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**Potentials and Challenges for Student Teachers in Using
Productive Pedagogies in their Field Experience**

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Abstract

The aim of this paper is to report on an ongoing doctoral study designed to introduce Saudi primary student teachers to the Productive Pedagogies framework in a final year preservice unit in mathematics education, and to investigate its usefulness to guide their practice during their field experience. The focus of this paper is to report on the student teachers' ability to implement the framework in their teaching and to identify any difficulties they have encountered. Each of the participating six student teachers was observed five times during the whole semester for evidence of implementation of the four dimensions of the framework. The observations were followed by individual discussion with the student and their lecturer. In addition, a focus group was conducted with all the participating students at the conclusion of the period of observation to investigate their understanding and views about the use of the framework. The findings indicated that, while the student teachers faced challenges in using Productive Pedagogies in their practice and some of the main dimensions were not highly implemented, there was clear evidence of increasing implementing of each dimension by student teachers over the duration of the observation period.

One main aim of many teacher education programs around the world is to provide the student teachers with different learning and teaching theories and to assist them in their use to develop effective teaching practices. In the last three decades, the dominant theories used in teacher education programs have become student-centred. As Confrey and Kazak (2006) note, teacher education has been dramatically affected by theory of constructivism. "Constructivist ideas have spawned hundreds of books and articles and currently influence classroom teaching practices and teacher education techniques (Oxford, 1997, p36). Goodell (2006) argues that all mathematics teacher educators need to consider the implications of constructivist theory for the teaching of mathematics and incorporate these ideas into methods courses. Many studies in the discipline have adopted varying constructivist approaches in mathematics teacher education programs (Klein, 1999; Ebby, 2000; McDuffie, 2004; Goodell, 2006; Lane, 2007).

Talking about teacher education in the 1990s, Mintrop (2001, p. 207) summarised that, "Our challenge as teacher educators and researchers was to design a teacher education program module that centred on an ambitious constructivist teaching model". Arguably, the challenge remains today for mathematics teacher educators in many countries, including Saudi Arabia, is to develop a framework for teaching to help student teachers to develop their understanding of student centred teaching and thus be better able to apply theories of learning to classroom practice.

According to Richardson (1997) there are two ways in which constructivism has been implemented in teacher education. Some programs focused on the development of specific pedagogies informed by constructivism with their student teachers. Other programs focused on enabling the student teachers to reflect on their own learning and practices and thus develop effective pedagogies in their field experience. Arguably, the approaches that depend on the student teacher using reflection on their practice based on their theories are more effectual for achieving flexibility in adapting pedagogies to the local context of the school and the student.

One possible way in which student teachers can use the learning theories to inform their practices is by making a change in their own beliefs about teaching and learning mathematics (Ebby, 2000; Stuart & Thurlow, 2000; Grootenboer, 2008; Lavy & Shriki, 2008). Mathematics teachers' beliefs influence their classroom teaching practices (Stipek at al. 2001). Many studies have shown that teacher's practices in the classroom are a reflection of his or her beliefs about learning theories and learning styles of students. Teachers' views on learning theories are therefore an important influence on classroom practice. Applefield, Huber and Moallem (2000) state, "teachers' personal theories of learning have long been viewed as having considerable influence on virtually all aspects of teachers' decisions about instruction" (p.1). For example, if the teachers believe that knowledge can be transmitted, then their pedagogy might involve the directed one-way flow of information from the teacher to the student. However, if teachers subscribe to the

constructivist view of learning, they will design activities to help students to build their own knowledge.

According to Llinares and Krainer, (2006) student teachers will have a better opportunity to integrate theory and practice when they are introduced to reflection on teaching practice directly. According to many studies, teacher education programmes should help student teachers to reflect on and analyse their own teaching practices in order to improve their skills of teaching (Artzt, 1999; Ebby, 2000; Morris, 2006). There is a shift in focus in this approach from beliefs to practices; a shift from student learning to pedagogy.

The study reported here has focused on assisting student teachers to reflect on their practices using the Productive Pedagogy framework (Education Queensland, 2001). The framework is a comprehensive tool for thinking about teaching that is perhaps consistent with constructivist theory of learning, however the framework also takes into consideration research from other areas of knowledge about effective teaching.

Based on the results of a large Queensland School Reform Longitudinal Study (QSRLS) (Education Queensland, 2001) and decades of research on teaching from around the world, a comprehensive framework known as Productive Pedagogies was developed in Queensland, Australia to identify the essential features of effective teaching. A primary rationale for developing Productive Pedagogies was to provide a tool for teachers to use to increase their students' learning outcomes, both academic and social (Lingard et al. 2001). The framework was not conceived as a recipe or panacea for teaching but described as "a balanced theoretical framework enabling teachers to reflect critically on their work" (Education Queensland, 2002, p. 2). The framework has a focus on the improvement of student intellectual reasoning and makes teaching and learning in schools more applicable to students' everyday lives in addition to creating supportive environments which accommodate diversity in the classroom and achieve the agendas of equity (Luke, 1999). The developers of Productive Pedagogies postulated that there were four dimensions that characterised effective teaching: Intellectual Quality, Connectedness, Supportive Classroom Environment, and the Recognition of Difference. Each dimension was further elaborated by a number of elements constituting the dimensions (Education Queensland, 2001). For example, the Intellectual Quality dimension identifies the following six elements: higher order thinking, deep knowledge, deep understanding, substantive conversation, knowledge as problematic and metalanguage[1].

Productive Pedagogies has become a central focus of research and academic interest over the last decade. Zyngier (2005, p. 4) commented that "variations of the Productive Pedagogies framework have been adopted in New South Wales, Tasmania, South Australia and Victoria". A

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[1] A full description of the dimension and elements is found on http://education.qld.gov.au/corporate/newbasics/html/pedagogies/pedagog.html

number of studies have modelled Productive Pedagogies in teacher education programs to 1) change pedagogic practice, 2) increase students' awareness of teaching pedagogy and 3) implement critical reflection for their understanding of the framework (Wilson & Klein, 2000; Gore, Griffiths & Ladwig, 2001; Sorin & Klein, 2002; Zyngier 2005; Aveling & Hatchell, 2007).

This paper reports on a study conducted in the context of a doctoral research project with one group of student teachers in Riyadh Teachers' College in Saudi Arabia. The project embedded the Productive Pedagogies framework in the mathematics education component of the course during the last year of the student teachers' course and utilised it in their field experience. In particular, this paper aims to 1) identify some of the difficulties encountered in the use of the Productive Pedagogies to improve the students' experiences in their field experience, and 2) highlight student teachers' improvement in using Productive Pedagogies over the observation periods. The following section discusses the context and design of the study. The major findings of the study will then be elaborated. The paper concludes with a discussion of some of the applications of the research for teacher education programs.

The Study

Prospective primary teachers of mathematics at the Riyadh Teachers' College undertake a four year Bachelor of Education course. The course contains a unit called "Mathematics Teaching Methods" in their seventh semester. The unit contact time is two hours each week for 14 weeks. In this unit, the students consider various mathematics teaching methods and their application. During the following final semester of the course, the students are engaged in fulltime field experience which includes teaching mathematics for a minimum of eight lessons per week for the full semester.

This study took place during both final semesters of the course and was conceptualised to consist of two phases. In *phase 1*, student teachers were introduced to the Productive Pedagogies framework in the unit of Mathematics Teaching Methods. In other words, the framework constituted part of the content of the unit and was used as an overall organizer to integrate the other content usually covered in the subject. At the same time, the framework was used by the lecturer in his teaching of the subject, thus modeling the principles of the framework in the classroom. The data collection for this phase consisted of the lecturer-researcher and student teachers own reflective journals and three focus groups with selected student teachers.

In *phase 2*, six student teachers were followed into their field experience at two participating primary schools. Each student teacher was observed five times during their field experience. In

each observation, evidence of implementation of the four dimensions of the framework was ascertained by using the QSRLS Productive Pedagogies Classroom Observation Manual (Education Queensland, 2001) which formed the basis for the usual feedback from the lecture on the observed teaching. The coding manual contains each element of the four dimensions, together with a score derived from a five point Likert scale indicating the level of manifestation of the element in that particular lesson (1 being the lowest). For example, in the Higher Order Thinking element of the Intellectual Quality dimension, the lesson was rated as 1 if the students were engaged only in tasks requiring lower order thinking such as receiving or reciting information, or participating in routine practice of acquired skills. However the lesson was rated as 5 if almost all the students, almost all of the time, are engaged in higher order thinking (Education Queensland, 2001). The coding for each lesson was used as a basis for the debriefing meeting between the supervisor and student where students were asked to indentify dimensions that they may want to concentrate on in future lesson plans. In addition, a focus group and semi-structured individual interviews were conducted with participants to investigate their understandings and views about the use of the Productive Pedagogies in their practice. There was a formal meeting for two hours at the teacher college each week to review and discuss their observations as well as to raise different issues regard classroom practices.

Key Findings and Discussion

The data collected from the student teachers in *phase 2* of the study showed that while there were some difficulties encountered in the use of the Productive Pedagogies to reform teaching, there was clear evidence of increased implementation of each dimension by student teachers over the duration of the observation period. The following two sections discuss each theme separately.

Difficulties encountered in the use of the Productive Pedagogies

Data on the use of the framework was gathered regarding the implementation of the four dimensions, Intellectual Quality, Connectedness, Supportive Classroom Environment and Recognition of Difference. In spite of some evidence showing attempts to implement the Productive Pedagogy framework in student teachers' field experience (see Alsharif & Atweh, 2010; Alsharif & Atweh, 2011), it was noted that some of the main dimensions were not implemented by the student teachers in their practice to any great extent. Careful consideration of the data represented in Figure 1 shows that there was a noticeable variation in the scores on the four dimensions, which in turn implied some variation in the use of the different elements in the model. While overall the student teachers scored slightly high in Supportive Classroom Environment dimension (2.42), they

scored very low in Recognition of Difference (1.47). In general, student teachers' scores were low in all dimensions.
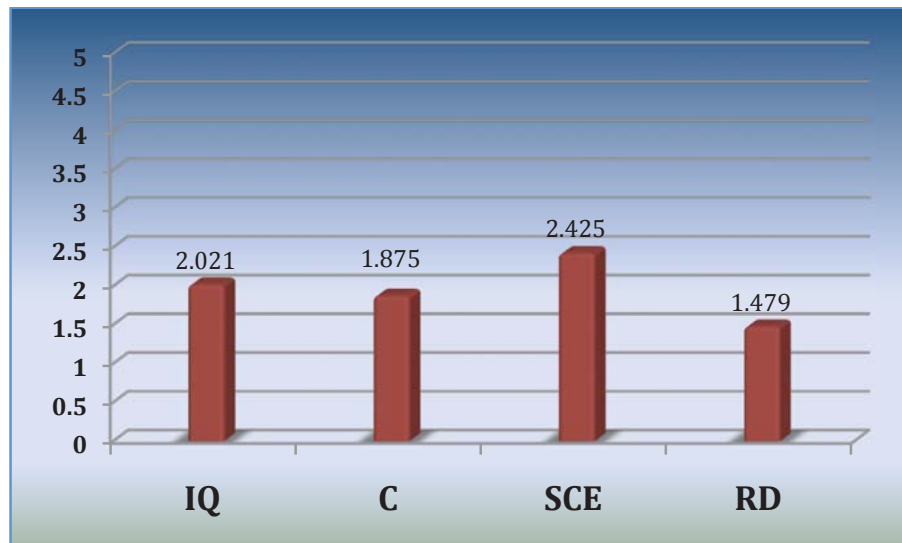

Figure 1: Student teacher scores on the implementation of the four dimensions of the Productive Pedagogies framework

Discussion with the student teachers pointed to a few hindrances identified by the students themselves in using some dimensions of the framework. In this paper, we discuss the difficulties pertaining to 1) teaching the mathematics subject, 2) students' levels of development, 3) school environment, and 4) socio-cultural factors.

Difficulties due to the teaching mathematics: First, some students reflected that certain elements of the framework were not easy to apply in mathematics lessons. For example, some student teachers claimed that teaching mathematics did not easily allow for the successful implementation of the Recognition of Difference elements like Narrative, Group Identity and Active Citizenship.

> *Recognition of Difference was the most difficult part of the productive pedagogies framework. That was due to the lack of clarity of how to implement citizenship or narrative into the mathematics lesson (PT7, Phase2, Interview).*

Another participant shared the same view and stressed that

> *Usually telling stories, as a teaching approach, is not strong enough to help students to understand mathematics, for example, in geometry units (Year 4) students need to learn how to use math kits such as protractor and pencil compass properly to measure angles and draw circles, where narrative cannot help them to learn these skills. (PT4, Phase2, Interview)*

The use of narrative, which is a form of storying and narrations, as a teaching method is increasingly used in education (Dettori & Paiva, 2009). The use of narrative in the literature is not restricted to subjects such as writing, history, and language subjects, but also has some application to mathematics and science education (Burton, 1996; Bruner 2004). However, Solomon and O'Neill (1998) argue that mathematics knowledge cannot be adequately conveyed in narrative form. Arguably more research in mathematics education is needed in this area. Student teachers

asserted that narrative as a teaching approach might limit their teaching activities to provide their students with useful assistance to understand some mathematics concepts.

Not only narrative was poorly implemented in mathematics by student teachers, active citizenship and group identity also were implemented less in mathematics lessons.

> *I cannot implement active citizenship in every lesson, and I taught many lessons before I found a link where I could talk about this element in my practice (PT9, Phase 2, Focus group).*

It should be stressed that, traditionally, mathematics textbooks do not address social issues as context to problems. Perhaps this is a reflection of the "objectivity" of mathematical knowledge and its strong relation to science and technology. Hence, a teacher who wants to encourage citizenship through mathematics needs to look for outside sources for inspiration. Perhaps the ability of student teachers to do that is limited. Some participants believed that achieving active citizenship does not belong to the disciplines but the school itself needs to be more involved in the effective facilitation of such elements of the framework.

> *I believe that the school administration should be responsible for the creation of activities that support active citizenship and group identity, (PT6, Phase 2, Interview)*

Difficulties due to the student level of development: Some of the participating student teachers indicated that certain elements of the framework were not easy to apply because of the students' level of development. There were some observable differences in the use of the framework between teachers at higher and lower year levels. The interviews and focus group discussions indicated that student teachers at lower levels of the school faced some difficulties in the earlier years (Years 1 – 3). Some student teachers have attributed these difficulties to the level of maturity of the students and their language abilities.

> *For students at the lowest stage, the activities that focus on higher order thinking can be difficult because they require high mental capacity (PT6, Phase2, Interview)*

Student teachers were concerned that a focus on higher order thinking should provide a challenge for the students; however, student may find these tasks too frustrating and may not be able to cope with them, thus resorting to copying the responses of other more capable students in the class. These student teachers have concluded that higher order thinking tasks should be used judiciously when considering their appropriateness to the students' particular level of knowledge development. Student teachers who teach students at lower levels seemed to experience some difficulties in posing questions that encourage their students to use higher order thinking in mathematics. They seemed to have less confidence in providing students with appropriate tasks to practice higher order thinking skills. According to Way (2008) many studies continue to show that teachers raise few questions that encourage children to use higher order thinking skills in mathematics. This is because students are inexperienced in these kinds of tasks or questions or that teachers are yet to developed their skills in using higher order thinking skills in their teaching (Way, 2008). Engaging students in higher order thinking was not an easy task for student teachers

and they needed to be certain that tasks and activities challenge students, not disappoint them. Student teachers should focus on the level of students' thinking and capabilities and match the tasks to suit the students.

Similarly, substantive conversation was another element where student teachers faced challenges in implementation with students at lower levels. One student teacher acknowledged:

> *Applying substantive conversation with my students (Year 3) seemed to be difficult. I encouraged them to raise questions, but there were no more questions to be raised in the classroom (PT6, Phase2, Interview)*

Involving students in in-depth discussions to understand the mathematical concepts was challenging for these student teachers. In traditional classes, at times, students resisted sharing their mathematics thinking or they were not comfortable with expressing themselves. The classroom seemed to have less student-teacher interaction in these cases. Kitchen (2004) stressed that novice teachers may find that motivating quiet students to express out their mathematical thinking is practicality difficult. While many studies indicated that engaging students in exchanging ideas and opinions during class dialogue would help them to grasp the complex relationship between the mathematics concepts, student teachers who teach at lower levels found it difficult to focus on substantive conversation in their teaching practices. Student teachers, and for that matter novice teachers, are often limited in their teaching by their previous experiences as students of mathematics. Traditional mathematics classrooms are known for presenting the context through teacher centred approaches where there is limited engagement of students in dialogue and the raising of questions to understand the concepts.

Also, Metalanguage, which refers to pedagogies that incorporate frequent discussion about talking and writing, had limited implementation in most of the mathematics lessons observed. One participant stressed the difficulty of incorporating discussion about talking and writing into the mathematics classroom by saying that

> *In my class (Year 3) focusing on aspects of language or writing will use up too much teaching time. Students have difficulty in reading and writing because they are still young. I usually have to read the questions to them (PT6, Phase2, interview)*

Another student questioned whether metalanguage is applicable at all in subject such as mathematics.

> *I could not create activities to apply the metalanguage element in my lesson. I think this element will be more suitable for social studies and Arabic language classes (PT3, Phase2, interview)*

These responses from student teachers indicated that some elements of the Productive Pedagogies framework were challenging. The lack experience in using higher order thinking, substantive conversation and metalanguage to illustrate mathematics concepts indicated that student teachers at lower levels seem to provide limited opportunities for students to discuss,

negotiate, explain and reflect their own ideas. It is worthwhile to mention that the field of early childhood education in Saudi Arabia is slowly evolving. Considerable work needs to be done in this area to investigate what young students are capable of and how to provide them with challenging opportunities to promote their intellectual development.

Difficulties due to the school environment: Some elements of the framework were not seen to be easy to apply due to the school environment as a whole. Student self-regulation was one of the hardest elements that student teachers had struggled to apply. From an observation of a Year 5 class, I noted 23 instances within the 45 minutes of class where the teacher had to discipline students and regulate their movement. The teacher spent considerable classroom time to control students' behaviours.

> *My class was interrupted many times because the school principle usually sends students to check all classes for different reasons (PT9, Phase2, Reflection).*

Other participating student teachers stressed that

> *My current problem is spending more time to control the students ... I cannot implement the student self regulation element well, I usually interrupt the lesson to discipline students (PT7, Phase2, Focus group)*

The student teachers felt that they need greater support from the school administration to help them to find ways to manage their classes. Student teachers were concerned about keeping the class quiet all the time. The student teachers would not allow their students to engage in discussion or talk with each other students without the teachers' permission. This may be explained by student teachers lacking confidence and experience in sharing control with students. Thereby, they tended to rely heavily on teacher-centred pedagogies. Also, this is partly due to the inadequate primary level lesson times of 45 minutes where teachers feel under pressure to finish the lesson quickly and efficiently at the expense of sharing the direction of the class with students.

In addition, the school environment seemed to limit student teachers' ability to apply the Connectedness dimension at a significant level. The school's tradition of strictly following textbooks as guides for planning and assessment were found to restrict the teachers from creating activities that may help students to combine mathematical knowledge and the real world outside the classroom. In Saudi schools, each student is provided with free printed textbooks for all subjects. The textbooks contain the prescribed lesson content and specific exercises that the students should learn. This puts teachers under pressure to follow the tradition of the school and use the textbook as the main source of students' work.

> *Completing students' text book questions with them and offering feedback while reviewing their work is important to my teaching" (PT6, Phase 2, Reflective Journal)*

As a supervisor of the student teachers' field experience, the first author was aware of being subjected to this same limitation. As part of the traditional classroom observations required by the

college, the supervisor is required check the students' textbooks to see how the student teacher corrected the students' work. This practice itself tends to reinforce the focus on textbooks and limits student teachers' thinking required to create different and rich activities that might help them to effectively apply the Connectedness dimension.

Knowledge Integration was also another element that student teachers had faced difficulty in implementing in their field experience because of the school environment. The student teachers were subject to the traditional demarcation between the different school subjects in terms of content that is reinforced by separately timetabled lessons that are taught by different teachers. Undoubtedly, this is, in part, a result of the lack of the student teachers' experience and the limited possibilities of discussion with other teachers in other subjects taught at the school.

> As a new teacher in the school environment and a first timer, I cannot make links between what I teach and other subject areas. I guess as time goes on, I should be able to integrate the lessons with other school subjects successfully" (PT6, Phase 2, Interview)

> There are no opportunities for formal meetings or discussions about subject area integration, in our school. Whenever I attempt to establish a discussion about our practice with other teachers, they do not take it seriously because I am a new teacher. (PT9, Phase 2, Interview)

Commenting on the school environment, Hayes, et al. (2006) argued that schools played a role in the effectiveness of these pedagogies. Regular meetings between teachers in schools and reflection on their teaching practice might help to increase the awareness of the quality of pedagogies. More time for teacher professional discussions with their colleagues about the framework will support and value their work (Lingard, Hayes, & Miles, 2003).

Difficulties due to socio-cultural factors: Some elements of the framework were not highly implemented because of some socio-cultural factors. It is worthwhile to note in this context that these are not difficulties identified by the students themselves but by the first author as teacher researcher.

First, Schools in Saudi Arabia provide limited space for democratic practices. Indeed, teachers have no space to engage in a social dialogue which would enable full democratic communication and participation within the school. As could be expected, this inevitably reflects on their interactions with students in the classroom. Perhaps this partly explains that some elements, such as active citizenship, were poorly observed in the classroom observation. The class where a teacher controls the room with no negotiation of rights or responsibilities attributed to students is an example of class with less active citizenship (Education Queensland, 2002). In addition, student teachers during the focus group interview raised questions about the benefit of focusing on active

citizenship in their mathematics lessons since their students take a unit called "national education". Even though students from Year 4 until Year 12 study national education for one lesson each week, they were required to just memorize some facts and general information about the country. It is doubtful that this subject would provide sufficient development of citizenship.

It is worth mentioning that in the education policy of Saudi Arabia, active citizenship was considered and has been highlighted by several articles in the education policy document. Some of the subjects addressed in these articles include the need to: provide students with the skills and knowledge necessary for being an active member of society; sharpen student's understanding of the cultural, society, and economic problems of society, and prepare them to participate in constructive solutions; and encourage social solidarity among members of the community through cooperation, love, fraternity, and placing the public good over private interests (Ministry of Education, 1980). However, these valuable principles need to be observed in all curriculum and classroom practices, as well as in all school decision making processes.

Second, it is perhaps due to a lack of research on the learning and pedagogies and an absence of educational reform movements in the country that education has remained very traditional. Above, we have discussed the reality that mathematics education teaching remains dominated by the textbooks. The textbooks themselves present mathematics as abstract decontextualised knowledge, dominated by concept and procedures with limited applications and problem solving activities. It contains very limited and artificial real world examples. Student teachers and, for that matter, all novice teachers, are often limited in their teaching by their previous experiences as students of mathematics. Perhaps this is one factor that partially explains why student teachers may have found it difficult to implement the Connectedness dimension of the Productive Pedagogy.

This traditional context of education extends to methods of teaching that the students and teachers are acculturated into. Traditional models of teaching in Saudi Arabia are dominated by teacher centeredness, with teachers as the source of knowledge and having the main responsibility for knowledge transfer. Providing information in an oversimplified way is the common teaching mode in Saudi classes. Students are accustomed to being spoon- fed by teachers. This teacher centred environment limits opportunities for student negotiation, dialogue and experimentation. In addition, the classroom environment in primary school tends to encourage students to compete rather than cooperate with each others. Clearly, these traditional dominant practices hinder the application of models of teaching promoted by Productive Pedagogies.

Improvement in the use of Productive Pedagogies over the time

The data collected from classroom observations showed clear evidence of improvement in the implementation of Productive Pedagogies by student teachers over the time. Figure (2)

illustrates the change of the means in all dimensions throughout the observation period. As can be seen, there was a considerable increase on the all dimensions; Intellectual Quality, Connectedness, Supportive Classroom Environment and Recognition of Difference during the observations.

As shown in Figure 2, in the first observations round, the student teachers scored only 1.44 out of 5 in the Intellectual Quality dimension, and 1.25 in Connectedness dimension. In the Supportive Classroom dimension the score was 1.73, and in the Recognition of Difference dimension it was 1.23. Over the next four observations, student teachers scores increased gradually on all dimensions. In Intellectual Quality dimension student teachers' score increased from 1.44 to 2.43, while in the Connectedness dimension their score increased from 1.25 to 2.37. In the Supportive Classroom dimension, student teachers' score almost doubled from 1.73 to 3.06, and in the Recognition of Difference dimension, it increased slightly from 1.23 to 2.09.
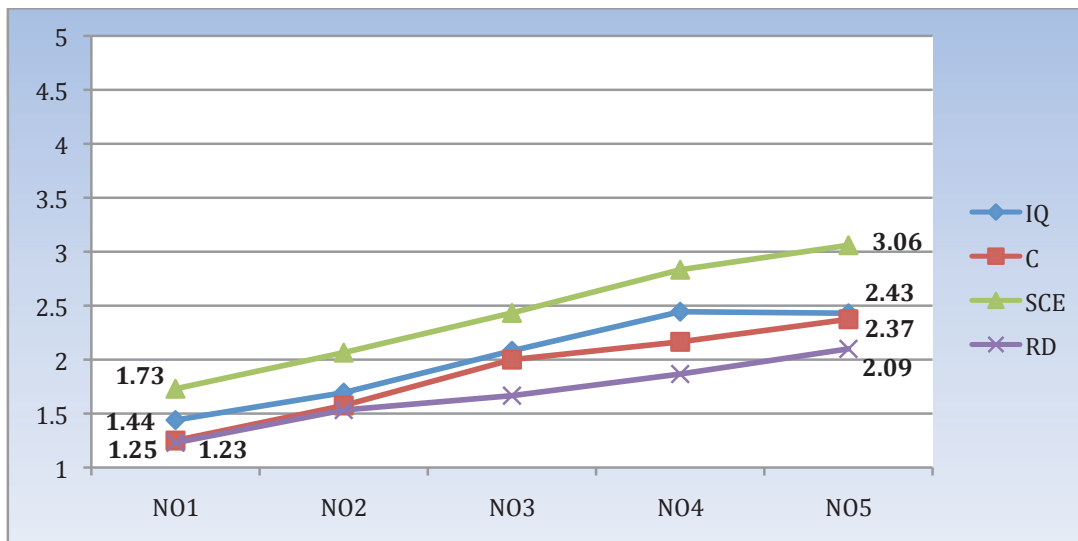

Figure 2: The change of the means of productive pedagogies dimensions through the observations period.

The student teachers themselves seemed to be aware of their increased ability to use the different dimension in their field experience.

> *I felt that my teaching improved from one day to another. I adapted my way of teaching to meet with most principles of Productive Pedagogies (PT3, Phase 2, Reflection).*

Another participant asserted

> *My teaching skills improved from one lesson to another. As a beginner, my implemention of higher order thinking, substantive conversations and connectedness were low, but improved after I focused on them (PT6, Phase 2, Reflection) .*

The student teachers have utilised the framework in a variety of ways to expand their teaching practices according to the characteristics of effective teaching stipulated in the framework.

For some students, the framework was a useful tool to reflect on their own practice. One student teacher asserted

> *How to improve my teaching? Before I asked myself this question, I should ask what the level of satisfaction of my teaching is and what I want to do to improve it. Then I think I can develop my teaching skills. If you do not move forward, you definitely will go backwards. (PT9, Reflection, Phase 2)*

Another student teacher found that using this model to share their experience with their colleagues helped to expand their understanding of the framework and develop their teaching skills.

> *The experiences gained from the discussion with my supervisor and my colleagues in the weekly meeting, helped me in solving some of the problems that I faced in implementing the framework. (PT4, focus group 4, Phase 2)*

Yet another student teacher used the Observation Manual in his observation of more experienced teachers to his benefit in developing his own understanding of the framework and its application:

> *I developed my teaching skills by attending some of the lessons of expert teachers during my free time in the school. This helped me to recognize how the framework might be able to be applied. (PT5, focus group 4, Phase 2)*

Finally, the meeting with the supervisor has provided some student teachers with not only the ability to recognise areas that they may be neglecting, but also to develop specific plans to rectify them.

> *I will work on creating a classroom environment where students can share their views and opinions freely so that they understand the lesson well. I will increase the mutual respect between students and encourage them to participate. (PT5, Reflection, Phase2)*

> *In the next lesson, I will start with a story to attract the attention of my students, and I will connect the lesson to their everyday life. (PT3, Reflection, Phase2).*

Concluding Comments

The experience of this selected group of students in using the Productive Pedagogy as tool for planning and reflecting on their field experience has demonstrated its overall usefulness. There was a demonstrated increase in the use of practices encouraged by the framework over the observation period. Students' interviews and focus groups indicated they were appreciative of the use of such a framework in this part of their training. Here we make some comments of the possible implications of this study for preservice teacher preparation in general and in Saudi Arabia in particular.

First the use of student teachers' reflection on their practice is an effective means of developing the professional practice of student teachers. This is in line with previous research (Loughran, 2002). The use of the Productive Pedagogy framework and in particular tools such as the Observation Manual, have assisted these student teachers to focus their reflection and use it as a means through which to talk about it with others. In particular, the framework assisted them to focus on their own practices and helped them to identify ways in which it can be improved. Here, we argue that such as focus on practices is more effective than a focus merely on their beliefs.

Undoubtedly the implementation of all four dimensions of the model at the same time must provide the student teacher with a sense of anxiety. However, this was not the intention here. The participating teachers were given the opportunity to identify a few elements that they would like to

concentrate on for the next lesson. Further, the use of scoring means as recommended in the Classroom Observation Manual may have the negative effect of making teachers lose confidence in their teaching and performance in the course requirements. Once again, care should be given in supporting teachers to improve their practice rather than the use of the Manual to assess their performance.

Second, this research has identified several hindrances that the students and the researcher have expressed as areas in need of attention to enable an increased use of effective pedagogies in the classroom. Many of these limitations may be due to a lack of knowledge by the teachers as to how to implement these dimensions at an appropriate level to the development of the student or to the subject of mathematics in particular. These noted limitations call for increased attention by teacher education courses on early childhood education as a whole and in mathematics education in particular. We remain committed to the idea that the Productive Pedagogies is useful across the school levels and in all subjects. However, the meaning of some of the identified dimension and elements with specific age groups and specific school subjects may require further unpacking.

While some of the hindrances identified above relate to schools, educational systems or even society that cannot be easy to change by a single teacher, let alone a student teacher, teachers who can develop confidence in the implementation of these characteristics of quality teaching and have experience how can they improve their practice, are at least in a better position to negotiate the contextual constraints in order to achieve more productive teaching in the classroom. What can be done and what needs to be done are not universal givens. They are very much culturally determined. Hence further research on what is needed and what is possible in Saudi Arabian context is crucial. Our research has indicated that the use of Productive Pedagogies is possible and useful with Saudi student teachers. However, the problems that may be encountered with its use and how to support teachers to contribute to improving their practice should be the subject of future research and professional development

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