



PROBLEM-BASED LEARNING IN TEACHER EDUCATION: AN ACTION RESEARCH PROJECT

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ABSTRACT

This paper argues that, although there is a worldwide move from face-to-face to distance education (DE) and open educational resources (OER) in teacher education, there is no guarantee that DE is able to lead to the development of appropriate teaching skills in student teachers. In the wake of the introduction of DE in teacher education at the Mauritius Institute of Education (MIE), a group of teacher educators at MIE have been questioning their own approaches to the teaching and learning process of teacher education. This questioning has encouraged them to revisit their own practices through the adoption of the problem-based learning (PBL) approach to deliver a module in an initial teacher education course. During the implementation of the PBL process, emphasis has been placed on the development of skills and the transformation of students from passive learners to active participants in their own learning. The teacher educators have investigated the implementation of PBL in their teaching through an action-research (AR) project. The research revealed that, when implemented using a face-to-face approach and cooperative learning, PBL was an effective tool in developing meaningful learning among student teachers. The researchers came to the conclusion that DE could have a role to play in the delivery of the theoretical component of teacher education. However, for the development of teaching skills, face-to-face sessions and PBL should be used as an effective tool to help student teachers acquire certain skills and hence help them become more efficient in their future role as teachers.

Keywords: *Problem-based learning, active learning, pedagogy, teaching strategies, teachers' beliefs, classroom practices, self-directed learning, meaningful learning, transformation.*



INTRODUCTION

Within the context of the worldwide demand for access to education and the increasing need for more qualified teachers in all sectors of education, the existing teacher education institutions are not able to meet the demand in many countries. Decision-makers have come to the conclusion that there is a need to adopt new strategies to respond to the high demand in the field of teacher education through the adoption of the distance education (DE) mode of delivery and the use of open educational resources (OERs).

The Mauritius Institute of Education (MIE), founded in 1979, is the only public teacher education institution in the Republic of Mauritius and has already started to move in this direction with some courses. Currently, there are calls and expectations for the MIE to evolve into a state-of-the-art organisation that is capable of providing different modes of teacher education to a larger audience through DE, including online and blended approaches.

It is widely recognised that DE and OER in the field of education provide a number of advantages for students, especially to vulnerable communities living in inaccessible areas, as DE provides larger numbers with access to education. However, in the minds of the authors of this paper and of other researchers (Kangai & Bukaliya, 2011; Hampton, 2002:84), there has always been a nagging question: "How effective is DE in teacher education, especially in the development of teaching skills?" To be more precise, the question was: "Is DE developing the "how to teach" in the classroom among student teachers?"

This question, and the context of change with the advent of DE as an alternative mode of operating in terms of teacher education at the MIE, has led to our reflecting on the effectiveness of the present pedagogical practices of teacher educators in the delivery of modules in teacher education. As a result of this reflection process, we decided to revisit and act on our own pedagogical approaches in the lecture rooms of the MIE. We wanted to experiment with a novel approach in the teaching and learning process of teacher education in Mauritius; that is problem-based learning (PBL). This process was investigated through action-research (AR).

This paper therefore focuses on the AR project that was carried out by a small group of teacher educators in the implementation of PBL in a module for student teachers in their initial professional development as primary school teachers. The project aimed at assessing the extent to which the PBL process was successful at



creating a learning environment that would lead to more meaningful learning for the student teachers.

This research is significant for us, the researchers, in that it allows us to question the current teaching and learning process in teacher education through the exploration of an essentially student-centred approach in a context where there is increasing pressure to adopt the DE mode of delivery because of systemic constraints. The intent was to develop insight into the teaching and learning process in higher education through an in-depth study of data obtained by means of a variety of tools. This research also allowed us to take stock of how our students learn in different situations, for example, through independent reading of the appropriate literature, through cooperative learning groups, through mini lectures and through scaffolding sessions. We were also able to evaluate how innovative they were in their classroom practices, as well as the limitations of that pedagogical venture.

RATIONALE

Our experience as teacher trainers and researchers involved in teacher education led us to believe that many teachers in Mauritius scarcely put the learning gained from the educational theories they encountered during their professional development into practice. Many teachers still stick to the traditional “chalk and talk” approach, although during their professional development, a considerable amount of time was spent on face-to-face sessions. This phenomenon is not particular to Mauritius, because, as Biggs argues: “...many students acquire knowledge in traditional programmes specifically for the purpose of passing examinations (Entwistle & Entwistle, 1997) and often only incidentally acquire the skill of putting knowledge to practical use.” (Biggs, 1999:207).

Furthermore, while several explanations can be given in the Mauritian context as to why teachers, in general, are unable to make the shift from traditional approaches to more innovative ones, there needs to be a deeper inquiry into teachers’ classroom practices across the Mauritian education system. Therefore, in line with our main research question, this research seeks to investigate the teaching and learning process, through a PBL approach, of a teacher education programme, and also to analyse the extent to which PBL can be regarded as an effective tool in the development of more meaningful learning among student teachers.

Our endeavour, as a group of three lecturers, has therefore been to implement an alternative approach to the traditional lecture or face-to-face method in contact

sessions during the initial professional development programme for student teachers. Most of these students were school leavers. Some were university graduates, who had received their academic education in a system in which the traditional transmission model of learning was the norm. In the context of a 30-hour module, Pedagogy, a PBL approach was adopted for primary school student teachers. The aim of the teacher educators/researchers was to assess how far a change in the teaching and learning process during the professional development of student teachers could lead to a change in the quality of their learning experience. This would ultimately influence their own classroom practices. We believe that the findings of this research will lead to pertinent recommendations that will not only influence the face-to-face delivery of the module afterwards, but will also influence our experience as a whole, which could improve alternative modes of study such as DE delivery modes.

OBJECTIVE OF THE STUDY

This AR research study intends to analyse the extent to which the implementation of a specific pedagogical action (PBL) has helped to bridge the gap between theory and practice in teacher education. It also intends to assess the use of PBL as a teaching and learning tool to transform student teachers from passive recipients of educational theories and pedagogical principles into active, self-directed and reflexive learners who take ownership of their learning. The following sections highlight the research questions that guided the study.

Research questions

Main question:

How effective is the problem-based approach in developing more meaningful learning among student teachers?

Sub-questions:

- Will PBL, as an approach, be able to equip learners with the required strategies to take ownership of their learning or to become self-directed learners?
- Will student teachers have developed an in-depth understanding of the basic pedagogical concepts and principles?
- How far will PBL enhance teaching and learning activities in teacher education in general?
- How will PBL enhance the teaching and learning approaches of teacher educators?



LITERATURE REVIEW

Pedagogical innovation for effective learning in higher education is an approach that is becoming increasingly prevalent in institutions of higher learning, as educators are being encouraged to question the effectiveness of their teaching. Biggs (1999:54) argues that one facet of good teaching is “to encourage students to use a deep approach”. The second facet of good teaching is to discourage students from using a surface approach. To do this, we need to identify any factors in our own teaching that might have this effect, and eliminate them”.

The best way to identify these factors is to research the teaching and learning process. The most common research approach is AR.

Since its introduction in medical schools, PBL has also been applied in other fields, including in teacher education, by some individual teachers or universities (as cited in De Simone, 2014), such as Barrows and Tamblyn (1980), Gijbels, Dochy, Van den Bossche and Segers (2005), Walker and Leary (2009), Derry, Hmelo-Silver, Nagaran, Chernobilsky and Beitzel (2006), Hmelo-Silver (2000), McPhee (2002), Derry et al. (2006) and Hmelo-Silver et al. (2009). Therefore, much of the research comes from the medical schools. A few studies are found in other fields.

According to Gallagher and Gallagher (2013:112), the majority of research in PBL pursues two lines of inquiry: “The first line of inquiry investigates whether students in PBL classrooms learn as much as students in classrooms with traditional instruction. The second line of inquiry investigates whether students can learn discrete learning skills through a PBL curriculum.”

This paper adopts both lines of inquiry, but has the added advantage of investigating how the use of PBL impacts on the teacher educator’s practice.

The effectiveness of the use of PBL in the teaching and learning process has been confirmed by a number of researchers (Faessler et al., 2006; Hmelo-Silver, 2004; MacKinnon, 1999; Maxwell et al., 2001). According to the research findings, PBL seems to motivate students to engage in their learning with more enthusiasm and to achieve deep learning. The evidence from research conducted in and outside the medical fields suggests that PBL is an instructional approach that offers the potential to help students develop a flexible understanding and lifelong learning skills (Hmelo-Silver, 2004).

PBL and adult learning

Implementing PBL among student teachers involves dealing with adult learners. According to Knowles (1980), life experience is a rich resource for learning. For adults to learn, conditions should not be exactly the same as those used in a learning model or pedagogies for children.

There is therefore a need in teacher education to create an adult-friendly and supportive environment, with mutual planning and setting of tasks, as well as the use of learning contracts and experiential techniques. We can describe our venture in adopting a PBL approach as a step towards creating an adult-friendly environment.

Models of instruction for adults are essentially founded on an adult's ability to develop intrinsic motivation, and autonomous and self-directed learning approaches (Knowles, 1980); this is also the basis of the DE philosophy. That is why DE is increasingly being adopted as a mode of delivery in teacher education.

In fact, the literature reviewed shows that PBL (the teaching approach adopted in this research study) can be adapted for use with students in higher education who are studying through DE. Findings highlight issues on how to make learning more effective and successful, how to make it interactive, how to address students' needs, how to provide support to students to shift to this mode of delivery, how to support student teachers' needs with the use of technology, and how to work with the student teacher and other partners in the team, such as editors, designers, producers, technicians, media specialists and others through whom communication is mediated. Other issues related to the implementation of PBL through DE concern effective strategies to develop appropriate methods of feedback and reinforcement, optimising content and pace, and adapting to different student learning styles (Sherry, 1996).

However, several researchers have addressed issues related to adult education in relation to DE prior to making such statements. Peters (1988), for instance, strongly questions the relevance of adult learning models to a distance mode and draws our attention to the process of individualisation versus an "industrial model". Other researchers, such as Bullen (1995), have also questioned the challenges experienced when individualisation or interaction is lost at the expense of mass production, which can be economically wise, but which does not necessarily support adult learning approaches. Both Peters (1988) and Bullen (1995) then consider it



essential to assess the feasibility and transfer of learning in DE modes of delivery, which can weigh heavily on credibility and standards: “Careful consideration must also be given to implications...for the academic credibility of distance education courses...an across the board approach is not likely to be politically acceptable.” (Bullen, 1995:5).

While we have not adopted a DE mode of delivery in our attempt to review the approach to teaching in a teacher education institution, this does not mean that we reject DE as a mode of delivery; we believe that part of the teaching experiment could have been carried out in DE, that is, we could have adopted a blended mode. Our main concern was the development of skills through PBL in a learning environment geared towards adult learning, and considering this as an essential shift from approaches that represented spoon-feeding to autonomous adult learning in a teacher training institution.

We also viewed this research through a transformative paradigm (Mezirow, 1981; 1994; 1997). Transformational learning has been defined as learning that induces more far-reaching change in the learner than other kinds of learning, especially learning experiences that shape the learner and produce a significant impact or paradigm shift, which affects the learner’s subsequent experiences (Clark, 1993). We draw from this the fact that the transformation that occurs in student teachers, as the result of the adoption of an alternative approach to teaching and learning, can in effect provoke a change even in an adult learner. This is in line with the view of Mezirow(1994), who posits that transformative learning occurs when adults engage in activities that cause or allow them to see something from a different perspective, and which can cause a shift when integrated into an adult perspective. The transformation may be small or large, and can impact on the adult learner’s life, either initially or in time.

An important aspect of this research is its impact on the teacher educators who are also the researchers. A current trend in teacher education is the pressure on the teacher educator to move from being a “teacher” to also being a “researcher”, that is, a reflective practitioner. Hökkää, Eteläpelto and Rasku-Puttonenb (2012) mention the “tensions in the work of teacher educators, who are increasingly required to redefine their professional identity, moving away from the traditional identity of “me as teacher” towards that of “me as researcher” (Cochran-Smith 2005; Murray 2007).

RESEARCH METHODOLOGY

This research lies within the qualitative paradigm. The core of the research approach is that AR is the most appropriate method of researching the effectiveness of the implementation of PBL as a teaching and learning approach in teacher education. AR offers a systematic approach to introducing innovations in teaching and learning in higher education. It puts the tutors or trainees in the dual role of both a producer of educational theory and a user of that theory to reflect and improve practice. It is an interesting way of producing knowledge about teaching and learning in higher education, and serves as a powerful way of improving learning and teaching practices in teacher education.

PROJECT IMPLEMENTATION AND MANAGEMENT PLAN

Implementing PBL and its impact on student teachers, as well as on teacher educators

The challenge for the teacher educators involved in this research was to plan the setting up of both the PBL experience for the students and the AR, which meant that both processes had to be planned concurrently.

Designing the environment

The student teachers were introduced to the PBL environment in which they would have to direct their own learning with the help of selected tasks along a structured route by means of the guided questions. Through this process, they would have to accomplish their learning tasks with a degree of autonomy.

Due to time constraints, only two problems or “triggers” could be proposed. These were, in fact, the brief case scenario of teaching and learning instances. The problems or triggers for the PBL process were crafted to address the dissonance between the philosophy of teacher education and traditional classroom practices in Mauritian primary schools.

Before embarking on the PBL process, student teachers were prepared to work collaboratively as a group and to identify the learning strategies they needed to develop. There was a film-viewing session on cooperative learning or lesson planning. This preparation was important, as our students were not accustomed to cooperative learning. Nevertheless, group work is an essential aspect of PBL, as it helps to develop learning communities.



The following steps were planned and implemented for each trigger:

- Copies of the trigger were distributed to students (an example of a trigger or problem is included in the appendix at the end of this paper).
- Learning resources (hard and soft copies) were distributed. Students were also directed towards certain websites that contained pedagogical content knowledge.
- Students participated in group work to discuss the first trigger and to develop their understanding of the problem. They were assisted in this task by the guiding and thought-provoking questions that accompanied the triggers. Students were also scaffolded by the teacher educators, who acted as facilitators.
- Each group delivered group presentations to the whole class on their understanding of the problem and the pedagogical implications. This was followed by feedback from the teacher educators.
- Each group submitted written work on the trigger.
- Teacher educators provided feedback.

The AR data-gathering process

The PBL approach was first implemented during the second semester of 2014. Although the approach continued to be implemented during subsequent semesters, this paper only reports on the experiment during this second semester.

Target group of students: Teacher's Diploma Primary 2013–2015

Cycle 1

Trigger 1 was implemented in this cycle. Data was obtained by evaluating the dynamics of the group work through observation and a checklist. Other types of evaluation included oral presentations by each group, and the written work submitted by each group. Each member of each group undertook self-evaluation. Data was also obtained through weekly meetings between the teacher educators, which included discussion and sharing.

Cycle 2

After reflecting on Cycle 1 by analysing the data obtained during that cycle, the teacher educators crafted Trigger 2 and distributed it to the students. The same process used in the first cycle was followed, data was gathered and reflection took place.

Cycle 3

Data from the second cycle was analysed and questions were crafted to be used to interview a group of students. All students were invited to participate in group interviews, but only a small number responded. The researchers met several times to discuss and reflect on the whole PBL process. This included issues that came up during the implementation of PBL and the AR.

The AR process (description and analysis)

Cycle 1

Cycle 1 related to a problem (Trigger 1) that resonated with the reality of the primary school classroom. The problem addressed related to questions and issues based on a traditional teacher-centred approach to teaching and the need to shift to more constructivist perspectives. Copies of the first trigger or problem were distributed to all groups. At a later stage, they were provided with the questions to trigger thinking and guide a discussion at both an individual and a group level through the PBL approach.

Slowly, student teachers became more actively engaged with background readings (CDs with readings, reading materials and a few handouts, additional links and references to internet sources) in an effort to make sense of underlying issues in the trigger. In the process, they developed a higher level of cooperation and collaboration.

This phase was dominated by some group organisational challenges in terms of role allocation and individual accountability. Gradually, it was observed that the process allowed students to demonstrate tolerance towards each other, learn to work in groups, and listen to and negotiate points of views. Some students demonstrated a lack of confidence when others dominated the group, while others were afraid to voice their views.

Cycle 1 was a determining start to PBL and students experienced both a sense of motivation (Barrows, 1996) and some difficulties inherent to this process. It meant that they had to adapt to a new learning environment (learning in groups and using the PBL approach), while traditional teaching and learning had previously dominated their experience of education.

The student teachers initially found it challenging to tackle the tasks, as they were responsible for their learning. They had to organise the roles of each group member



in terms of oral presentations, group research, discussion and written tasks. Although this was challenging at the start, we found that this mechanism quickly led to a means of revisiting the way they would be engaging in the learning process.

Some students found this experience to be “noisy”, “time-consuming” or “tedious”, as they had to answer their own questions and research the answers through readings. At this stage, they had little understanding of how to organise themselves, while some groups took the lead and became proactive, offering suggestions. Other groups found themselves still struggling after several weeks, as a lot of social and teamwork skills were necessary for PBL.

During group presentation of their work, students demonstrated some knowledge and understanding of the pedagogical concepts, but this was superficial. Variations in trainees’ grasp of some core concepts surfaced between groups. Many trainees included too many theoretical details in their presentations, lost the focus of the main argument, and failed to illustrate how these details were meaningful to practice in the primary school. At this early stage in the PBL process, it appeared that learners’ focus was more on reading and gathering maximum information.

Gaps in understanding and misunderstanding some pedagogical ideas and concepts were noted in the group discussions; these were addressed through guided discussions by teacher educators in their new roles as coaches and facilitators. This resulted in further probing by trainees to clarify issues and concepts.

During the oral presentation of their findings, the teacher educators realised that the student teachers were in need of additional support or scaffolding if they wished the experiment to be successful. Barrows (1986) also argues that a lack of adequate support will affect the effectiveness of PBL as a strategy. Thus, additional support was provided in the form of mini lectures, coaching and clarification of misconceptions. Advice was given to guide the groups towards more research when it was felt that this was needed. All these measures acted to organise the students’ study efforts (Van Berkel et al., 2001).

As a result, their written coursework demonstrated an improved level of understanding of the concepts and constructs. It was noted that there appreciable attempts were made to integrate the background reading into the explanations of some issues. However, it was observed that students’ responses were broad and focused on reproducing the knowledge gained from the readings. This was reflected in their coursework. However, their writing remained at the descriptive level and little critical

thinking was demonstrated. Trainees failed to apply a theoretical explanation to guide their analysis and to make suggestions to improve the teaching process. The level of argumentation was inadequate, and explanations and analyses remained superficial. These findings supported the crafting and organisation of Trigger 2 some weeks later.

Cycle 2

The teacher educators crafted a new problem (Trigger 2) (see the appendix). This focused on issues related to instructional planning using the constructivist approach and on issues related to “differentiated instruction”. The aim of presenting this trigger was to allow students to become more critical about teaching and learning in a primary school, and to develop core skills, such as lesson planning and selecting appropriate teaching strategies.

At this stage, the learners’ experience of PBL progressed in a number of ways and they were more motivated (Barrows, 1996). The oral presentations improved significantly, as they had already negotiated some basic organisational issues during the first phase (such as a working relationship with peers). As a result of this improved organisation, and some earlier readings for the first trigger, they could interpret a number of concepts the researchers saw them discussing and infusing in the presentations.

Trainees doubled their efforts to address some of their weaknesses, which had transpired from the learning process with Trigger 1. For this stage of the learning process, the students demonstrated a willingness to take ownership of their learning, and they became actively engaged in the learning process.

The students’ presentations indicated that some had also begun to read more materials than those found on the CD and the recommended readings provided to them, and they made plans to meet outside the lecture room to discuss the trigger. This stage necessitated fewer interventions from the tutors to direct the group tasks, as the trainees began to own the learning process.

It was generally observed that the trainees were striving harder to analyse issues emerging from Trigger 2. Different groups became more actively engaged in the co-construction of knowledge and developed the skills that were required to elaborate on lesson plans, while also catering for diversity among learners.



According to the feedback obtained from student teachers' reflections on the module, their active participation was stimulated by reading the learning resources provided and those accessed on the internet. As a result, their construction of knowledge and understanding through group discussions and the sharing of ideas on new concepts were richer. The clashes that occurred during the early stages of group work diminished as students made an effort to consider the different viewpoints. This resulted in greater consensus between group members.

Evidence of deep learning was apparent during the oral presentations. Students, in their respective groups, demonstrated a greater in-depth understanding of the pedagogical concepts and constructs linked to lesson planning as they integrated information from their background reading into the presentation of a lesson plan and the subsequent arguments.

Their oral presentations were also characterised by poise, better communication skills, confidence and critical thinking as they challenged each other's views and grew comfortable with the process. However, one major challenge that was experienced at this stage was that many students were still unsure about how to relate theory to practice. The trainees' beliefs about teaching and learning still seemed to be influenced by the traditional teaching methods used at school. This was observed in their presentation of a lesson plan on differentiated instruction. The structure of the lesson plans, though adequately grasped, needed improvement and discussion. Even if the underlying philosophy of teacher training was an inductive constructivist one, their lesson planning reflected more of a behaviourist and deductive approach, although some attempts were made to shift towards a more learner-centered approach. There seemed to be a problem at the level of transfer of learning.

Therefore, the teacher educators had to trigger prompts to provoke more thinking. As with Trigger 1, additional scaffolding, coaching and mini lectures were needed to provide support to student teachers, especially when designing a more constructivist lesson plan (Van Berkel & Schmidt, 2001). The last phase of the cycle was the submission and marking of the written assignment. The newly redesigned lesson plans showed a transfer of learning in the lesson planning process, though more in-depth knowledge and practice were necessary to develop skills for differentiated lesson plans.

Cycle 3

For this cycle, data was obtained through interviews and focused group discussions after students had gone through a period of school-based experience, where they were given an opportunity to teach. Responses obtained show a high degree of enthusiasm among trainees about their teaching experience and the successful implementation of the strategies and methods learned during training. Most students seemed to associate their success in the classroom with their learning experience on the PBL process.

According to the student teachers, they were challenged in their assumptions and representation of teaching at the primary school level by working on the PBL problems that they confirmed triggered a lot of thinking on the issues underlying teaching and learning from both a traditional and a constructivist perspective. They went through their practicum experience with an improved understanding of the Mauritian school context (Savery & Duffy, 2001).

Many of the student teachers confirmed “an increase in our knowledge...and our lesson plan grew better and better”, and that some of the pedagogical knowledge acquired was done “through readings” and “during the group discussions”. It would seem that these pedagogical gains were infused in some of their classroom practices during the practicum. Students confirmed that they were able to implement some constructivist teaching methods, such as brainstorming, group work and activity-based learning experiences that were devised to arouse their pupils’ interests – even if the current teaching context remained traditional. This situation has been highlighted by Rendas, Fonseca and Pinto (2006).

The practicum seemed to have provided the student teachers with an opportunity to test some of their newly acquired knowledge of some teaching strategies. Taking a hindsight position, they felt they had become more critical thinkers; some were even making fun of the class teachers’ deductive approach to teaching (De West & Walker, 2013). Such changes in practice pointed to the possibility that using the PBL approach during professional development made learning more meaningful for the student teachers – so much so that it helped foster meaningful change in the trainees’ classroom practices.

Time taken to implement PBL led the teacher educators to be realistic, and we decided to restrict ourselves to two triggers instead of three to make room for deeper



learning, both individually and in a group. The implementation of PBL kept all the educators very busy, as the process involved monitoring group work, scaffolding student activities, observing group work, administering different evaluation checklists and time management.

The PBL process also involved a lot of teamwork and collaborative teaching among the teacher educators, as they visited each other's classes.

PBL in teacher education: discussion on emerging issues

A number of issues emerged from the process of implementing PBL in teaching the Pedagogy module in the initial professional development programme of primary school student teachers in Mauritius.

Meaningful learning of pedagogical concepts and practices

Coming from a tradition of teaching that represented “spoon-feeding” from their schooling experiences and lectures or discussions during their professional development, student teachers were confronted with a teaching and learning process that was characterised by non-frontal teaching to self-directed learning. They were expected to own the learning process (Knowles, 1975).

The PBL experiment seems to have resulted in the student teachers being able to learn about and master a number of pedagogical concepts and constructs through self-directed learning, especially through cooperative learning, with some scaffolding from the teacher educators, as testified to by the students themselves:

“We came across a lot of teaching concepts, such as cooperative leaning, how to explain, communication skills, discovering learning, brain-based learning, role plays and questioning...scaffolding...personally I think I've learnt a lot from PBL to be an effective teacher and I look forward to put my acquired knowledge into practice for the best use.”

Other trainees emphasised the importance of their independent reading:

“...through readings we were able to increase our knowledge and afterwards apply it in our work.”

“...went through several textbooks to have an understanding of various concepts for writing a lesson plan.”

It must also be pointed out that not all students achieved the same degree of mastery.

The process allowed students to take ownership of their learning and to become actively involved in the construction of pedagogical knowledge, as testified to by one student:

“Discovery has taken place...it is true that sometimes, due to lots of assignments, we don't have the time to go and do research work at home, but as it was part of our homework, we have done it and it has been of great help to me – the research work ...” (interview)

At the same time, student teachers seemed to have become aware of their personal growth (Maurer & Neuhold, 2012), as evidenced by these excerpts from the interviews:

“We've progressed a lot in terms of knowledge and contribution to work and distribution of work”

“Our lesson plan grew better and better each time.”

The learning process

The learning process through cooperative learning for the student teachers was effective in creating learning possibilities. The students became more meaningfully and deeply engaged in the process of learning by working cooperatively. The positive effects of teamwork were observed by the teacher educators, and were testified to in trainees' feedback:

“I have developed social skills, listening more to my friends and encouraging one another...developed team spirit... can now work better in groups...self-development ...” (trainee feedback).

All individuals in each group evaluated themselves positively in terms of the social skills required to function in groups (listening, taking turns, contribution to discussion, quiet voice, reach consensus and valuing each other's ideas).

Team spirit and teamwork were revealed through the students' verbal and non-verbal language. They could increasingly relate to each other's views and were capable of being reflective and critical, and of challenging each other in their



understanding and presentation of their work, instead of being passive (Thomas, 2000). Student teachers' acceptance to take responsibility for their personal growth led them to further develop their social skills as they explained how they shared information to complete their assignments and how this helped in their personal growth (McPhee, 2002) and by doing so, they showed they could move away from the "spoon-feeding" mode to a self-study and team approach.

"We met several times through Skype and phones and mails and did corrections..." (student teacher: feedback questionnaire)

"We've developed many competencies on teamwork, leadership skills, cooperation, collaboration and socialisation" (student teacher: feedback questionnaire)

Self-evaluation by each member of each group showed that students were taking a critical and reflexive stance (De Jong, Cullity, Haig, Sharp, Spiers & Wren, 2011) regarding the different triggers as they began to take ownership of the learning process.

Our analysis of the process also led us to conclude that student teachers increasingly demonstrated a willingness to question themselves through the self-evaluation process, and they admit that the reflective nature of the tasks "made us reflect on what kind of teachers we want to become..."

Challenge to student teachers' beliefs and representations of local primary education

Both problems crafted by the teacher educators to allow the students to develop their knowledge and understanding of pedagogical concepts and constructs also created a disposition (to a certain extent) in student teachers to question traditional practices in Mauritian primary schools. Having themselves been educated in the context of the traditional transmission model of teaching, they initially thought that that model was the "best". Working on those PBL triggers created an awareness among the students of their assumptions and representations of teaching at primary school level, as evidenced by the following reflection on the coursework:

"PBL has indeed helped me to be aware of the real situations or problems actually existing in primary schools and how these can be tackled. I have been able to identify what teaching skills I must acquire to become an effective teacher through PBL...I have developed my interpersonal and communication skills...how a teacher must behave with his pupils in different circumstances."

At the end of Cycle 2, and during the interviews, we obtained a lot of evidence that the student teachers had a tendency to shift to a more constructivist approach in their construction of the teaching and learning process, especially in the specimen lesson plans that they produced. This may be evidence that there has been a transfer of learning.

Schön (1983) suggests that, in order to allow for reflective practitioners to develop their potential, confrontation with problems is necessary, as it necessitates that learners confront “hunches” to guide their new experiments and develop further reflection. PBL has influenced student teachers in different ways, causing them to review and negotiate their understanding of traditional ways of teaching at primary school level with an approach for self-direction as the process demanded.

This process will inevitably have an impact on their present and future professional development.

Professional growth for teacher educators

The research also provided an opportunity for continuing professional development (CPD) for the teacher educators. The whole process led to their professional growth through reflexivity and an improved understanding of adult learning, while giving the teacher educators the opportunity to take stock of the problems inherent to this new approach to teaching.

In a study conducted by Dolmans et al. (2002), the authors elaborate on how subject area expert tutors tend to focus more on subject matter expertise in a PBL approach, while non-content expert tutors focus more on process facilitation to direct group dynamics. In our case, given that the module taught was non-subject-oriented and predominantly process-oriented, we observed a number of benefits as we experienced the process of encouraging self-directed learning.

The process of interaction was rich, in that we had regular formal and informal meetings. We were prompted by the “newness” of this collaborative endeavour to investigate further and improve each trigger, and discussed our observations and reflections after each interaction and during each cycle. This demanded additional effort and time for planning, as were brought to challenge our assumptions, anticipate new challenges, and report on the team and individual experiences (Barrows, 1986; Pagander & Read, 2014).



The study also influenced our posture as insider researchers (Corbin & Buckle, 2009). For instance, these were our classes and each of us served a dual role as teacher educator and researcher at the same time. We were conducting research in the context with which we were very familiar.

Shifting from one role to the other was problematic and stressful. In the beginning, it was particularly difficult for all three tutors to report in a dispassionate way about the AR. We needed to practice distancing ourselves from the experiences of our respective classes. This is where the approach suggested by Drake (2010) (bracketing our understanding prior to analysis) became important as a process of distancing oneself from the action and research areas. In our case, this process necessitated team moderation, provocation and conflicts throughout the cycles as necessary processes that allowed the data analysis to be meaningful, dispassionate and interpretive for research.

As researchers, we then had to shift from being a reflective practitioner (Schön, 1983) and facilitator in class to thinking deeply about how this process was influencing student teachers and their practice. The overall process thus endowed us with greater tolerance, interpersonal knowledge and insight into the module. The process was also demanding and stressful as, in spite of the planning, we felt constrained by the 30 hours of face-to-face sessions in class, and we often found ourselves negotiating for more slots to advance. Our common understanding of AR using PBL with student teachers as a team initiative was, in itself, a learning process, and was sharpened by the constant process of discussions, implementation and reflection over the cycles. This is in line with what Dolmans et al. (2002) suggest, i.e. that tutors focus more on making the process geared towards self-direction and independence for the learner.

This study allowed us to reflect on another aspect of this module, in particular with regard to the teaching modality, which has traditionally been a face-to-face approach. While a considerable amount of time and energy was spent on the mounting of PBL through an AR project with a focus on the traditional face-to-face approach, we believe we would have to put in greater efforts if this module were to be written or taught through a DE mode. For instance, it would be essential not only to invest in the additional training of staff members, but also to consolidate a practical school-based component within this experience so that trainees could integrate the PBL experiences and triggers, and link these to their learning journey.

CONCLUSION

We started our argument by explaining that we had embarked on a pedagogical project of changing our approach in a specific module of teacher education through a PBL approach by changing the mode of the delivery of courses in teacher education, that is, a move towards DE and OER.

Initially, we were mainly thinking of improving the quality of learning for our students, ensuring that they found the learning to be meaningful and that they went through some sort of transformation from being passive recipients of knowledge to active participants in their own learning. To a certain extent, we were successful in achieving our aims. At the same time, we were able to reflect on the different strategies and methods we adopted to achieve our aims.

During this PBL process, students learned through a variety of modes. They learned through independent reading of the literature on pedagogy from hand-outs distributed by the teacher educators, CDs on the subject, internet materials that, although not really DE materials or OERs, permitted them to develop their knowledge and understanding of different pedagogical concepts, theories and constructs. However, the research revealed that the students needed other aspects of the learning process – the cooperative learning sessions and the scaffolding from the teacher educators –to achieve in-depth learning of the main pedagogical principles, teaching strategies and support processes that may not be in place in many DE programmes. At the same time, student teachers seemed to have come to a better understanding of their role in the teaching and learning process through the PBL process. We were able to observe their transformation from traditionally passive learners into active participants in their learning and the development of their social skills during cooperative learning sessions. Student teachers demonstrated the disposition to be more innovative and inventive in their teaching strategies and



seemed to have understood that they have to resist the pressure in schools to be conventional and traditional in their approach to teaching. At the same time, we witnessed them develop a reflective stance towards education in general, as well as towards the Mauritian education system with its generally traditional classrooms.

All this goes to suggest that, in initial teacher education programmes, student teachers need considerable pedagogical support in terms of the enactment of classroom practices. Teaching involves a number of skills that enable the management of the teaching and learning process in a real classroom situation. It is not easy for the transfer of learning in terms of skills to occur only through reading, understanding and reflecting on the literature, as usually occurs in DE. These teaching skills can only be learned in face-to-face sessions and classroom situations. That is why we are advocating a mixed mode of delivery in teacher education: DE for the theoretical part; face-to-face with more of a PBL approach (so that contact sessions model good practice and are not used to transmit content); and immersion in the school and classroom situation (where teachers need to be able to transfer the theoretical knowledge they have gained from the literature and the experiential learning from the carefully scaffolded face-to-face contact sessions into the dynamic reality of real-life classrooms).

Furthermore, while the use of the PBL approach traditionally taught in a face-to-face manner has been widely researched in trying to understand how learning is enhanced, further investigation is needed to understand its implications in a DE mode. This research can therefore serve as leverage to evaluate the potential areas applicable for such study. A further study will be required to make recommendations about the inclusion of a DE mode in the PBL process.

It is hoped that this research will spearhead a campaign to transform outmoded approaches to teaching and learning in teacher education as we evolve towards alternative approaches to face-to-face delivery.

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APPENDIX

Trigger 2

Tina is a primary school teacher with ten years’ teaching experience. Every day she has to present her lesson plans/notes to the DHM who will vet and sign the copy book in which her notes are written. Tina used to write elaborate and detailed lesson plans just after she left her teacher training institution, the Mauritius Institute of Education; but after a few years, she started to adopt the same practice as other teachers of long experience – her lesson plans were reduced to a few lines, as in the following example:

English for 24 March 2014
 Lesson 7: p.27–28
 The Story of the Little Red Hen
 Teaching the Future Tense
 C.W. p.28 No 1–5

Tina does not mention the teaching strategies she is going to adopt in order to teach the lesson. Her class consists of 23 pupils of varying abilities, background and interests.

Questions to trigger reflection on Trigger 2:

Main questions/diagnostic	Possibilities? Solutions-driven
<ul style="list-style-type: none"> • How much does the example of lesson planning given above resemble what you have observed during your school-based experience? 	<ul style="list-style-type: none"> • Produce an elaborate lesson plan for a lesson of your choice in a subject area of your choice. • Explain the importance of lesson planning.
<ul style="list-style-type: none"> • What are the teaching strategies commonly used by teachers in Mauritian primary schools? 	<ul style="list-style-type: none"> • Identify and explain the importance of teaching strategies that promote active learning and are related to constructivism.
<ul style="list-style-type: none"> • Do teachers usually cater for the different needs of students? 	<ul style="list-style-type: none"> • Explain differentiation. • Plan a differentiated lesson.