterise and analyse most phenomena. "Complex systems such as human beings or human communities – in contrast to complicated systems – are more dynamic, more unpredictable, and more alive" (Davis and Sumara, 1997: 117). Taking a complex view of life means that the focus is on the interrelationship of things and the manner in which subsystems come together to form larger, more complex systems. The theory of enactivism (see

for example Davis, 1996; Maturana and Varela, 1986; and Varela, Thompson and Rosch, 1991) is concerned more broadly with the construction of a collaborative world. It involves becoming part of an ongoing existing world and the shaping of a new one, and acknowledges the role of the individual in affecting the world's form, and this pushes enactivism into the realm of the moral. The theory of enactivism looks at each learning situation as a complex system consisting of teacher, learner and context – all of which frame and co-create the learning situation.

Davis (1996) explores the possible role of assessment within an enactivist position. He begins by noting that the root of the word assessment comes from the Latin word *assidere* (to sit beside). He then goes on to argue that this means that assessment should be better understood as a focus on those teaching actions which are directed towards a fuller understanding of both a learner's subjectivity and the learners' collectivity. Such an understanding will allow teachers to adapt their teaching approaches appropriately. In this enactive sense, assessment is participatory, and inseparable from instructing.

A complicated view of assessment sees errors as symptoms of an underlying disease that can be located, isolated from other understandings, and removed. In this way, what should be understood as complex knowing is instead reduced to partitioned competencies by a complicated interrogation. In contrast, an enactivist position regards errors as important and essential focal points of any mathematical inquiry. Errors signal moments where both teacher and learners have an opportunity to bring unformulated concepts to conscious awareness. Such errors are not located inside particular individuals since they have been arrived at as a result of the interactions between teacher and learners in a particular context. On the contrary, they exist in the constellation of classroom events, and as such are to be welcomed as an opportunity for all to become engaged in a collaborative task of working on the unformulated concept. They are instances that call for negotiation as they prompt awarenesses of inconsistencies between subjective conceptions and general consensus – thus potentially presenting both for revision. The purpose is not to remediate them but to learn from them – that is to reform collective action every bit as much as to reform subjective action.

Introducing Listening

Another way of thinking about different concepts of assessment is to focus on three types of listening (Levin, 1989) that are required of the person doing the assessment.

The most common form of listening found in the classroom is *evaluative* listening where the listener judges what the other is saying against the template of his/her own certainties. Teachers typically judge whether the information which is offered is right or wrong, and, whatever they decide, deviate little from their plans. The familiar cycles of teacher question, learner short response, teacher evaluation that are associated with traditional teaching are typical of evaluative listening and consistent with the assessment as evaluation model.

In *interpretive* listening, the listener tries to hear what the other is saying in order to interpret where they are and how they are feeling. It is 'a sort of reaching out rather than a taking in' (Davis, 1996: 53). In this mode, the teacher's focus is on accessing rather than assessing the learners' ideas, and an emphasis is placed on the development of a skill of questioning which encourages the learner to think and explain their thinking. This form of listening seems to be the type called on in the model of formative assessment outlined in the previous section.

In both these forms of listening, there is a split between the teacher and the learner where the teachers direct the learning from their own understandings.

The third form of listening is called *hermeneutic*, and this describes an approach where listeners open themselves to others without holding on to their own assumptions. In this form of listening, both parties enter into a shared project of coming to a joint understanding of each other's position. Davis (1996: 234) comments that in this way, "the practice of assessment refers to testing one's own hearing, and the word testing shares roots with text and texture". The teacher becomes an important interactive and co-emergent part of the learning context.

In a book based on his research, Davis (1996) explores these ideas in more detail, and gives classroom examples of teachers operating in different lessons in each of these three ways of listening.

Assessment in a Mathematics Teacher Education Course

Having introduced the reader to some aspects of assessment and listening, I want to explore these

concepts further by focusing on one particular university class that I have taught. The data that follows was drawn from a Postgraduate Certificate in Education (PGCE) (Secondary) Mathematics Method class of 16 student teachers. These student teachers came from a variety of backgrounds and their mathematics qualifications ranged from Maths 1 (8 students) to Maths 3 (5 students). At the time when I started teaching them, they had already completed a series of eight once-a-week three-hour sessions at the start of the year followed by their first period of five weeks of teaching practice in a local school. The data focused on four particular three-hour sessions, which are described in the next section.

The Four Class Sessions

At the start of my first session, I set them the new task of writing at least an A4 page after each session "describing (an) aspect/s from the session in which you feel you gained an insight into yourself as teacher, learner or mathematician". The journal entry had to reach me before the next session. The student responses to the four weekly three-hour sessions that I spent with them, which are described in brief below, forms the major part of the data that inform the rest of this article.

In the first session, I described some of my work with adults who fear mathematics. I described some of the major shifts I had introduced into my pedagogy as I attempted to focus on co-operative work with an emphasis on listening to the diverse responses and processes employed by learners (see Breen, 2001 for a detailed description of these features). I then introduced a mathematical activity, which asked them to build shapes with matches, and then visualise and generalise the emerging patterns, in an attempt to demonstrate some of these pedagogic shifts.

At the start of the second session, I split the class randomly into five groups, each containing three members in it (one student was absent). After introducing the three different levels of listening (evaluative, interpretive and hermeneutic as outlined in the previous section), I emphasised the importance of listening as a tool for working with others. The student teachers were given the task to work on a given problem (Painted Cubes[1]) as a learning community where the focus would be on the process they developed rather than the solution

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[1] In the Painted Cubes problem, students are asked to imagine a large 3x3x3 cube which has been painted in red on the outside and then broken up into its constituent small blocks. How many of these blocks will have 3 sides painted? 2 sides? 1 side? 0 sides? Generalise for an NxNxN cube.

obtained. As an assignment they were asked "to describe the way in which their community came together and the contributions that the various members made to the experience", and submit this to me in writing at least two days before the next session.

In the third session, I started off by asking each group to talk about their experience of the previous week and we looked for similarities and differences in the group experiences. Later on in the session, they were asked to get into pairs and assign one person the role of teacher and the other person the role of learner. A role play situation was set in which the teacher had asked the learner to stay after school to re-visit an incorrect answer that the learner had given to a question in a test. The teacher was given the task of following Kierkegaard (1939: 30) by trying to "understand what the learner understands and in the way that he understands it".

The final session from which the data are taken involved the student teachers in writing a content examination. This will be discussed in more detail later.

Introducing Perturbation

An aspect of the enactivist position that has appealed to me revolves around the role of the teacher as perturbator. The idea is that learners each have their own construct, which is based on their biological constitution and historical and contextual experience in the world. Learners will take up whatever aspects of the lesson that their constructs predispose them to accept at that moment. This is something which lies outside the control of the teacher. This means that the teacher's role becomes one of maximising the possibility for take-up of key concepts and this can best be done by focusing on perturbating the learning environment.

> Thus we argue that such notions as controlling learners and achieving pre-set outcomes must be set aside in favour of more holistic, all-at-once co-emergent curricula that are as much defined by circumstance, serendipity, and happen-stance as they are by predetermined learning objectives. (Davis and Sumara, 1997: 122)

One of my main aims in these PGCE sessions was to try to provoke the student teachers into thinking differently about the potential in mathematics classrooms for embracing diversity of thought as a means of working on mathematical concepts. Different answers or ways of working were

welcomed and appreciated as an opportunity to engage and work with others to optimise the potential for learning.

Acknowledging Existing Marks

Mathematics teacher educators who work with both primary as well as secondary student teachers often assume that this group of student teachers who have chosen to teach mathematics at secondary school level will have fewer issues remaining from their schooldays than their primary school colleagues, as a result of their superior track record of achievement in mathematics. Previous work (Breen, 1991) has shown that this is seldom the case, and this group proved to be no exception. Several of the student teachers in this particular group were not at all complimentary about their school experiences. Tony[2] was the first to comment on this topic in his opening journal entry.

I am reluctant to become a maths teacher for a number of reasons. Whenever I think of maths being taught at schools, the only picture I have is a teacher drilling the learners to solve a problem in a particular way. Most often maths classrooms I have been in at school were boring and the teacher doing the talking. The only thing keeping the learners awake is the fear of failing a test or exam. The only thing I remember about my maths teacher is her sarcastic comments. I think my greatest fear is that I would become like her.[3]

My work with those who struggle with mathematics (Breen, 2001) has led me to try to assert (and practise!) a pedagogy that tries to break the normal power relationships. Kathy soon conveyed her appreciation that my different approach had started to break patterns, which she felt had already been established within the group during the previous lecturer's sessions in the early part of the year.

I didn't know if I'd be feeling how I had been feeling for every other Tuesday before this: frustrated, angry, down and quite unintelligent (a nice way of saying stupid). I think it was more the company in the class than the teacher. There are a few people that act like the maths experts, better than the rest of us. They were always praised and loved it and we

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[2] Names have been changed in all cases except where specifically requested to do otherwise by those concerned.
[3] All extracts in italics are taken with permission from the journals of the student teachers.

were always silent. So that is why I am still very quiet in class. And please don't call on me to try and make me participate, I choke under pressure.

Cotton (2002) draws on Lave and Wenger (1991) and Wenger (1998) to examine schools and classrooms as communities of practice. In this way, students in mathematics classrooms engage with each other in practice and develop a sense of self in relation to that community of practice. For some students there is a greater synergy and sense of belonging as they fit in with the group and the teacher's expectations of the class, whereas for others, there is a sense of rejection and little sense of identity within the communities of practice. For those students for whom there is little sense of belonging and a lack of sense of identity, there is greater danger of exclusion from that community of practice. "They set themselves up in an alternative community of practice, which consists of a group of failure – those for whom mathematics is seen as difficult, complex and the learning of it unattainable – recognizable by 'I was never any good at maths at school'." (Cotton, 2002: 1124). Kathy's comments strongly echo this description as she has clearly positioned herself as one of the 'stupid' ones. Ross, on the other hand, later comments on how it was the actions of the teacher educator, which had positioned him in the opposing group of achievers.

A couple of people verbalised that they were intimidated by me. This is definitely not due to my personality but probably because I probably got all the work this year correct and did it faster than the class. I definitely was never trying to impress the class but the teacher, Mr. Y, would always make me explain the work on the board because he noticed we weren't being constructive when we had finished the work.

It is interesting to note that Ross links intimidation to a personality trait rather than to his achievement in mathematics. He also makes it the teacher's responsibility for calling on him and does not offer any alternative action that might have been taken.

Community of Practice

The aim of the second session was to explore the ways in which the groups of three tackled the problem of setting up a community of practice to tackle the Painted Cubes investigation. The PGCE course as a whole is one in which the benefits of group work are generally praised, but very little work is done in trying to tease out the difficulties

and stresses in getting individuals to work in groups. In this class, Kathy had already commented on her dissatisfaction with the quality of group work in the previous teacher's sessions.

> *The maths method course was something I dreaded because we would be put in groups and those that knew would tell the rest of us.*

Of the five groups, only one worked in a co-operative and collaborative way to solve the problem. Michelle teamed up with Kathy and Tony in what (from earlier references) might have been expected to be a dysfunctional group. To the contrary, it was clear from observing the different groups that their interaction was positive and harmonious. Michelle reported:

> *I really enjoyed maths today. I felt that at long last there was no "I did 3 years of maths at university (so therefore I am better than you)" as opposed to us mere mortals who did less. The whole thing really stressed to me how personality compatibility contributes to the success of the group. I know that all three of us feel intimidated in class but between the three of us we all just got on and did the work while having fun.*

The comments of both Tony and Kathy support this view. Tony wrote:

> *I appreciated the exercise on learning communities. Each member of the learning community brought something to the group.*

In trying to probe them at the start of the third session, it became clear that one important move that they had made was to start slowly and make sure that they all had the same understanding of the problem. Kathy extended this by saying:

> *I had such a great time today. It was because of each other that we discovered the patterns of numbers in the cubes. It was because of Tony's method of counting the squares on one side with only 1 side painted that I saw the pattern of (n-2). Michelle, Tony and I all had respect for each other and maintained that throughout the task. We really tried to create a learning community.*

Telling

In the previous section, I reported Kathy's dread of working in groups where the 'clever' ones would just tell the others the answer. Clarke and Lobato (2002) point out that 'telling' has had bad press since it has been linked to the form (i.e. whether or not the teacher is making a declarative statement or other type of assertion) rather than to the function of the teacher's action. They reformulate 'telling' in terms of the functions of 'initiating' (if the idea originates with the teacher) and 'eliciting' (if it originates with the student/s).

One of the groups appeared to be working reasonably well when I visited them although I was aware that one of the student teachers, Michael, appeared to be paying more attention to solving the problem than to setting up the community. When Prince submitted his report on the group's interaction, a whole new picture emerged as to what had happened for him.

> *I attempted to visualise it in my mind at first but I struggled with that so I decided that I would build just the one face of the cube and then see if I can work anything out from that. I took the blocks and put them together and just before I finished putting up one face, Michael already had the answer. He gave the answer to us... He went on with the other blocks – the blocks that would have only two sides painted, one side painted and no sides painted. He just gave us like the answers to all that.*
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> *I tried to ignore him because I was still looking at my face trying to figure out things but it was difficult for me to ignore the answers that he gave to us. So I don't know if that put me under pressure or what. I don't know if I should call it pressure but basically I just couldn't figure out things any more. I couldn't think. I had the face in my hand. I tried to move my fingers across it, trying to visualise things and make a few calculations. I couldn't, because he had already given us the answer and what he was doing now as I was aware or trying to figure what was going on, he was sort of moving on to a 4 x 4 x4 cube and that put me under even more pressure.*
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> *So I found myself asking him "How did you figure that out?" Can you just explain that to me how you got the answers? And then he went on like this, OK listen Prince, on the corners you have 4 and between them we have one blah blah blah and that makes... It didn't make any sense to me.*

This extended extract gives a clear and powerful insight into the way in which being told an answer can freeze students' thinking processes to such an

extent that they might end up colluding with the 'teller' in their own mis-education. Fortunately, in this particular example, Prince is a capable mathematician with a persistent streak who had the support of the third member of the group, Joyce, in re-grouping and returning to the problem.

'Telling' Tensions

The Painted Cubes task specifically asked them to work towards becoming a functional community of practice. Nevertheless in two of the groups, one of the student teachers was sidelined. In the first of these groups, Ntosh seems to have explicitly sidelined herself from the group at an early stage. According to Karen,

> *In our group Ntosh identified herself as being not as able as Arthur and I, and therefore sidelined herself before we had even started the task. Arthur and I did not challenge her assumption but assumed the role of tellers.*

Arthur made a similar observation in his report:

> *Me and Karen seemed to think about the problem in a very similar way. Ntosh was nervous and began by confessing to us that she was slow and took long to understand maths. I felt that she immediately restricted and boxed herself as an inferior Mathematician.*

Mason (2002) makes a distinction between not-noticing, noticing and marking.[4] At the end of a particular shared incident, Mason claims that there will be some who will select a specific aspect of the experience for writing down (marking); there will be some who, once reminded of the incident by someone else will be able to confirm that they remember that it did take place (notice); and there will be some who will not be aware of the incident despite the fact that others claim that it took place (not-notice). Ntosh does not mark the moment where she raises the issue of her ability directly with the group, but she does write about her struggle with the problem.

> *I did not understand this problem. Arthur had a very good way of explaining the concept of how to get to it. But I had some difficulties in understanding this concept. They were trying to explain but I was kind of lost... Both Karen and Arthur had different ways of solving the problem. But I was the only one left out of the group.*

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[4] It is noticeable here that the word mark is used in a different sense from its assessment understanding.

With Ntosh now marginalised as active solver of the problem and positioned as the one who needs an explanation, the role of the other two members of the group becomes constituted in a different way. As members of the achieving group ('the haves'), they take on the task of sharing with a member of the non-achieving group ('the have-not') – but they are both well aware of the tension that this brings as the following writing shows:

> *I am very much a teller. I found myself spending most of the time explaining my understanding of the solution than listening to how Arthur and Ntosh had seen it. ... Even after discussing hermeneutic listening and telling myself to listen I found my desire to tell was so overwhelming that I totally forgot about the listening part. When I realized that Ntosh didn't understand my explanation I merely repeated it more slowly – incorrectly assuming that the pace of my explanation had confused her and not the explanation itself. I really need to work on my listening skills.   (Karen)*
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> *This activity really highlighted my tendency to do all the things Chris has been warning us about. In this sense it was rather annoying as I found myself telling a lot and not really getting anywhere in terms of really explaining anything. This exercise highlighted how a problem can be approached in so many different ways. The options are in a sense endless.   (Arthur)*

More telling lessons

The enactivist position believes that while the teacher can act as a disturbing agent, what is actually learnt is determined by the structure of the learner. The submission of both journals and assignment reports between sessions generally allowed me to come to a better understanding of the thoughts and lessons that had remained with individuals at the end of each session. This allowed me an increased opportunity to think about the appropriateness of content and method for the next session. This submitted material also helped me identify hooks that might be useful for further probing or perturbation. However, despite the fact that lessons can be prepared and plans made in this way, the direction of the session is inevitably influenced by what comes up during the session.

The Painted Cubes community of practice assignment took place on a Tuesday, and all write-ups were handed in by the following Friday. This

left me with a period of three days to read the reports and then to consider how to work with the insights that I had gained into their work. At the start of the exercise I had told them that their comments about each other would be kept confidential unless they gave me permission to quote them. Informed by what they had each written, I decided that I would try to introduce those aspects, which their reports had suggested were significant to them, in a general and non-directed way. Having done this I invited individuals within each group to comment on their own group's process. In the session, issues of telling and exclusion were raised and individuals were generally willing to talk about their experiences with honesty and directness. Prince had recorded his reflections on audiotape and both he and Michael agreed to let the class listen to his story of how Prince's thought processes had been interrupted by Michael's desire to tell the answer. This session seems to have been a particularly successful sensitiser to the issues involved.

> *The feedback from each student about the previous week's group activities was absolutely fascinating. The main ideas that I learnt were that learning does not take place when you just attempt to tell or impose your understanding on someone else. This is what Karen and I tried to do and it failed dismally.*
> *(Arthur)*

Joyce had been the third member of Michael and Prince's group, and the debriefing session impacted on her as she considered what had happened.

> *I was struck by the negative effect of interrupting a person's thought process and telling them the answer. For me, this was quite an eye-opening discovery because I think that sometimes I do tend to give clues or answers to someone I am trying to help, thinking that I am actually helping them. In fact, I am just impatiently steering them towards my way of thinking about the problem. I suddenly put myself in the position of the person being interrupted and realised how frustrated I would feel if someone interrupted my thoughts just as I was coming to my own answer. (Joyce)*

Listening

All three sessions had focused on ways in which the teacher could assist in co-creating a learning environment where each student felt confident enough to engage with the mathematical material being offered both on their own and within a group. The dimensions of the challenge that this would present seemed to have been seriously considered and pondered as shown in the following journal entry by Joyce.

> *Quite often throughout this course we have been encouraged to listen to the learners and to build on their existing knowledge, rather than simply approaching a subject from our own perspective. However, today highlighted for me that this process goes a step further. It is not enough just to listen; as a teacher you have to literally put yourself in the position of the learner and try to get to grips with their way of understanding something. Taking this process one-step further means sharing this way of understanding (whether it is right or wrong) with the rest of the learners so that their own understanding is improved. Learning then takes place in a community. It all sounded fairly simple until we actually put these skills into practice today! It is quite difficult sometimes to work in groups in which each person's way of understanding is very different from the next. I think the exercise also highlighted the fact that for a teacher to really listen takes effort and a lot of patience. Sometimes we are so blinkered that we can't even begin to consider someone else's perspective. To adopt this approach in a classroom would be a huge challenge, but one that would hopefully have longer-lasting benefits for learning.*

Reviewing Assessment

This section of the article will briefly re-examine the different types of assessment introduced in the first two sections.

Formative Assessment

The PGCE class was able to experience a formative assessment approach from the lecturer where the contents and methodology of each session was based on their work and reflections from the previous session. In this way, each session was designed to meet the needs of the student teachers as argued earlier in the article.

Sitting Beside Assessment

An exclusive concern with the components of teaching has always been and continues to be inadequate for preparing teachers for the complex situations within which they will be working. We cannot teach everything that must be known for what is known and the circumstances of that knowledge are always shifting, evolving, unfolding.

(Davis and Sumara, 1997: 121)

During the teaching sessions described above, no student teacher was praised for getting the correct answer to a problem. Instead, in keeping with the enactivist view, the class worked on the errors made by members of the class as a means of generating different understandings of the concept under discussion. In this way, feedback from student teachers was used to plan the next move. The sessions were co-created in the moment according to what the class offered. The teacher's role was to engage with each student in a hermeneutic space so that he was able to enter into the student's learning space and ask appropriate questions. The class was encouraged to mirror this example, both in pairs in the activity in the third session (described previously), and in the Painted Cubes community of practice activity in the second session. Joyce's final comment above gives an indication of the deep insights into this methodology that can be gained from the work done by the class.

Her insight that working in this way would be a huge challenge is encouraging, and, with this in mind, a full module at Masters level has been developed where the enactivist theories espoused above are matched with Mason's Discipline of Noticing (Mason, 2002). The module runs over twelve weekly sessions, builds on the ideas of Varela, and interweaves readings on enactivism and practical work on critical incidents using the Discipline of Noticing, which provides an initial exploration of this topic (see Breen, 2000; 2002). The further insights and skills gained by teachers completing this module are promising and provide a way forward for Joyce (and other teachers) to continue with their studies in the future.

The Examination

The PGCE Mathematics course as a whole required that student teachers prove that they have a sufficient command of the content of the school-leaving syllabus, by obtaining a sub-minimum[5] of 50% in a 3-hour examination set at the end of the first semester. The paper covered the work from both the school leaving mathematics papers (Algebra, Geometry, Trigonometry and Calculus). Those failing to gain this sub-minimum at their first attempt have the opportunity to write a different paper at the end of the year. Although the paper was intended to take 2.5 hours, student teachers were allowed to take up to four hours to complete it. They could also eat during the examination and get up and take a break when needed.

Despite these moves to soften the pressure of a return to assessment as evaluation, the contrasting effects on the different student teachers were clearly evident. The average mark for the class was 62%. Five of the class failed to get the required 50%, while eight student teachers scored marks in excess of 80%.

Bronwen, one of the confident student teachers with a successful track record in mathematics, enjoyed herself (she obtained a mark of 95%).

Thank you for creating such a comfortable and non-threatening atmosphere for the exam today. It made the whole process quite enjoyable instead of daunting. When you stopped us to reflect on the experience I was actually very content. I was comfortable, working slowly and methodically and pleased with how I was progressing. Thank you for a fair paper.

Bronwen's only previous disquiet in these sessions had been in the Painted Cubes group exercise when she had come up against Ross (he who had been accused of intimidating others). She felt on that occasion that he had become angry with her when she had stopped following his lead and instead changed direction. Most of the class expected Ross to finish in the top three in this examination – in fact his mark for this test placed him in the bottom half of the class.

I discovered I did not remember as much as I had anticipated. At least I was not alone. Someone else discovered the same thing and we were able to pat each other on the shoulder. During the test Chris said we should pause and feel what it's

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[5] The significance of this being a sub-minimum requirement is that all student teachers have to obtain this 50% pass in order to pass the course. In other words, outstanding marks obtained for other assignments cannot be included as an averaging opportunity to compensate for failing to obtain the required pass mark for the content test.

like to be writing a maths test again. Unfortunately I did not feel anything in particular. The happy or unhappy bit will arrive with the results. The writing is just writing – it is just work.   (Ross)

At the other end of the spectrum, the picture is bleak. Tony experienced the whole examination as a return to the reality of his school experiences. He knew he was going to fail so he decided it was not worth spending time in preparation. His positive contributions in class and his role in creating a vibrant learning community with Kathy and Michelle are forgotten. The test comes – his self-fulfilling prediction comes true and he's back in his fixed position that he is not going to teach maths and that he hates it. He has been marked again.

I have a phobia for maths. I am anxiously waiting for the year to come to an end. Teaching maths is not in my dreams. (Tony)

Kathy too is devastated by the experience of the examination and is so upset by her results and the way that it damages her that she writes a long reflection of over two pages in her journal after the final session.

I know that I don't want to teach matric[6] maths. I like maths and numbers and the exercises we were doing in class… I have never done so poorly on an exam in my whole life.   (Kathy)

The article could end at this point closing the circle and pointing out the way in which summative assessment has the potential to destroy the self-confidence of individuals. The case for prioritising other forms of assessment for individuals seems to have been made.

Assessing Confessions of a Mathematics Teacher Educator

Evaluating Assessment

However, Roth (1996) ends his article with a comment about the role of tertiary educators:

> The sad thing about all of this is that most of us who teach undergraduate and graduate courses use grades and thereby contribute to the system in this way. We contribute to the cultural reproduction of a system that many of us scathe. (p. 819)

Roth has personalised the role that we play in reproducing this system, and in doing this, he challenges me to take personal responsibility for what happens in my classes. This echoes with some earlier writing of mine, in which I posed some probing questions to mathematics teacher educators, "What do we do with our own personal voices of discomfort? To what extent have we engaged in systemic change in our own institutions?" (Breen, 1999: 117). It is time to turn the spotlight up a bit and look and listen a bit more closely to the people and their voices, and as I do so, the safe depersonalised style of writing immediately falls away and I am forced to engage with the individuals in my class.

My heart becomes heavy as I think back to the way in which my initial sessions raised interest and enthusiasm for Tony and Karen (amongst others). I created the possibility for them to redefine their relationship with mathematics. They interacted with each other and the rest of the class and began to discover their ability to solve mathematics problems. They became animated in the mathematics class. And then I watched them crumble as I set and administered a test for which they did not have a chance of succeeding. Roth's challenge makes it too easy for me to pass all the responsibility for failure on to the system, or on Tony and Karen (the familiar 'blame the victim' syndrome?), especially if I am serious about our co-creating the learning environment.

In the Masters module mentioned earlier, I set a written assignment for the group of teachers taking the course in the same year. I gave them a flexible marking matrix and invited them to choose the individual matrix that they wanted me to use in assessing their work. Student teachers weighted aspects such as 'theoretical insights', 'personal insights', 'use of additional literature', and 'creativity' differently according to how they believed that they had tackled the assignment.

The challenge now is for me to explore ways in which I can break my unthinking contribution to the destructive evaluative assessment system currently embedded in this PGCE course. My starting point will be to meet with those who have to re-write the examination at the end of the second semester to seek their advice and ideas.

Sitting Beside or Running Away?

> Acknowledging the role of the individual in affecting the world's form effectively pushes enactivist thought into the realm of the moral.   (Davis, 1996: 190)

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[6] This refers to the final school leaving matriculation examination. Those in their last two years of school (Grades 11 and 12) are prepared for this examination and thus, in Kathy's words, are being taught 'matric maths'.

One of the ways that an enactivist position differs from constructivism is that the enactivist is forced into taking ethical stances because of the view of the interrelatedness of all components of the learning situation (see also Varela, 1999). To what extent does this force the teacher to take uncomfortable stances?

The issues raised above regarding evaluative assessment are easy to spot (although painful to raise). The victims are easily identified. A more difficult issue to pin down arises out of the 'community of practice' exercise. There is agreement in the group that Ntosh was excluded (or excluded herself) from the mathematical contributions to the activity. Arthur and Karen agonised about this and acknowledged their predisposition to tell. In the other group where Lyn, Simon and Fred worked on the problem, there was common agreement that Fred had been excluded. Fred is an older, quiet student. Fred reported that:

I was mostly constructing the figures and found out that my contribution in terms of visualisation was always not fully taken into consideration by the group.

Lyn had commented at the start:

I was apprehensive about working with Fred and Simon as I've noticed in previous classes that they are not very interactive in classroom discussions.

When the class met after the examination, I asked them to write down the names of those they thought would take the two top positions (Bronwen and Ross were by far the top choices). I also asked the class to estimate the mark each person thought they had obtained (again Bronwen and Ross came out on top). Fred estimated that he had a mark of 55%, yet was one of the top three with a mark close to 90%! Only one member of the class had positioned him in the top three. The class had made a decision on Fred's ability based on his lack of interaction in the class, and somehow Fred seems to have internalised a lack of confidence or ability to judge his own performance.

My dilemma is that both Fred and Ntosh have English as their second (or third?) language and their education was disadvantaged by the apartheid regime. In the feedback session, I make the comment that, for a group to maximise the possibilities of effective operation, all members of the group need to take responsibility for inclusion. In particular, I said that this meant that it was incumbent on all parties to both listen and to contribute. Arthur picked up on this in his journal:

However what was really interesting as well was that the responsibility also lies with the learner/ or the person who does not understand to be proactive and not allow themselves to be left behind or denied the chance to think.

Have I introduced an escape clause, which encourages the perpetuation of blaming the victim? Where does my role as a mathematics teacher educator begin and where does it end? If I set a task and want to sit beside the learners as they work together, am I not morally obliged to tackle the issues as they arise? When can I safely say that I have fulfilled my obligations to the group? At the moment it feels as if I scratched a surface but beat a hasty retreat when I glimpsed what I was uncovering!

In Conclusion

This article has taken as given the existence of assessment as evaluation as a means of judging the delivery of institutions and organisations. Instead it has focused more closely on the possibilities of assessing the work of individuals and groups, and, in particular, on the challenges that this poses to the teacher – and the teacher educator! The issue of the teacher's role as perturbator also presents some serious problems since this cannot be seen as a licence for the teacher to act irresponsibly. How much can one perturbate and what are the consequent responsibilities? How can teachers develop the appropriate skills and sensitivity for this type of role? Clearly, with the class described in this article, I was able to obtain regular feedback from classroom discussion and the journal entries, which were submitted in sufficient time to impact on the next lesson. These were a great help.

Acknowledgements

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"In the middle of every difficulty lies opportunity."
Albert Einstein