

Preparedness of Female Mathematics Preservice Teachers in Saudi Arabia

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Recently, calls have been made to improve student learning outcomes through focusing on teacher quality. Initial teacher education is considered to be one of the most important factors to enhance teacher quality and is closely linked with feelings of teaching efficacy in beginner teachers. Based on a study examining female Saudi preservice teachers' (PSTs) sense of preparedness to teach mathematics at secondary or intermediate school level, this paper explores how well Saudi PSTs feel prepared to teach mathematics and their related teacher efficacy by examining interviews with a sample of PSTs, who were in the final year of their 4-year teacher education program. The findings show that these PSTs felt prepared regarding teaching methods and strategies but felt less prepared about other aspects of teaching, such as classroom management, lesson preparation, and integration of technology. The findings from this study contribute to the current efforts towards improving teacher quality worldwide, including initial teacher education in Saudi Arabia.

Keywords Preparedness to teach · preservice teachers · mathematical knowledge for teaching · initial teacher education

Introduction

Internationally, the unprecedented attention given to teacher quality and accountability (Cochran-Smith & Villegas, 2015) has resulted in an increased focus on the nature and outcomes of initial teacher education (ITE) (Lim, 2011). Charged with preparing graduates for teaching, ITE is considered to be "an ideal site for increasing teacher quality, providing it is subject to reform" (Ell & Grudnoff, 2013, p. 79). For teacher graduates, preparedness to become a quality teacher—a teacher who will impact productively and equitably on student achievement in schools—includes not only the development of teacher knowledge and professional disposition and vision, but also a sense of preparedness and feelings of teaching efficacy.

Teaching quality is directly related to learning achievement and, as indicated by Darling-Hammond (2006) and Hattie (2012), it is the most important school influence on student outcomes. In terms of teaching quality, graduating teachers who have strong feelings of preparedness are likely to perform better in the classroom than those who do not. Moreover, well-prepared graduates tend to stay in the profession for longer (Carver-Thomas & Darling-

Hammond, 2017). On the other hand, teachers who do not feel well prepared have a disruptive influence on the classroom environment (Mitchell, Marsh, Hobson, & Sorensen, 2010), with lower student outcomes, and they are more likely to abandon teaching as a career (Carver-Thomas & Darling-Hammond).

With a lot at stake, ITE is increasingly held accountable—through the likes of Graduating Standards—for demonstrating that it can prepare quality teachers (Swabey, Castleton, & Penney, 2010). However, the design of ITE programs involves “a range of complex and even controversial issues” (Cochran-Smith & Power, 2010, p. 6) that can influence teacher preparation and indeed PSTs' sense of preparedness. PSTs need to feel well prepared in a number of areas, namely content knowledge (CK), specialised pedagogical content knowledge (PCK) and pedagogical knowledge (PK) (Ghousseini & Herbst, 2016). CK is defined as the “amount and organisation of knowledge per se in the mind of the teacher” with “understanding the structures of the subject matter” (Shulman, 1986, p. 9) and PCK is knowledge about how to present the CK to students (Ball & Forzani, 2010), whereas PK is the knowledge needed for teaching that applies to all curriculum areas (e.g., principles and strategies of classroom management, and theories of teaching and learning) (Shulman, 1987). As well as having the ability to choose appropriate materials and being skilled in a range of effective pedagogical approaches, a well-prepared PST should feel confident about his or her knowledge of students' mathematical understanding and understand how different social and cultural contexts can influence student learning outcomes (Petrou & Goulding, 2011).

It has been widely acknowledged that PSTs' beliefs regarding teaching and learning have a strong influence on their teaching practices; however, few studies have examined how such beliefs can affect feelings of preparedness (Buehl & Fives, 2009; Leong, 2012). Several researchers examining PSTs' levels of preparedness (e.g., Kraut, 2013; Ord, 2010) found that PSTs' self-perceptions of preparedness are uniquely determined, according to individual definitions. Most typically, their feelings of preparedness are linked to self-perceived levels of the different types of teacher knowledge. For example, Leong found that beginning teachers believed sound CK to be the best indicator of good mathematics teaching, in that having sound CK helped them feel more confident, especially in planning lessons and explaining mathematical concepts in a variety of ways. Likewise, CK, alongside PK, was also regarded by PSTs in Buehl and Fives' study as vital for teaching quality and an important aspect of PSTs' sense of preparedness.

Internationally, the recognition of the role of teacher quality in influencing student learning outcomes has led to widespread reforms of ITE programs (Lim, 2011; Zeichner, 2012). Reforms in teacher education, aligned with calls to enact improvements for mathematics education, argue against the narrow and frequently deficit focus on the learner to focus more on supporting teacher quality (Alsharif, 2011; Knight et al., 2015). Saudi Arabia, in response to a low Trends in Mathematics and Science Study (TIMSS) rating achieved in 2007 (Mullis, Martin, & Foy, 2008), which highlighted poor student outcomes in mathematics, has also begun to consider the issue of teacher quality. In an analysis of recent reforms that focused on only a few aspects of the education system, both Alghamdi (2013) and Dodeen, Abdelfattah, Shumrani, and Abu Hilal, (2012) called for more effort to be put into addressing teaching styles and theories of classroom instruction, especially in light of their influence on student outcomes.

Educational reform is a particular concern in Saudi Arabia, possibly more so than in other countries, because of the push towards increasing the nation's human capital and diversification of the economy (Zaenalabedein, 2016). Calls to overhaul the traditional education system with its

focus on testing and assessment has prompted calls to improve and change ITE (Alshamrani, 2012) in order to create a student-focused outcome-based education system (Zaenalabedeen). The strong shift in focus and accelerated pace of reform makes this a unique situation within the context of research into educational reform and ITE. Teacher-related factors, including how well PSTs are prepared to teach and their feelings of teaching efficacy can provide indicators of how well reforms have progressed. Teaching efficacy – defined as what a teacher or PST thinks about his/her effectiveness and what he/she is capable of doing as a teacher (Clark, 2009) – has been shown to be a strong indicator of teacher quality (Brown, Lee, & Collins, 2015).

Despite a programme of ITE reforms in Saudi Arabia there are to date only a handful of studies on ITE in that country (Almoathm, 2008; Alsharif, 2011). Of these, only a few considered the topic of mathematics education and there are no studies focused on the preparedness of female mathematics teachers or PSTs. In addition, as is the case of many of the international studies, the perspectives of PSTs are not often considered in the research on teacher education (Alghamdi, 2013). This study aimed to fill this gap in the literature and give a voice to the perspectives and views of PSTs in Saudi Arabia, regarding how well they felt prepared to teach mathematics, and particularly the voice of female PSTs, where the research was only able to focus on female participants for cultural and religious reasons. Drawing on a larger mixed methods study that explored female Saudi PSTs' sense of preparedness to teach mathematics in intermediate or secondary schools, this paper provides insights gained from interviews with a sub-sample of PSTs. In exploring their sense of preparedness to teach we address two research questions:

1. What beliefs do Saudi female PSTs hold about being prepared to teach?
2. How do Saudi female PSTs perceive their level of preparedness to teach mathematics?

The findings, situated within the context of Saudi ITE, will add to the knowledge of the nature of reforms needed to improve the quality of those teaching mathematics at intermediate school and secondary school level in Saudi Arabia. Further understanding of the factors that impact on PSTs' sense of preparedness and feelings of efficacy may also help other reform initiatives in this country.

Literature Review

Earlier studies conducted in Saudi Arabia (e.g., Al Nazeer, 2004; Ben-Motreb & Al-Salouli, 2012; Khashan, 2014) revealed that many PSTs lack the content knowledge (CK) needed for good teaching; they had a superficial level of knowledge rather than a deep and thorough understanding of mathematics. For primary teachers, these findings held for both beginner and experienced male and female teachers. Internationally, studies into PSTs' CK have found that those teaching at primary or intermediate school tend to feel less prepared because they felt they had lower levels of CK, but this was not typically found for specialist secondary teachers (e.g., Lim, 2011; Hine, 2015). The role of CK is important in efficacy and effective teaching, as indicated by Hill et al. (2008) who found that mathematics teachers with strong CK were less likely to make mistakes when demonstrating how to solve problems, tended to use more rigorous mathematics in their teaching, and were able to answer students' questions skilfully and thoroughly. Along similar lines, Mae (2019) found that Australian teachers CK was a significant factor in teachers' noticing and capability to design high cognitive level problems for their students.

In relation to PSTs, Balatti and Rigano (2011) noted that qualities of preparedness included good communication skills, the ability to use creative learning tasks, use of authentic examples in teaching, taking a student-centred approach in selecting teaching strategies, an ability to relate to students, and having good organisational skills. Balatti and Rigano suggested the PSTs' responses indicated their awareness that teaching efficacy was more than simply having sound CK. This argument aligns with earlier studies (e.g., Askew, Brown, Rhodes, Wiliam, & Johnson, 1997; Petrou & Goulding, 2011) that argued that someone with sound CK alone may not necessarily be a good mathematics teacher.

Another area that has a strong influence on feelings of preparedness is that of PK, particularly in the area of behaviour management. In an Australian study, O'Neill and Stephenson (2012) found that PSTs felt somewhat prepared in the area of managing student misbehaviour. These PSTs felt confident in their ability to use a range of strategies to manage behaviour but, in practice, they only used a few strategies (e.g., praise and encouragement). This contrasts with the findings of Cabaroğlu (2012), who found that the narrow range of behaviour management strategies used by PSTs in Turkey tended to be reactive strategies (e.g., shouting and threatening). Although it may be tempting to view these different findings as a reflection of the difference between Western and non-Western nations, the situation is more complex, as highlighted by the research of Roble and Bacabac (2016). Situated in the Philippines, Roble and Bacabac concluded that mathematics PSTs felt confident about their ability to use a broad range of strategies for managing behaviour. Potentially, the present study into the feelings of preparedness of Saudi teachers could help illuminate cross-cultural patterns.

In the area of mathematics, strong PCK is a good indicator of teacher quality and is likely to directly affect the students' achievement in mathematics (Baumert et al., 2010) through assisting students by identifying their (mis)conceptions and creating a stimulating classroom environment (Blömeke, Olsen, & Suhl, 2016). Although PCK is widely considered to be vital for preparedness and teacher efficacy (Ball & Forzani, 2010), research involving PSTs present varied levels of association of PCK with preparedness to teach or "good" teaching. For example, Lee and Tsai (2010) found that PSTs struggled to distinguish between the constructs of PK and PCK. However, in an Australian study, Hine (2015) found that almost all primary and secondary PSTs stressed the need to strengthen their PCK, and in a further study (Hine & Thai, 2018) secondary mathematics PSTs perceived themselves as lacking the PCK needed to teach effectively. In the context of Saudi Arabia, Ben-Motreb and Al-Salouli (2012) found that many of the 40 PSTs surveyed lacked adequate PCK and were unable to explain the concepts they were teaching, to show connections between and among different strands of knowledge or explain how mathematical concepts apply in daily life.

Supported by Darling-Hammond, Chung, and Frelow's (2002) research which concluded that efficacy was the strongest predictor of PSTs' preparedness, teacher efficacy is often used as a tool for quantifying PSTs' sense of preparedness. Darling-Hammond et al. noted that PSTs who felt better prepared had a stronger tendency "to believe they could reach all of their students, handle problems in the classroom, teach all students to high levels, and make a difference in the lives of their students" (p. 15). On the other hand, PSTs who did not feel well prepared were "more likely to feel uncertain about how to teach some of their students and more likely to believe that students' peers and home environment influence learning more than teachers do" (p. 15). Similarly, Clark (2009) found that the most important indicators of how well PSTs would be able

to cope with daily classroom life—and ultimately the success of their teaching career—were a sense of preparedness and teaching efficacy.

Earlier studies on preparedness of PSTs specialising in a range of curriculum areas (e.g., Darling-Hammond, 2006; Zeichner & Conklin, 2005) found that the majority of graduates felt sufficiently prepared to teach. Moreover, they attributed the ITE program to have been beneficial in preparing them for their teaching careers. Similarly, Anthony et al.'s (2008) study involving 855 graduating secondary teachers in New Zealand found that approximately 87% of those teachers felt well or very well prepared to start teaching. A more in-depth examination of the data found that despite PSTs' reports of a sense of preparedness overall, they felt less confident in some areas. For example, PSTs did not feel well prepared in the areas of assessing and monitoring student progress, responding to diverse students' needs, inclusive educational practices related to Māori (indigenous) students, and communicating and working with the parents. In the United States, Koehler, Feldhaus, Fernandez, and Hundley (2013) found that PSTs felt inadequately prepared about classroom management and their ability to meet students' psychological needs.

Studies on PSTs' sense of preparedness in Saudi Arabia are lacking, but research from other developing nations, such as Ghana (Agyei, 2012) and Kenya (Ng'eno, Githua, & Changeiywo, 2013) and Solomon Islands (Rodie, 2011) note a more comprehensive list of concerns. For example, Solomon Island PSTs lacked confidence about assessment planning, writing reports, communicating with students and other teachers, standing in front of the class, preparing resources for teaching, and managing misbehaviour. A commonality among these studies was the finding that many PSTs felt unprepared about the use of information technology. A lack of familiarity with ICT, difficult access and a lack of infrastructure were also found in the context of many schools in Saudi Arabia (Alshehri, 2012).

In summary, the literature on PSTs' feelings of preparedness and teaching efficacy suggests that PSTs frequently tend to consider preparedness and efficacy through the lens of their knowledge, particularly CK, PK (particularly skills such as behaviour management), and PCK. This study therefore aimed to explore whether and how such definitions featured in the female Saudi PSTs' definitions and feelings of preparedness and teaching efficacy.

Method

Interviews are found to be extremely effective tools to collect and understand "people's perceptions, meanings, definitions of situations and constructions of reality" (Punch, 2005, p. 168). In this paper we use data from interviews with 16 female Saudi mathematics PSTs who were in the final year of their four-year undergraduate ITE. At the time of the interviews, these PSTs had recently completed their practicum. The practicum took place in intermediate and/or secondary schools and lasted approximately four months during the final semester of tertiary study.

The interviews were conducted face-to-face when possible or by telephone. Each interview lasted approximately 30 minutes. The aim was to explore how participants perceived their situation and their constructions of reality regarding to their ITE experiences and sense of preparedness. The interview questions were adapted from the work of Rodie (2011) for the purposes of this study (see the Appendix). Arabic was used when conducting the interviews because this was the first language of the researcher (first author) and the participants. Interviews took place either in December 2015 (Semester A in the Saudi Arabia education system), or from

March to May 2016 (the Saudi Semester B). During the interviews, the researcher presented questions on general and specific aspects of preparedness to explore how PSTs defined and perceived preparedness to teach. The semi-structured interviews followed a predetermined protocol that supported the interviewer to probe for more details from participants when necessary. The interviews were audio-recorded with the consent of the interviewees, transcribed into Arabic and finally translated to English for thematic analysis. The data were sorted manually and categorised, which enabled the researcher to familiarise herself with the data and gain an understanding of the topic's complexity. Summarisation, coding, and derivation of themes were used to analyse the data according to the process of description and conceptualisation analysis. The qualitative analysis involved preparing the data, organising them and finally reducing them into meaningful segments. The segments were labelled through inductive coding to classify the data within distinct themes and subthemes (Creswell & Plano Clark, 2007); these themes and subthemes are presented in Table 1. Each category was assigned a code so they could be collated to themes relating to the research questions.

Table 1:
Themes and subthemes discovered through the interviews

Theme	Subthemes
Definitions of Preparedness to Teach	<ul style="list-style-type: none"> • levels of PK and skills • levels of specialised CK • feelings of confidence and gaining experience
The Ideal Mathematics Teacher	<ul style="list-style-type: none"> • having the attributes of a 'good' teacher • care for students • teacher knowledge • supporting positive mathematical identities
Sense of Preparedness	<ul style="list-style-type: none"> • teaching methods • classroom management • lesson preparation and explanation • knowledge of mathematics and the curriculum
Feeling Less Prepared	<ul style="list-style-type: none"> • self-confidence • classroom management • CK • lesson preparation and explanations • using technology in the mathematics classroom

Findings

Definitions of Preparedness to Teach

Four main subthemes emerged from the interviewees' definitions and discussion of preparedness to teach: (1) levels of PK and skills; (2) levels of specialised CK; (3) feelings of confidence and gaining experience; and (4) the attributes of a 'good' teacher.

Regarding the first subtheme, the most frequent framing of preparedness related to a feeling of efficacy about different aspects of PK and teaching skills (n=13). Nearly half (n=7) of the descriptions of preparedness included aspects of classroom management, such as time management, interacting appropriately with students and managing misbehaviour. For example, PST 11 said that "it is important for the teacher to follow a method to manage the students and it is essential to have respect between the teacher and her students". Three PSTs included lesson planning and good preparation in their definitions (e.g., PST 13 described preparedness as "being fully prepared to prepare the lesson content and objectives"). These three PSTs also stated that being able to "enthuse the students about the lesson" was important. Other definitions of preparedness related to the subtheme of PK provided by ten of the interviewees included effective delivery of the lesson content, which was linked to clear step-by-step explanations and illustrations, alongside familiarity with and the ability to apply different methods (e.g., the use of teaching aids).

The second subtheme related to CK (n=12). Definitions of preparedness related to the CK subtheme included "having a good understanding of the subject content", "the ability to apply multiple mathematical representations", or "being fully versed in understanding the content of the mathematics curriculum." However, few of the PSTs referred to PCK as being part of preparedness, although some aspects of PCK were mentioned by some interviewees: "familiarity with the teaching strategies that are specific for mathematics" and "making students like the subject and not forcing memorisation."

The third subtheme was that of self-confidence. Seven PSTs used feelings of confidence and having classroom experience as a definition of preparedness. These interviews tended to relate the ability to become 'good' at teaching to their positive practicum experiences. For example, PST4 explained that "being able to improve your teaching from the beginning of practicum period to its end," helped her feel prepared. However, unlike other PSTs, PST 16 noted that "reading lots of books" increased her feelings of preparedness.

The fourth subtheme, the attributes of a 'good' teacher was closely linked to the theme of the ideal mathematics teacher. Some PSTs included teacher attributes in their definitions of preparedness, such as "having a strong personality," being "strict" or "patient", "not complaining about students' questions because mathematics needs further explanation and clarification," and caring about students by "avoiding choosing difficult questions to include in the exam questions that have not been presented to the students previously."

Taken together, the data suggest that for these PSTs, feeling or being prepared involved having a level of PK that would allow them to manage the classroom and feel confident. CK and familiarity with the curriculum were also seen as being important parts of preparedness, although PCK did not appear to be part of the definitions of preparedness. Many PSTs emphasised the importance of the practicum, indicating that familiarity with the curriculum and gaining teaching expertise requires classroom experience.

The Ideal Mathematics Teacher

The PSTs were asked to describe the teacher they would like to be (their ideal mathematics teacher). Definitions of a good mathematics teacher fell into three main subthemes: (1) care for students, (2) teacher knowledge, and (3) supporting positive mathematical identities. These responses regarding the ideal teacher tended to have a more student-centred approach to teaching rather than the teacher-centred focus revealed by the interviewees' definitions of preparedness.

Care for students was the most common subtheme in descriptions of the ideal teacher. Care for students was expressed as adapting teaching style to the students' abilities. For some PSTs (n=3), this was described as being able to answer students' questions, and "being a patient teacher if the student does not understand" (PST 14). Three PSTs discussed consideration of students' feelings about learning mathematics:

I would like to be a teacher who cares about her students' psyches. For example, I noticed some students were too shy to come up to the blackboard, so I discussed with the students about why they were shy and they told me they were afraid to answer wrongly. Therefore, I tried to encourage them even if they did a mistake, to show them what the right answer is. (PST 16)

Building relationships with students and balancing strictness and lenience was included in the description of the ideal mathematics teachers by four PSTs, which is part of the subtheme of care for students:

Dealing with the students very kindly and having a close rapport with my students, so they won't be scared of me. I do not wish to be a strict teacher. (PST 6)

I want to be more interactive with the students; that is, to be close to them and to be more than just a teacher for them, and the students will not be afraid of mathematics or of the teacher herself. (PST 13)

However, one interviewee described how caring needs to be balanced with strictness for successful classroom management:

Firm and strict in my rules for the students and never be lenient with students and being serious in teaching—don't have space for side conversations between students, and no space for them to play and waste the lesson time. (PST 15)

The second subtheme in the descriptions of the ideal teacher related to teacher knowledge (n=13). Mathematical CK was the knowledge most frequently mentioned (e.g., sound mathematics and curriculum knowledge) alongside PK (e.g., managing the lesson time, lesson planning, familiarity with the lesson, and loving mathematics), rather than PCK. Nevertheless, PST 12 described how teacher knowledge should go beyond "acquaintance with the scientific subject" and should involve aspects of PCK ("knowing all the details of the mathematics curriculum... and delivering it very well to the students"). In addition, three PSTs described how ideal mathematics teachers need to be familiar with the entire curriculum:

It is necessary for the teacher to have experience in the mathematics curriculum that she is teaching and the mathematics curriculum for the previous grade because every mathematics curriculum is linked to another. For example, in some lessons, I needed to go back to look at the previous mathematics curriculum. (PST 10)

The third subtheme, supporting positive mathematical identities, overlapped with the first and second subthemes. Typical descriptions related to this subtheme discussed the ability to help students “understand” mathematics by giving clear explanations and helping students to “love” mathematics. For some PSTs ($n=7$), helping students understand involved adapting to students’ abilities through scaffolding learning tasks and giving “clear, simple, and step-by-step explanations.” Others highlighted “using different methods of solving a problem” or “giving quizzes to prepare students for the final exam.” The aim of such actions was to make mathematics accessible:

I hope to be a teacher who is able to deliver information to students no matter how difficult it is and simplify the solution of problems for the students. For example, the mathematics textbook shows the long way to solve mathematical problem. However, I discovered that instead of resolving the problem in a full page as in the textbook, I could resolve the problem in two lines in another way easier than in the textbook, which made the students enjoy the lesson more. (PST 10)

Alongside scaffolding, five PSTs expressed the belief that using a variety of teaching strategies (e.g., technology and real-life applications) would help facilitate students’ understanding, engage students and provide motivation.

Developing the students’ love of mathematics was also included in the descriptions provided by four PSTs:

... because if students love a certain subject, they will love the teacher of that subject and they will love to study. Then they will be able achieve well in the subject. (PST 1)

Furthermore, one respondent mentioned that an ideal mathematics teacher should also love her subject.

Overall, according to these PSTs’ definitions, the ideal teacher is one familiar with her subject and the curriculum and takes a student-centred approach to teaching. An ideal teacher is able to draw on a variety of techniques to help students understand. Furthermore, an ideal teacher helps students feel comfortable and supports them to enjoy learning mathematics.

Sense of Preparedness

The areas in which the PSTs felt most confident and/or prepared were categorised into five subthemes: teaching methods; classroom management; lesson preparation and explanation; knowledge of mathematics and the curriculum; and self-confidence.

Half the interviewees mentioned feelings of preparedness and confidence regarding the use of different teaching methods (e.g., playing games, teacher role-playing, and cooperative learning) to deliver mathematical content to ensure students’ understanding. They also felt prepared about adopting different strategies to tailor the lesson to the abilities of diverse learners, to encourage all students to participate, to support positive relationships with mathematics and to develop students’ mathematical thinking skills. Furthermore, some PSTs expressed feelings of confidence about their ability to use teaching aids (e.g., mind maps, manipulatives) and worksheets to check students’ understanding. However, only a few PSTs ($n=2$) stated that they felt adequately prepared to connect mathematical concepts to daily life with concrete examples. Similarly, only three PSTs said they felt prepared and confident about the use of technology (e.g., using PowerPoint as a visual teaching aid).

The second most common area in which the PSTs felt prepared (n=9) was classroom management. In this regard, the PSTs expressed feelings of confidence and preparedness regarding behaviour management techniques that used via both rewards and punishment. For example, PST 10 reported using:

... rewarding methods such as giving gifts for the disciplined students and creating competition between the groups of students. Also using the style of punishment for the students who did not do their homework by deducting marks.

Lesson planning and explanation was an area in which seven PSTs felt well prepared. In particular, these PSTs talked about feeling confident about preparing lessons in advance, organizing the blackboard, delivering mathematical information, and using step-by-step explanations.

Five PSTs considered familiarity with the curriculum and CK as being areas in which they felt confident:

I have the ability to answer a student's question from another curriculum for the following grade that I have not taught, because I have a background in mathematics as a university student. (PST 1)

Some PSTs (n=4) discussed that their feelings of confidence and belief in oneself as a strong leader was an important part of feeling prepared) (e.g., "I am confident of my knowledge and the information that I have", "I have a strong leadership personality").

Despite often expressing feelings of preparedness in a number of areas, the PSTs also expressed a belief that they needed to become more confident and better prepared ("I hope to be able to strengthen my strengths"), especially in the areas of classroom management, using a variety of teaching strategies, using technology, and linking mathematics to daily life.

Feeling Less Prepared

The areas in which the PSTs felt less prepared related to four main subthemes: (1) classroom management, (2) CK, (3) lesson preparation and explanations, and (4) using technology in the mathematics classroom.

The area that most of the PSTs (n=14) felt less prepared for was classroom management. The interviewees discussed the difficulties they had experienced during the practicum relating to managing a large number of students, or arranging narrow and crowded classrooms in order to use student-centred teaching strategies:

I am not prepared at all in classroom management, controlling/managing the classroom, and organizing the blackboard; I haven't arranged it well at all. (PST 15)

When a student asked me a question, I became distracted from the lesson and I lost control of the classroom. (PST 14)

Most of the teaching strategies that we have studied cannot be applied because the class time finishes, but the strategy has not yet been completed. (PST 13)

Behaviour management was felt to be a difficult area in which most PSTs felt poorly prepared. Some PSTs reported feelings of impatience and difficulty with anger management:

I do not know how to deal with the naughty students and I have difficulty with that especially with middle school students, because I do not like to deal with them by screaming and giving orders. (PST 12)

Although it was less commonly reported as an area of concern by most PSTs, five PSTs stated that they felt they could be better prepared in CK, especially regarding problem-solving strategies and the curriculum across grade levels. PST15 explained how she was attempting to become more prepared in these aspects:

I am acquainted with the maths curriculum for middle school, but I was not familiar with the maths curriculum for secondary school, so I was searching on the Internet to be more familiar with it.

Four PSTs explained how they felt less prepared about certain aspects of lesson preparation and explanation. These PSTs discussed feelings of under preparedness regarding lesson planning, engaging the students, delivering lessons tailored to the students' understanding, and using mathematical expressions and symbols.

I need to be a bit more experienced in explaining the lesson and being able to deliver its content more easily without confusing the students. In addition, I faced difficulty in planning and arranging the lesson content, as I was unsure about what I should present first. (PST 6)

I used to teach using the vernacular (informal language) during my teaching and did not use the mathematical expressions and mathematical symbols. (PST 7)

Two PSTs expressed feelings of being less prepared in their ability to connect mathematics with real life examples. However, they were attempting to prepare themselves through online research.

I was trying as much as possible to connect mathematics with reality and other sciences, but I was afraid that the students did not understand. I could link the lesson sequences by flowing on to the results of scientific experiments in chemistry and physics, but there were too many mathematics lessons that I could not link to reality. (PST 12)

In response to the question about feeling less prepared, only one PST specifically discussed the integration of technology into teaching. However, the responses to other interview questions demonstrated that PSTs often felt less prepared about the use of technology beyond PowerPoint and mentioned that their ITE program did not always address this issue.

I faced difficulty integrating technology. It was not a weakness, I have not learnt how to integrate technology in teaching. We only learned about using PowerPoint presentations. (PST 4)

In addition, although several PSTs reported that they knew how to use different strategies, they found that during the practicum it was difficult to implement these strategies. Feelings of a lack of control and lack of knowledge of ways to manage instances when they were confronted by misbehaviour or limited by inadequate time or space made them feel less prepared. This suggests that although PSTs gain appropriate PK in the academic context of their ITE courses, applying this PK in practice proved to be harder than expected, emphasising the key role of the practicum for helping PSTs feel prepared.

Discussion and Conclusion

As has been found by previous studies (e.g., Anthony et al., 2008; Clark, 2009; Rodie, 2011), the PSTs generally felt well prepared to begin teaching, and felt confident in their knowledge of different teaching methods and strategies. However, their descriptions of what being prepared to teach means mostly related to having appropriate teaching knowledge, especially CK and PK. The definitions provided by the PSTs in this study were similar to those found in many other studies (e.g., Buehl & Fives, 2009; Kraut, 2013; Leong, 2012), although they contrasted with the PSTs in Balatti and Rigano's (2011) study, who did not explicitly mention CK as an important part of practice. The PSTs in this study felt prepared regarding CK but also expressed a lack of confidence about their ability to answer students' questions. This contrasts the findings of Hill et al.'s (2008) study, where teachers with a high level of mathematical CK were more likely to adequately respond to students' questions. Interestingly, PCK, which is closely related to 'practice', was not often discussed in the interviews, a point that may explain why some PSTs felt less prepared despite feeling confident about their CK.

Given that earlier studies of Saudi ITE had raised concerns about a failure to link theoretical aspects of teacher education to the reality of the classroom (Alzaydi, 2010; Wiseman & Al-Bakr, 2013), this lack of integration is a likely explanation for these PSTs' failure to discuss PCK. The lack of explicit references to PCK by the interviewees suggests that the ITE methods courses need to make the link between PK and PCK more explicit and provide more guidance as to how the principles of PK can be applied in different subject areas, as has been suggested by calls for practice-based reforms (Hunter, Anthony, & Hunter, 2015). A productive link would be to ensure that learning the work of teaching includes a focus on how to manage learning more than simply managing student behaviour.

The findings of this study confirm the importance of the practicum in developing PSTs' sense of preparedness. Generally, the PSTs described how attempting to apply different pedagogical strategies in the classroom during the practicum was more difficult than they had expected, which suggests the presence of a theory/practice divide. It is likely that the gap between theory and practice, reinforced by the tension between tradition and reform, has contributed to how these PSTs feel prepared in some aspects but not others, and may well account for their sometimes contradictory statements. For these PSTs, behaviour management was particularly challenging and often countered attempts to use non-traditional student-centred teaching strategies. This struggle felt by the PSTs highlights the importance of the practicum experience in terms of placement in a situation where they are confronted with real students with differing levels of ability rather than idealised "theoretical" students. Cushner, McClelland, and Safford (2003) suggest that proficiency in such situations increases student outcomes such as motivation and learning. Indeed, proficiency in responsive teaching strategies is necessary for adequate preparation (Fehr & Agnello, 2012). Nevertheless, ITE programs frequently fail to provide opportunities for PSTs to have enough practical experience to become proficient in this area. Learning more 'about' rather than 'how to' fails to bridge the theory-practice divide (Muir, Allen, Rayner, & Cleland, 2013).

Similar to the findings of Balatti and Rigano (2011), the interviews revealed that feelings of confidence and having the ability to relate to students were important parts of PSTs' feelings of preparedness. These affective aspects of PSTs' sense of preparedness, often described in terms of feeling confident, a sense of control and the ability to form relationships with students, are a reminder that knowledge exists in a "dynamic relationship between social, psychological, material, and embodied realities" (Ord & Nuttall, 2016, p. 357). However, although the PSTs expressed the desire to adopt a student-centred rather than a more traditional teacher-centred approach, their feelings of preparedness were mixed, with PSTs identifying that they were stronger in some areas than in others. For example, they expressed concern that they were not adequately prepared in classroom management, meeting their students' psychological needs, disciplining students, developing patience, and answering students' questions. However, of note was the expectation, expressed by several PSTs, that they would continue to develop expertise in various areas (e.g., knowledge of the curriculum, using technology, lesson preparation, and providing representations for problem-solving), once they began teaching in the classroom. This positive framing of professional learning, with a number of PSTs describing how although they felt that they did not yet embody their ideal teacher, they would be able to do so, given more time and experience in the classroom suggests that preparedness can also embody a disposition to professional learning.

When describing the ideal teacher whom they would like to personify, the interviewees seldom discussed personal characteristics beyond patience, although the subtheme of care for students was common in these descriptions. It is likely that these PSTs feel that they already embody these personal aspects of being an ideal teacher (e.g., friendliness, respect, a love of mathematics), whereas they were aware that the knowledge- and skill-based aspects of the ideal teacher could be developed over time and they expected (or hoped) to do so in the future.

This examination of PSTs' feelings of preparedness to teach mathematics provides insight into how well secondary and middle mathematics teachers in Saudi Arabia are prepared in terms of ITE curriculum. In order for ITEs to improve and adapt their curricula to ensure quality mathematics teaching, the study indicates that the gap between the theoretical knowledge provided by ITE programs and the sometimes-contradictory realities of the classroom needs to be bridged. For example, feelings of being poorly prepared in the area of technology expressed by the PSTs suggest further avenues for curriculum reform both in access and knowledge. To support PSTs to gain the experience, preparation, and familiarity needed, one solution could be for the educators in ITE programs to model the use of technology during lectures. Specialist ICT courses as part of ITE could be another solution. However, the practicum schools also need to play their part and provide access to technology for PSTs. These solutions regarding preparedness in the area of using technology in the classroom are a small-scale example of the need for ITE programs to be practice-focused (Campbell & Elliott, 2015).

Overall, the voices of these female Saudi mathematics PSTs have exposed the ongoing presence of a theory-practice divide in ITE in Saudi Arabia. Possibly driven by the current shift in the culture of education in this nation, PSTs appear caught in a dilemma of change. On the one hand, these PSTs were eager to adopt student-centred teaching practices but on the other hand, they also wished to mirror the more traditional teaching styles of their cooperating teacher during the practicum. Efforts to incorporate more practice-based ITE could provide PSTs with opportunities not only to learn about but also to apply core teaching practices within a planned and scaffolded system under guidance (Connecticut Workgroup, 2017; Hunter et al., 2015; Zeichner, 2012). To realise the many benefits of practice-based ITE quality would require

curriculum change from merely focusing on “what to teach” to considering “how to teach” (Anthony et al., 2015; McDonald et al., 2014).

Maximising the potential of the practicum experience would also need to be part of ITE reforms. This would necessitate that schools and the universities work together to bridge the gap between the theories taught in the universities and the reality of the classroom. These PSTs were taught by traditional methods during their own school years yet appear aligned with the ideals of the newly reformed Saudi curriculum. In addition, they must work with cooperating teachers who were unlikely to demonstrate student-centred teaching practices – a state confounded by the limited opportunities for professional development in the Saudi education system (Almazroa, Aloraini, & Alshaye, 2015; Alshamrani, 2012; Alshehri, 2012). It is also probable that the PSTs were influenced by feedback from the more experienced cooperating teachers (the role of feedback and mentoring was addressed in the wider study of which this paper is a part). In trying to resolve these tensions, it appeared that these PSTs were unsure about what they are prepared for: the past (as reflected in the traditional infrastructure and values of the schools) or the future (as expressed in the theories provided by the ITEs).

Overall, the feelings and perceptions of preparedness revealed by these interviews provide a snapshot of an education system where reforms have begun but have not reached fruition, and the consequent tensions faced by PSTs within such a system. As such, the study findings remind us that teacher education is located within the milieu of economic, sociocultural, and political forces. One striking aspect of this study is that only female Saudi PSTs participated in this study. Restricting the participants to females only was partly for practical reasons, as the cultural and religious practices in Saudi Arabia preclude a female researcher from directly contacting or interviewing male participants. It is because of the segregated education system in Saudi Arabia that it is important to present women’s unique perceptions regarding preparedness and teaching efficacy within this system. Given the historical and changing gendered roles within society it is likely that an investigation into male PSTs’ perceptions of preparedness to teach mathematics – who receive their ITE from different providers and are being prepared to teach male students – are different from those for females. This would make an interesting topic for future research.

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Appendix

INTERVIEW

Please think back to your practicum and teaching methods courses and answer the following questions:

You are just about to graduate, tell me what sort of mathematics teachers would you like to be when you graduate?

How well prepared do you feel to 'be' that teacher?

- Talk about those areas that you feel most confident or prepared in, and those that you feel less prepared.

To finish off, it would be really helpful if you could think for a moment and recap on the question: How would you define what "preparedness to teach" means or looks like?

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