Making sense of undergraduate students’ reflections as they learn through writing an action research proposal

S. Maoto
Department of Mathematics, Science and Technology Education
University of Limpopo
South Africa
e-mail: satsope.maoto@ul.ac.za

Abstract
This article explores learning opportunities offered by students’ written reflections as they learn through writing an action research proposal. From tapping into students’ reported struggles, I analysed data using three stages of qualitative data analysis: data reduction, data display, and conclusion drawing (Miles and Huberman 1994). It emerged that the inescapable psychosocial learning environment which was created influenced students’ learning patterns. The more students realised that they could not escape the situation, the more they changed their conceptions of learning; developed a learning etiquette; and developed degrees of acceptance, fulfilment, empowerment and autonomy. It is in terms of these indications that I argue for the provision of different reflection avenues, process-oriented supervision and use of action research principles to encourage students’ deep learning of content at hand.

INTRODUCTION
This study was situated within my own classroom in an undergraduate Bachelor of Education Senior Phase and FET programme pursuing the central question: What learning opportunities are offered by students’ reflections? The ‘Bachelor of Education degree’ in the South African context is an integrated academic and professional initial teacher qualification normally studied over four years of full time study (Department of Higher Education and Training 2010). This article captures the lived experiences of students on learning through writing action research proposals and on reflecting on their learning. The focus was placed on those students who registered for mathematics methodology modules. As the lecturer responsible for designing the modules’ content, I structured the content areas in such a way that students were introduced to an action research process in the second semester of Year 3 (research proposal writing) which continued in the two semesters of Year 4 (improving research proposal write-ups and research report writing). The core purpose of the modules over the four years was to equip students with the necessary knowledge, skills and values to become teachers of mathematics. Included among
the outcomes were students’ demonstration of the ability to reflect on classroom activities and carry out action research that would assist in informing ongoing development and improvement of personal classroom practice. This study attempted to pursue students’ learning towards attainment of these outcomes.

**LITERATURE REVIEW**

There is presently a growing interest in studies that emphasise students’ reflections on their own learning. Some such studies focused on pre-service teachers’ reflections on their university/college learning experiences linked to their actual classroom teaching experiences (Frick, Carl and Beets 2010; Rodman 2010; Rose 2009; Haciomeroglu 2009; Kitchen and Stevens 2003; Scanlan, Care and Udod 2002; Rogers 2002; Smith and Lowrie 2001). Certain of the studies focused on students’ particular content or concept learning through the use of their reflections (Slaten 2010; Soto-Johnson, Cribari and Wheeler 2009; Breed, Mentz and Monteith 2008; Odafe 2007). The complex and dynamic nature of the teaching and learning environment and the continually evolving education reforms will continuously require us to ask questions that centre on student and teacher learning through reflection. Germaine to the development of professional knowledge, skills, and values is the use of reflection by the practitioner. Through the reflection process, tacit knowledge inherent in practice is surfaced to consciousness (Scanlan et al. 2002).

Frick et al. (2010) reported on the perspectives of a selected group of Postgraduate Certificate in Education students who participated in the initial development phase of a mentoring system during their practice teaching in schools. They were convinced that through the guided reflection process students learned about the self in context and that mentoring acted as a catalyst to enhance that learning. Rodman (2010) looked at how the reflective engagement of pre-service teachers in a structured classroom activity reinforces the application of the teaching-learning process in the classroom and enables them to construct meaning from that application. The findings of her study suggested that ‘structured reflection, as related to field-based placement, increases the understanding and application of various educational theories for pre-service teachers’ (Rodman 2010, 32). Through their experience, pre-service teachers reported growth and development in designing learning activities, ways to keep learners on task, ability to modify and adapt for all learners, motivation strategies, use of specific instructional strategies, classroom organisation and procedures (Rodman 2010). Rose (2009) focused on how an instructor can employ action research principles to continuously and systematically assess student learning in a graduate course in which students collaborate in teams on action research studies at schools or colleges. She concluded that use of action research principles offers instructors a vehicle for making sense of and improving their own practice and students’ work both in and out of class. For her, a continuous process also assisted in examining the quality of students’ work, including their research efforts.
Haciomeroglu (2009) examined the nature of pre-service secondary teachers’ instructional strategies and views about mathematics’ teaching and learning, and how those views influenced their instructional practices as a result of their participation in reflective activities during algebra lessons. The study revealed that by reflecting on their teaching and observing different teaching strategies, the teachers identified strengths and weaknesses in their lessons and analysed issues in planning, teaching and assessment. Kitchen and Stevens (2003) examined how self-study of teacher education practices can enhance the reflective dimension of action research. They concluded that their level of reflection during the action research process was heightened.

The findings of these studies reveal four critical processes that need to be carefully considered for achieving success in modules that seek to help students and educators become reflective practitioners and researchers: structured reflections, mentoring (which seems to be close to process-oriented supervision), use of action research principles and self-study. Worth noting is that although structured reflections allow students to begin learning how to reflect, they could limit students’ thinking and writing skills and they depersonalise the reflection process. It could therefore be argued that students need also to be exposed to more open ended reflection formats. Mentoring promises to be one way to facilitate student reflection in and on practice (Frick et al. 2010). Using action research principles could offer teacher educators a vehicle for better understanding and improving their own practice (self-study, as in research by Kitchen and Stevens 2003) and the work of their students (Rose 2009). The interplay of different reflection avenues, process-oriented supervision or mentoring and use of action research principles promises to be another route towards equipping pre-service teachers with the necessary knowledge, skills, attitudes and values for the teaching profession.

Slaten (2010) explored students’ growth as regards understanding mathematical concepts when they conduct research. The study revealed that the students who completed the reflection assignment were able to re-examine, deepen and extend their current levels of understanding of the concept selected for their inquiry. Soto-Johnson et al. (2009) demonstrated how pre-service elementary teachers’ written reflections influenced their learning of geometry. It emerged from their findings that participants performed better on tasks when they participated in written reflections and that those who wrote reflections at the beginning of the semester produced stronger reflections. Breed et al. (2008) investigated the extent to which high and low achievers were engaged in reflective thinking before, during and after coding a computer programme. Although they found no practical significant difference between the two groups in either of these phases, for some reasons it seemed as if the low achievers did not gain from the reflection. According to Odafe (2007) the new vision for mathematics’ teaching and learning can be more realistically and fully realised if students are encouraged to reflect on their learning. For him the reflective process improved his students’ study habits and participation in mathematics classes.
The findings of these studies point the way to how reflective practice can and should be encouraged in different pedagogical contexts. In one way or the other, they support the notion that reflective engagement and self-correction lead to increased understanding of content knowledge, skills and self awareness, and thereby improved performance amongst students. Using cycles of reflection can increase the meaningfulness of the students’ research experiences regardless of the type of course (Rose 2009). It thus makes sense to view a major responsibility of teacher education as that of facilitating ‘a reflective, self-monitoring practice and of promoting such a practice as a critical and active habit that improves the pre-service teachers’ pedagogical ability’ (Rodman 2010, 20). Practical advice on how reflection is to be achieved and operationalised is necessary.

From this literature review it can be deduced that critical processes that promise to promote students’ becoming reflective practitioners and researchers are:

- exposing students to different pedagogical contexts that offer them an opportunity to learn about and implement action research principles;
- engaging students in reflective thinking in and on action, moving from structured reflections towards more open ended reflection formats through mentoring or process-oriented supervision that support self correction.

In this study the interplay of these critical processes brought a different flavour to studies that focus on and emphasise students’ reflections on their own learning. Also, in this study it became clear that as students learned about action research as a concept or content area, they implemented and linked that knowledge to their actual classroom teaching experiences, a simultaneous learning of action research theory and practice.

**RESEARCH METHODOLOGY AND METHODS**

This study took place in my own classroom, a natural setting that enabled me to have face to face interaction over some time with my students. Data constructed in this manner, where I could actually talk directly to participants and see them behave and act within their context and ultimately reflect on their own learning, is a major characteristic of qualitative research (Creswell 2007). My students as participants were ‘key informants’ and possessed the information necessary to contribute towards answering the research question (Fraenkel and Wallen 2003, 458). Stated well by Creswell:

... qualitative researchers use an emerging qualitative approach to inquiry, the collection of data in a natural setting sensitive to the people and places under study, and data analysis that is inductive and establishes patterns or themes. The final written report or presentation includes the voices of participants, the reflexivity of the researcher, and a complex description and interpretation of the problem and it extends the literature or signals a call for action. (Creswell 2007, 37).
From Creswell’s definition it may be deduced that the methodology employed in this study conforms to the qualitative research tradition in education.

The data concern only one cohort of 38 students of the eight cohorts who went through a series of activities in learning mathematics methodology modules that led them to writing their own research proposals. Students had to submit their responses during the process and on completion of all the given activities, also a ‘module evaluation schedule’ and two-page reflection report on what had been learned as their learning portfolio. Initially students’ written reflections of the previous cohorts were collected with no intention of using them for the purpose of research. Realising that they often reflect on similar struggles or frustrations, I subsequently decided to consider the submissions of this particular cohort for research purposes.

As an entry point into an action research process, students were tasked to select one lesson from their teaching portfolios that they considered as unsuccessful, to answer questions that included how the lesson was planned initially, how the lesson was presented, why the lesson was considered unsuccessful, what went wrong, what needed to be improved in the lesson, and an explanation of how they would bring in improvements if afforded a second chance of presenting the same lesson. The successive activities were designed in such a way that students analysed and answered questions centred on action research proposal write-ups of previous students who had gone through the same exercises. As they read through the sample proposals they needed to be aware of the sorts of information addressed under each of the different research aspects. At the core was to expose students to learning experiences that would assist them to decide on their own research titles emanating from their reflections on their unsuccessful lessons. They should ultimately be able to use the knowledge they had gained as they attempted the activities of writing their research proposals. Although students could share information and discuss how to go about responding to the given questions of each of the activities, their responses depended greatly on their individual choices of their unsuccessful lessons.

Qualitative data analysis processes used involved stages of data reduction, data display, and conclusion drawing (Miles and Huberman 1994). I first read through each of the 38 submitted written reflections, working back and forth, examining the data for emerging themes. Initially I used the different words that appeared recurring in the write-ups to code the data. As I reread the reflections I revised my selection of the sentences or paragraphs to include, which assisted me to abstract my decisions regarding themes. Students’ names were also coded to hide their identity. Identifiable comments were therefore excluded. Data display, through narrative text, organises the information in such a way that it facilitates drawing conclusions. Throughout, I back up the findings and discussions with direct quotations from the students’ written reflections. Each individual quote is not necessarily indicative of the meaning of the theme, but merely supportive. The richness of each theme is defined by the whole set of quotes. Quotes from a particular student may appear more than once within a theme and may appear in more than one theme to illustrate an idea at hand. Overall I use those excerpts that appear to best capture lessons learned. Conclusion drawing
involved critically reflecting on the data, the learning opportunities, offered by students’ written reflections.

**FINDINGS AND DISCUSSIONS**

This section is organised according to themes which emerged from data: changing conception of learning; developing a learning etiquette; developing degrees of acceptance, fulfilment, empowerment and autonomy. Throughout, I am heavily directed by students’ relevant direct quotes. I provide a summary at the end of each theme to reconcile ideas.

**Changing conception of learning**

Indications of students’ changing conceptions of learning revolved around increased student engagement, a shift from learning without understanding to learning with understanding, and a change in students’ study habits.

**Increased student engagement**

There were some indications of varied student engagement in the work. For some students their engagement appeared to be merely compliance, ‘on-task’ behaviour, while for some it appeared to be more than that. There were students whose reflections appeared to be voicing feelings of ownership in the work, feelings that appeared to register that this learning is for ‘us’, the student, not for the lecturer. One student wrote:

> I came to realise that change is hard. Honestly speaking there has always been a little element of laziness in me, but that was removed by MMAT 321 work. ... I knew that in order to answer the questions given in the activities I have to read all those research proposals and to me they were so many. I realised that I cannot afford to repeat the course, it was not easy. (CKJ 2009).

This student sounded explicitly to be admitting that he had been lazy in his studies. There is an undertone that he felt challenged to change his ‘lazy’ behaviour in order to succeed in carrying out the activities in the module. There is also an indication of some hidden tone of pain as he realised that change is hard. For him this might imply changing from being lazy to working hard. He attributed that to MMAT 321 work which demanded serious reading before attempting the given questions. What surfaced is also an issue of being extrinsically motivated by a pass or a fail as regards the course. The student noted that he could not afford to repeat it. Another student put it as follows:

> At the beginning of this module I thought maybe the lecturer is lazy but now I learnt that students need to be actively engaged in the learning process and that good teaching is not making learning easy, but rather making it active and engaging for students. (MMS 2009).
In this instance the initial undertone is that in order for learning to take place, the lecturer should teach ‘us’. How the teaching is to take place appeared to be understood as telling students how to go about responding to the activities in the module. Although the student was explicit in shifting the element of laziness from students to the lecturer, she noted her changing view on learning. She stated having learned that students need to be actively engaged in the learning process. As to what that meant was not explained. She simply noted active engagement by students as an element that should constitute good teaching.

There were some students whose reflections hinted at an acceptance of responsibility to create new understandings of concepts for themselves. Although they complained at the start that they should be told what to do, in their write-ups they noted some of the facilitator’s roles as that of coaching, moderating, suggesting and allowing the learners room to ask questions. One student was forthright enough to recommend that, in order to ensure that the learners retain what they have learned, educators need to incorporate discovery based hands-on learning and should provide time for reflection so that students gain an understanding of concepts for themselves. Almost all students, directly or indirectly, indicated that although they felt challenged, they had learned in the process as in ‘I knew that this is a course which I will always say with boldness that I have indeed learned something ... I realise that hard work pays’ (CKJ 2009). For CKJ engagement with the given activities was not just responding to them for the sake of complying, but really learning from them. And, the type of learning in this case sounded as if it was one that could not be forgotten. SKJ wrote:

To succeed in this module, you have to be ready to work hard. Of which I was not used to work hard. I was used to writing my assignments in the last minutes ... I realised that what I was doing was not good for me and my learning. I became aware that I must not just write the given task for submission purpose only but also to acquire knowledge out of it. (SKJ 2009).

For SKJ learning is not promoted by last minute responding to given tasks or writing just for the sake of submitting an assignment; there should be acquiring of new knowledge in the learning process.

*A shift from learning without understanding to learning with understanding*

Mathematics students often become used to working on questions that require only use of the symbolic language of mathematics. Questions that require collection, reading with understanding, display of information, analysis and deductions from materials become challenging to them as they have to attach meaning before answering. CKJ wrote: ‘I have always hated the comprehension part in English question papers because you first read a story and then you answer the questions following’ (2009). What appeared to be implied is that this student compared learning in this particular module with responding to questions in an English comprehension test, which he hated. The challenge in comprehension tasks is to test whether one reads with
understanding. It becomes harder to respond relevantly, accurately or appropriately to the questions of a comprehension if one does not read between the lines with understanding. CKJ further put this implicitly in the following manner:

I actually learned that being able to speak English, does not necessarily mean that you know how to put the words that you speak down on paper, because as much as I know that my English is bit fluent, still I could not make sense of what I wrote and that was a real stress for me. (CKJ 2009).

In this reflection, an issue of language, English as medium of instruction, emerged. CKJ thought that learning in this module was not influenced by how good one’s English was, but rather on how well one put the ideas down on paper. He hinted that ideas should be expressed in such a way that they make sense to one as the writer; that is, one has to understand what one has written. RTE wrote:

I never relied on working alone in this module though I am a type of an autonomous person. I have ... consulted with my friends to check whether I was relevant in my responses. Sometimes they positively criticised me. When I reflected on my mistakes I could realise a need to restart everything. From that I started to realise that no one ... can exist in isolation. Everyone needs other people to survive in life. (RTE 2009).

Emerging from RTE was the sociological conception of learning. He noted the importance of social interactions although he indicated he was an autonomous person. For him consulting with friends assisted him to evaluate his own thinking and that of others from the criticisms they gave. Learning with understanding, for him, was enhanced by interactions with friends. Through this he was able to revise his thoughts, reconnect his ideas and reorganise the information he collected. SKJ noted her shift as follows: ‘I learned how I can read for understanding on aspects of writing a research proposal’ (SKJ 2009). Although she indicated that she could now read for understanding, she did not capture how and when she had learned this. Of importance is her awareness that she should read for understanding before attempting to write her research proposal.

**A change in students’ study habits**

The majority of the students complained about the module taking away most of the time they would have sued for resting or sleeping or being with their friends. They seemed to have missed this lack of free time as they noted that the work of the module demanded from them dedication, commitment, sacrifices and a persistent search for knowledge relevant to their identified research areas. NSZ wrote:

We had too much work which kept me awake and I had sleepless nights all the time. It required me to do lots of research about some other topics which are in this module, so it frustrated me in a way that from the onset until the end of the module I was up working on the activities day in and day out. (NSZ 2009).
The undertone in this reflection could be that it was the way in which the activities were designed in the module, not the lecturer, that kept students working. As NSZ stated, the activities required them to search for information. They had to read beyond the given course material as they were expected to write in a scholarly manner. Each source of information calls for thorough reading with understanding before it could be directly or indirectly quoted in the write-up. SKJ puts it thus:

The work in this module has changed my daily routine activities. At times I found myself sitting for more than 6 hours in a computer lab searching for information and not finding it. But I never gave up more especially in searching information related to the literature review of my study. (SKJ 2009).

What surfaced for SKJ is the possibility of searching for information on the internet for long hours but ending up with no relevant sources. She never lost hope.

CKJ wrote:

I never sat in front of the computer for more than two hours before engaging in this module but this time I witnessed myself sitting in front of the computer for more than four hours everyday searching for information ... (CKJ 2009).

CKJ expressed developing a sense of patience and autonomy. From both SKJ’s and CKJ’s reflections emerged messages of not accepting defeat, not surrendering to the demands of the work, which assisted them to move forward.

It became evident in certain cases that it was the accomplishment of finding responses that made sense which contributed to some sense of satisfaction in students. Although they mentioned having spent long hours searching for information on the internet, reading, writing notes and staying concentrated on the work, they confirmed having learned meaningfully. VV wrote:

The day I received a guide I thought I will complete the activities within a month, but things did not go the way I thought they will be. ... Activity 2 was difficult for me than other activities and is one of the activities that I have learnt so much. ... I spent hours and hours, days, weeks ... before I got answers. I opened lots of files on the internet and read and took notes. Gaining such a lot doesn’t mean writing own research proposal for the first time will be simple. First it requires a lot of time and attention. Secondly you stop doing or attending your favourite things, for instance spending time with friends. Thirdly you must be reading or typing, and/or rewriting it and lastly spending days and nights not finding the ideas and theories that support my title .... (VV 2009).

His reflections still echoed having experienced long hours of work, missing out on time to be with friends, a drive towards finding ‘answers’ through not losing hope and gaining new knowledge beyond responses to the given questions. Working with
numbers is not the same as working with words, sentences or paragraphs, so that this shift becomes a real challenge for mathematics students.

There were also indications of continued thoughts on the work; for some students this changed state of learning impacted on their relationships with their friends. One student wrote:

Everyday I found myself talking about this course even if I was not with my classmates. ... It reduces my sleeping hours and people around me are always complaining that I am harsh on them. ... I took the work seriously but I have been disappointed by the sources. The title of my action research looked easy but getting the relevant sources was not easy. (KAS 2009).

KAS’s continued engagement in the work impacted on people around her and this affected her sleeping habits. In addition she cited failure to find relevant information for her action research study as another factor contributing to her changed study habits and behaviour.

Changing students’ conception of learning is a process that involves a great many sacrifices from educators and students. Both parties should be ready to make themselves available for the learning beyond normal teaching hours. From the students’ quotes there seemed to emerge a general belief that learning has to do with hard work, and that this requires active engagement in the learning process. Active engagement for them ranged from a compliance or ‘on-task’ behaviour to an adoption of ownership in learning – an awareness that learning is for them not for the lecturer as supervisor. Together with this emerged an acceptance of responsibility to create new understandings of concepts for themselves; thus to create themselves as autonomous learners, learners who could take control of their learning by defining their goals and monitoring their progress. From the tones of their reflection, it is evident that there should be a consideration of an integration of the physical, cognitive and social aspects of learning. It emerged that it was the integration of those aspects of learning that contributed much to their being present in the research learning. As they realised the inescapable need to read for understanding in search for relevant responses, they also valued social interaction as promoting learning.

Developing a learning etiquette

Students reacted both positively and negatively towards learning, which they referred to as a ‘frustrating’ experience. As they struggled with the issue of self-reflection and honesty in giving responses, they appeared to have been developing some rules of proper behaviour. KAS wrote:

It was not easy for me at first to select the lesson that did not go well ... At first I selected the lesson which suits me, taking advantage that I will be able to create false information based on the lesson. I then later realised that it is not going to work for me and also there is no use to consider the lesson that went well because I won’t be able to proceed with the background of my action research proposal. I then went back
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to the PPE book and tried to check the lesson that really did not go well. (KAS 2009).

From KAS’s reflection it became clear that often with reflective practice one does not like to expose what exactly happened in his/her classroom, especially when one regards this as hanging out dirty linen for the public to see. For KAS the creation of false information in an attempt to avoid reporting on her unsuccessful lesson did not work. She had to revert to being honest about her choice so that she could accurately capture what prompted her action research proposal.

To offer individual students continued assistance towards improving their own thoughts, beliefs, and actions relating to given activities, they were provided with the opportunity for unlimited consultations before final submissions. With hopes of hearing more about how they had seized the opportunity, students registered varied barriers that impacted on producing good write-ups. CKJ wrote:

To be honest I nearly forgot to say something about activity one which was a real pain, because we had to consult the lecturer to check if our work was worth typing and when I realised that she could not check my work because of strike, I became very unhappy because I knew that there was no way that she was going to postpone the submission date. (CKJ 2009).

Although CKJ blamed the strike as a barrier to consultation at a certain point, he noted that there would be no chance for postponement of the agreed submission date. In his reflection some development of a sense of responsibility came to the surface. Some students complained about the time of day the module was presented, long consultations queues and the lecturer’s written comments. NSZ wrote:

Whenever I wanted to see the lecturer she was not available in most cases for assistance during the climax of this module. ... Sometimes she was gone for evaluating students for teaching practices. ... Whenever she was around to assist us, you would find that there were many of us which meant she would not assist us all because it was not practical to read through each work of thirty eight students. ... Another disappointment I encountered based on the assistance issue was she took some of our works to comment on them and this was an issue because we as learners have different learning styles. For me, I have an auditory learning style which means I learn best when we communicate mouth to mouth. I could understand what she wrote but I could guess at some point. (NSZ 2009).

Catering for different learning styles suggests offering varied assistance which would have extended the time taken by the lecturer, based on individual student’s needs. For NSZ who indicated that he learnt best when comments were given face to face, this became taxing on the lecturer’s side especially when it was required by all 38 students. Although he noted that it brought some disappointment, he had to learn to trust his thinking and ideas. For RE the timing was appropriate in that he was able to share with classmates where he experienced difficulties. He wrote:
It was a right timing for me because classmates were there to help me. And, the lecturer did give us time to consult and I could get it clear that she expected us to be better qualified teachers. We were all treated with same respect and with no judgments on our abilities. (RE 2009).

RE further noted how they were treated as students: ‘same respect and with no judgments on their abilities’. He was silent on whether he would carry those attitudes into his own classroom teaching. RTE added having acquired some social skills. He wrote: ‘I have acquired cooperation and team work ...’ (RE 2009).

MR reported on how her learning was impacted by contrasting remarks or views during discussions. She wrote:

What disappointed me a lot was that every time when I attended classes or consulted, the information that I got was the opposite of what I wrote in my work. This discouraged me to consult and also to attend classes because I had to change my work after every consultation. (MR 2009).

MR was not able to put down convincing support for her points of view and thus resorted to withdrawal into the background. She also lacked patience. As she continued with her reflections, there was the sense of a move towards viewing frustrating experiences positively. She recorded how over time she managed to move forward, thus developing appropriate behaviour. She wrote:

Things are usually not as bad as they first appear. Sometimes, things seem much worse simply because we’re tired or mentally drained. Taking a break and remembering to keep our sense of humour can also help. A positive mind is far more open to solutions and answers than a negative one that thinks it’s just “hopeless” and thinks “what’s the use?” A closed mind will not be able to see the possible solutions when they do come along. So I will always stay positive. (MR 2009).

MR’s reflection indicated the importance of staying positive. She was able to see the possible solutions after opening up her mind. She further reflected on how she had avoided asking herself the question: ‘Why was I wrapped up in one problem for such a long time?’ (2009). She explained having avoided such a question because it was going to keep her rooted in the past. She pointed out that such a question does not offer a solution to the problem. The important thing, she highlighted, was to know what she needed to do in order to reach the solution of the problem which, she noted, was to finish her action research proposal in time. SLE wrote:

The thing that made me to keep pushing until something happened was my inner voice that kept saying if I give up it means that I am not a responsible person as I am running away from my responsibility (future) meaning that I am a coward. And, that inner voice also said that hard work pays and also that in life the kind of situation or challenge that you come across is suitable for you and you will be able to make it and
finally I made it in my research proposal and I know what is needed in research. (SLE 2009).

It was more an intrinsic than an extrinsic motivation that drove SLE forward to completion. The ability to listen to that encouraging inner voice was what mattered most in her development of a learning etiquette.

Students normally react differently to frustrating situations that they cannot escape. Accompanying frustration are usually anger, worry and disappointment. There were evidences of a mix of positive and negative reactions. Realising that they had no chances of cancelling the module, students changed their attitudes, improved some social values and eventually developed a degree of learning etiquette. Evident was a shift from a fear for the unknown to a zeal to show that they can complete it and a shift towards enhancing honesty, patience, tolerance, responsibility, cooperation and teamwork.

**Developing degrees of acceptance, fulfilment, empowerment and autonomy**

More evident in the students’ reflections were some degrees of acceptance, fulfilment, empowerment and autonomy rather than rejection and continuous dependence on peers and the supervisor. Students accepted that they had learned a great deal and recommended that future students be introduced to action research. NSZ wrote:

> I learned so many things that I thought were difficult ... This learning boosted my enthusiasm to want to learn more, so I cannot recommend that anything be changed in the tasks. At this level all students who register in the Department must be introduced to action research as to improve the way they will solve problems they would encounter when teaching the mathematics content in schools. (NSZ 2009).

There is an acknowledgement of having learned and of intrinsic motivation to want to learn more. This brought about a sense of fulfilment in some students; it could also be traced in CKJ who wrote that:

> As much as the work was plenty, the work was fulfilling, especially writing the research proposal. I always felt so good to tell my friends that I have been very busy in the computer lab trying to finish my research proposal. I honestly started feeling like a real student, because there was no way where I could sleep without being in the library or to the computer lab to try and push the work given. My high moment occurred when I realised that I was writing about something that even some Masters students still struggle to write. My other high moment occurred when I visited a friend and met this other gentleman who registered for PGCE and seemed to have all the information on what research proposal was but when I read his, I realised that it was not of an acceptable standard. I noticed that if he was in our class he was not going to survive. I felt so empowered to learn that I could realise mistakes in somebody else writing. (CKJ 2009).
It was fulfilling for CKJ to realise that he learned about something with which even postgraduate students struggle. He felt he was being a real student as the whole exercise had taken him to a level where he could not sleep without doing some work. He also reported having been empowered to a point where he could recognise mistakes in other students’ writings. KAS wrote:

If it happens that I register an honours degree after completing this undergraduate degree, I won’t struggle much because already I have a lot of information needed for writing a research proposal. ... I am proud that I can write an action research proposal during my third year of study while honours students from other faculties are not having a clue of what a research proposal is. (KAS 2009).

Just like CKJ, KAS was proud to realise that he was better than some honours students who were clueless as regards writing research proposals. VV wrote:

Writing my first research proposal is one of the things I will never forget my entire life. I had read more than 75 sources including books about theories, views and findings on learning and teaching mathematics. I learnt about many causes of learning difficulties in learning mathematics, the effect of team activities, and misconceptions, especially in algebra (e.g. solving quadratic equations), solving skills, teaching for conceptual understanding ideas and many more. The knowledge that I gained through writing my own research proposal I think will help me a lot during the teaching practice next year and beyond. (VV 2009).

From VV’s reflection, learning took place in various areas of knowledge ranging from learning about specific content to general theories, views and findings on learning and teaching mathematics. For VV that learning was helpful beyond classroom situations. VV’s reflection stressed the importance of drawing upon a substantial knowledge base, which students were required to interrogate for the relevant information that would be necessary to assist them to write their research proposals.

RTE described the same feeling of having learned, and highlighted being better equipped with skills and knowledge to develop further in aspects of life. He wrote:

I have learnt to be a hard working autonomous person who always back up his argument upon valid facts. ... I feel like now I have acquired all the necessary skills to go out there and face the challenges of the world due to the experiences I had in this module. ... I can boldly say that I am better equipped with necessary research knowledge and I am now moving towards being totally developed as an individual; morally, academically, socially and as well as cognitively. (RTE 2009).

He indicated having acquired autonomy and could also argue based on valid reasoning. From the learning RTE emphasised being ready to face the outside world with all the necessary research knowledge and skills he had acquired. What emerged from his reflections were also voices of empowerment and a strong sense of self-confidence. SKJ put it as follows:
This module has prepared me for good and I now know that I have the potential to do more than this. I will transfer what and how I learned in this module to other modules and never forget that hard work pays, easy come easy go. ... You prepared us to be independent and active in our learning, you are my inspiration. (SKJ 2009).

From SKJ’s reflection important elements that show empowerment came to light. First was the ability to transfer – that is, the ability to use what she had learned in new and unfamiliar situations, and to learn related information in other modules. Transfer is essential because most new problems require solution via previously learned strategies. Second was independence through active learning.

Students found themselves having to accept the learning situation as presented to them. That acceptance of action research learning invoked a degree of fulfilment, empowerment and autonomy. These sorts of skills developed as they interacted with other students in their class and beyond, but only in social situations that were characterised by support and recognition. Domains of fulfilment, empowerment and autonomy in their case involved working collaboratively at the start and gradually moved towards working independently having the disposition to explore ideas and challenge assumptions often in the face of resistance. They also moved to a point where they realised that the knowledge gained could be transferred to new and unfamiliar situations.

DISCUSSION

I begin this section by referring to Marton and Saljo’s (1976) concepts of surface and deep learning, what Waghid (2006) referred to as ‘frivolous’ and authentic learning. A surface approach or ‘frivolous’ conception of learning is characterised by teacher dependence with students as passive recipients of information, lack of critical engagement with the lecturer or with texts, and facts memorised or simply taken without critical scrutiny or questioning rather than meaning established, relationships observed, and independent interpretive judgements made. In contrast, a deep approach implies that students seek out underlying meanings, take charge of their own learning, willingly and openly engage in critical dialogues with their lecturer in order to construct own knowledge and that of others – that is, authentically take a vigorous and active approach to learning content at hand. Reverting to students’ reflections mentioned, it appears certain that some form of deep learning occurred, together with instances of authentic learning.

From their reflections, students experienced the learning environment which had been created as frustrating, painful, demanding, engaging and requiring personal change. They were provided with just one option, working hard, to succeed in the module. Within that ‘frustrating’ environment their struggles ranged within issues of self-reflection, honesty, responsibility, patience, cooperation and a spirit of teamwork. If they had not been subjected to that kind of learning environment, their learning could have been ‘business as usual’. On realising that the only way they could succeed was to work hard, they accepted the challenge. It was that domain of acceptance
which influenced how they engaged in the work. Initially their engagement appeared to be just that of compliance, ‘on-task’ behaviour, in other words, responding to the activities’ questions just for the sake of submitting the assignment, without careful analysis of what they needed to include under each aspect of their action research proposals. The lecturer’s role initially was thought to be that of telling and providing knowledge. Engagement in this instance can be perceived as something dissociated from intellectual challenge and real learning to be provided by the given activities. Students gradually shifted from that shallow approach to learning towards learning that demanded from them active involvement in creating new understandings of concepts. Creation of new understandings of concepts requires critical mental engagement with those concepts either independently or in consultation with others. In their case it needed to be learning that transcended compliance, ‘on-task’ behaviour, busy work or short term ‘feel good’ activities. It needed to be learning that actively engaged them to disclose and reorganise low moments of their unsuccessful presented lessons. They were obliged to revise their thoughts and reconnect their own ideas. In that way they were able to acquire new knowledge and thus improved their intellectual capacity.

Students’ reflections emphasised how they had moved from being lazy to working hard, how they had shifted from learning without understanding to learning with understanding and had changed their study habits. These appeared to have been influenced by how the activities were designed. They were required to read between the lines, analyse, comprehend, and critically reflect before responding to activities’ questions. They had to critically read given texts or their own searched sources of information to support or identify gaps within literature for writing their research proposals. This created a culture of reading, reading with the intention to comprehend, to make sense of what they read, which also contributed towards their sociological conception of learning. There were those students who reflected on how criticisms made during interactions assisted them to evaluate their own thinking and that of others. They reported having learned that quality learning does not occur from responding to easy activities but has to do with acquiring of new knowledge, creation and gaining of new understandings of concepts for themselves. This does not suggest that giving students ‘difficult’ work promotes quality learning for all. The argument is that to promote the kind of deep learning as in this study, we need to expose students to challenging, discovery-based, hands-on reflection avenues supported by continual if not continuous process-oriented supervision. Students must freely ask questions, critically reflect and freely disclose their hidden feelings. That was possible because I was present for my students’ learning, provided coaching, moderated and gave suggestions. On realising my continued support, they became willing to confront uncertainty, willing to be wrong and trusted that they could learn from each other. That willingness provided me with a strong platform to influence their research behaviours. That opportunity of learning about teaching through research created positive social change in students. They consequently developed some degrees of fulfilment, empowerment and autonomy.
CONCLUSION

The teaching of the mathematics methodology content module, linking it with students’ action research learning, with emphasis on learning through reflections may well result in research that is rich both in field data and reflection in and on practice. That approach promises to provide an enriching opportunity for both students and facilitators to learn together, thus encouraging ‘self-study’ on the educators’ part (Kitchen and Stevens 2003). The students’ experience in being introduced to action research through reflecting on their own unsuccessful lessons provided them an opportunity to describe and unravel their understanding of learning. Through process-oriented facilitation and supervision, their level of reflection became heightened.

From all these factors arises a need to strive for teaching that stimulates and develops students’ critical, creative and reflective thinking abilities. Such high order skills could be attained if we collaborate with students on their learning, value students’ voices, connect student engagement to high levels of intellectual quality, create opportunities for them to transfer knowledge and skills between learning activities and emphasise the use of continual reflection in the different phases of programme development.

REFERENCES


S. Maoto


