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A Mixed Method Investigation of the Impact of Practicum Experience on Mathematics Female Pre-Service Teachers' Sense of Preparedness

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***Abstract*—**The practicum experience is a critical component of any initial teacher education (ITE) course. As well as providing a near authentic setting for pre-service teachers (PSTs) to practice in, it also plays a key role in shaping their perceptions and sense of preparedness. Nevertheless, merely including a practicum period as a compulsory part of ITE may not in itself be enough to induce feelings of preparedness and efficacy; the quality of the classroom experience must also be considered. Drawing on findings of a larger study of secondary and intermediate level mathematics PSTs' sense of preparedness to teach, this paper examines the influence of the practicum experience in particular. The study sample comprised female mathematics PSTs who had almost completed their teaching methods course in their fourth year of ITE across 16 teacher education programs in Saudi Arabia. The impact of the practicum experience on PSTs' sense of preparedness was investigated via a mixed-methods approach combining a survey (N = 105) and in-depth interviews with survey volunteers (N = 16). Statistical analysis in SPSS was used to explore the quantitative data, and thematic analysis was applied to the qualitative interviews data. The results revealed that the PSTs perceived the practicum experience to have played a dominant role in shaping their feelings of preparedness and efficacy. However, despite the generally positive influence of practicum, the PSTs also reported numerous challenges that lessened their feelings of preparedness. These challenges were often related to the classroom environment and the school culture. For example, about half of the PSTs indicated that the practicum schools did not have the resources available or the support necessary to help them learn the work of teaching. In particular, the PSTs expressed concerns about translating the theoretical knowledge learned at the university into practice in authentic classrooms. These challenges engendered PSTs feeling less prepared and suggest that more support from both the university and the school is needed to help PSTs develop a stronger sense of preparedness. The area in which PSTs felt least prepared was that of classroom and behavior management, although the results also indicated that PSTs only felt a moderate level of general teaching efficacy and were less confident about how to support students as learners. Again, feelings of lower efficacy were related to the dissonance between the theory presented at university and real-world classroom practice. In order to close this gap between theory and practice, PSTs expressed the wish to have more time in the practicum, and more accountability for support from school-based mentors. In highlighting the challenges of the practicum in shaping PSTs' sense of preparedness and efficacy, the study argues that better communication between the ITE providers and the practicum schools is necessary in order to maximize the benefit of the practicum experience.

***Keywords*—**Mathematics, practicum experience, pre-service teachers, sense of preparedness.

I. Introduction

RESEARCH into education has found that teacher efficacy strongly influences the ability to teach effectively [15], [55]. Moreover, teacher efficacy is a strong predictor of teacher quality [30], [52], which in itself continues to build or reaffirm efficacy [19], [34], [54].

For pre-service teachers (PSTs), feelings of preparedness and efficacy have been shown to be key indicators of future classroom performance [21], [31]. Given that classroom experience is regarded as the most important factor influencing teaching efficacy [10]-[11], it is not surprising that for PSTs, the practicum is an important part of initial teacher education (ITE). Practicum, providing the opportunity, be it in approximate form, to experience 'real' teaching, contributes to PSTs feelings of self-confidence [8], [20]-[22], [24], [33], [35], [48], [59] and as such is a significant influence on their sense of preparedness. Drawing on the first author's doctoral research, in this paper we report on how a sample of Saudi Arabia intermediate and secondary mathematics PSTs' practicum experiences affected their feelings of preparedness to teach.

II. Literature Review

One of the goals of the practicum is to allow PSTs to put the theory taught in the university-based ITE courses into practice [4], [25], [57]. The practicum provides PSTs with the chance to try new ideas and teaching activities, use technology, build relationships with students, work with students of varying ability, arrange the classroom environment, assess students' skills, and adapt the curriculum or lessons to suit the needs of the class [9], [29]. Furthermore, the practicum encourages PSTs to reflect on what they believe about good or effective teaching [53].

While acknowledging that practicum provides practice-based opportunities, inclusive of opportunities to take risks and make mistakes, the desired outcome of any practicum, especially those that occur toward the end of formal ITE, would also be to raise the PSTs' sense of teaching efficacy [15], [20]. Despite the importance and understanding that there is more to practicum than mere participation [12], [25], [39], international research reports that for many PSTs the quality of the practicum is variable [17], [28].

Several factors determine the quality of practicum

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Open Science Index, Educational and Pedagogical Sciences Vol:13, No:1, 2019 publications.waset.org/10009915.pdf

experiences: the cooperating teachers and mentors modelling good teaching practice [15], [50], constructive feedback [36], [41], the PST's relationship with the mentor supervisor, the support provided by the cooperating teacher, the school and the university supervisor; and the number and/or duration of practicum experiences [8].

A common finding is that PSTs report the challenges of behavior and classroom management during the practicum to have a strong negative impact on feelings of efficacy [7], [13], [14], [16], [47]. The challenges and the consequential impact often arises from the contrast between behavior management theories and actual student behavior, with some studies suggesting that ITE educators are out of touch with actual practices in the classroom [51] or cooperating teachers unaware of recent theoretical developments. Such disparities lead to a disconnection between the practicum schools and universities [37], [49]. In addition, the level of support given to PSTs on practicum can reinforce this disconnect, leading to a weakened relationship between schools and ITE providers [45]. This disconnection between schools and universities reflects a long-standing [43], and somewhat unresolved concern in teacher education. Researchers have recommended improving the partnerships between schools and universities to help PSTs develop a higher level of efficacy [26]–[27].

In Saudi Arabia, the practice–theory divide is particularly wide. While the ITE providers emphasize theoretical pedagogical knowledge (PK) and content knowledge (CK), the schools value skills like classroom and behavior management [3], [6]. The university-based courses in pedagogical theory often fail to indicate how theoretical PK can be applied [2], and they tend to concentrate on general PK rather than subject-specific applications of PK [3]. Mentor teachers often prefer to use older teaching methods (e.g. rote learning) [44] which discourages PSTs from trying new methods [5]. An additional concern is the recent findings by [3], who found that some PSTs received little or no mentoring from the schools.

III. Methodology

In light of the findings in the literature, this study aimed to examine the practicum experiences of sample of final-year female intermediate and secondary mathematics PSTs from several ITE institutions who had completed a 4-month practicum (n = 105). A mixed-methods approach was used to investigate the influence of the practicum on these PSTs' feelings of efficacy and preparedness. Quantitative data were collected with a questionnaire in paper form (n = 5) or online (e-mail and social media, n = 100). Qualitative data were collected via face-to-face or phone interviews with PSTs (n = 16). The interviewees indicated interest in participating through their responses to the questionnaire. The survey questions and the interview questions were developed simultaneously and the two instruments were applied in Semester A (December 2015) and Semester B (March–May 2016) of the Saudi school year.

In the questionnaire, PSTs' were asked to indicate on a Likert-type scale how five items relating to the practicum had affected their sense of preparedness; an additional open-ended question asked the participants to list other factors that had also influenced this sense. During the semi-structured interviews (30–40 minutes) participants described how various components of the practicum had shaped their sense of preparedness and efficacy. The survey and interviews were conducted in Arabic, audio-recorded with consent, transcribed into Arabic and translated into English for analysis.

After being checked for accuracy and to identify missing or incomplete responses, the quantitative data were analyzed in SPSS to obtain descriptive statistics (means, standard deviations and frequencies). Survey responses were given as percentages. The answers to the translated interview transcripts and the open-ended questions were subjected to thematic analysis following [23].

IV. Findings

All practicum-related factors were found to have a clear influence on PSTs' feelings of preparedness (Table I). The factor reported to have the strongest influence was the experience of teaching students (mean = 1.43). Some participants rated factors as having little or no impact, most notably feedback from cooperating teacher (n = 20). The questionnaire did not ask whether the influence of the different factors was positive or negative, but assumed that factors that had a negative influence were rated as having less influence or no influence. The responses regarding cooperating teacher feedback had a large standard deviation, suggesting that feedback could have a positive or negative influence.

TABLE I
Factors Influencing the PSTs' Perceptions of Preparedness

Factors	Frequency (Percent) Influence				Mode	Mean	Std. Dev
	Strong	Moderate	Less	Not at all			
Actually teaching during student teaching experience (practicum)	67 (63.8%)	31 (29.5%)	7 (6.7%)	0	1.00	1.4286	0.61795
Feedback I received from my cooperating teacher during practicum	52 (49.5%)	33 (31.4%)	15 (14.3%)	5 (4.8%)	1.00	1.7429	0.87737
Watching other skilful teachers	56 (53.3%)	39 (37.1%)	10 (9.5%)	0	1.00	1.5619	0.66396
My mathematics ability	52 (49.5%)	48 (45.7%)	4 (3.8%)	1 (1.0%)	1.00	1.5619	0.61899
My ability to interact with students	55 (52.4%)	44 (41.9%)	4 (3.8%)	2 (1.9%)	1.00	1.5524	0.66479

(1=strongly influential; 2=moderately influential; 3=less influential; 4=not at all influential, n=105)

Half of the participants (51.4%) wanted to spend more time in the school or a longer practicum (mean = 2.46; Table II).

In the interviews, participants were asked to describe their practicum experience and how this influenced their sense of preparedness. The PSTs indicated that the strongest influence

on their feelings of preparedness was the practicum experience itself. Positive experiences in the practicum led to increases in confidence or feelings of becoming a good teacher for seven PSTs. For example, PST5 described how "spending more time teaching and getting mentoring" had helped her improve her teaching skills and increase her feelings of efficacy.

TABLE II
PSTs' SATISFACTION ABOUT PREPAREDNESS

	Frequency (Percent) Agreement				Mode	Mean	Std. Dev
	Strong	Agree	Disagree	Strongly Disagree			
I need to spend more time in the school practicing teaching maths.	17 (16.2%)	37 (35.2%)	37 (35.2%)	14 (13.3%)	2.00	2.4571	0.92016

(1 = strongly agree, 2 = agree, 3 = disagree, 4 = strongly Disagree, n=105)

Perceptions of the practicum fell into four main themes: importance and usefulness, challenges, negative impact, and improving teaching efficacy (the influence of mentoring and feedback is discussed separately). The PSTs reported that the practicum helped them to experience what 'real' teaching was like (e.g. "how to deal with the students and take into account individual differences" (PST16)) and to apply a range of teaching strategies.

The practicum also provided some opportunities to observe experienced teachers and learn from how they taught the mathematical content, managed classrooms and behavior, and interacted with students, etc. The interviewees mentioned increased value when these observations were reinforced by conversations and mentoring from the teacher.

Although most PSTs had positive perceptions of their practicum, they described many challenges (n = 14) such as the negative attitudes towards PSTs shown by the cooperating teachers, students and the school administration, as well as time constraints and low self-confidence. For three PSTs, they were explicit in noting that the challenges faced during the practicum led to them developing a sense of feeling less prepared.

While these three were explicit in the describing their practicum experience as detrimental to their sense of preparedness, across the interviews PST all provided examples of specific factors or experiences that they felt were less than optimal in supporting their learning the work of teaching. Eight PSTs reported that they had been disrespected by their students because "students know that we are PSTs … and they give us less attention" (PST2). Five PSTs described the frustration of working with students who were reluctant to learn mathematics, and how this contributed to feelings of lower efficacy. Two PSTs believed that the students' poor behavior had been influenced by the attitudes of the administration, with one describing how "no one cared about the students" (PST3) and the lack of consequences for misbehaving students. Some PSTs reported that these attitudes impacted their sense of preparedness but others believed that problems with student disrespect would not occur when they became "real" teachers.

Six PSTs found the school system to be challenging. For example, PST10 expressed a belief that the school's examination policy was unfair and undermined the teachers' efforts:

> *Some students were absent deliberately on the exam day in order to get the exam questions from their classmates and then come another day and do the exam and get full marks easily.*

One PST also expressed frustration with the way her cooperating teacher emphasized rote learning and wanted her to use this method, even though the PST believed that "mathematics differs from other subjects that rely on memorization, as mathematics needs understanding" (PST1). Noting a complete breakdown of the mentoring relationships, one PST reported that "mathematics teachers in my school refused to be cooperating teachers for us, because they did not know what they had to do for PSTs" (PST4).

The physical classroom/teaching environment also presented problems. Experiences such as small classrooms, overcrowding (up to 40 students in one classroom according to PST8), a lack of office space, and insufficient or inadequate resources, particularly computer and technological resources, were also reported. A number of PSTs (n = 7) reported how these problems had a negative effect on their sense of preparedness.

Nearly half of the PSTs noted the negative impact of time pressures, particularly in reference to efforts to manage class time when trying a new teaching strategy. With reference to formative assessment, one interviewee (PST7) provided an example of how it was difficult to "identify the students' weakness" because "lesson time is not enough for doing that." This was echoed by discussions of how the practicum did not include enough actual teaching time and that overall "the practicum period is too short" (PST10) and how this had led to feelings of being less prepared.

Many of these abovementioned challenges relate to a perceived and real disconnect between theory and practice. While PSTs readily identified concerns about the practicum, many of the PSTs who discussed this issue also voiced concerns about the 'adequacy' of the ITE program. In discussing that they had been unable to put the skills and theories presented in their teaching methods courses into practice in the context of mathematics, some expressed frustration with how the teaching methods courses had presented PK as theory alone. In the words of PST12, "we read them from the textbook [. . .] There was no practical application." Another PST reported how their courses had not sufficiently linked theoretical PK and certain teaching strategies to the application to mathematics; rather they tended to use examples that applied in teaching literacy with little apparent transfer to mathematics.

Personal traits (e.g., self-confidence) were perceived to have affected the PSTs' practicum experiences. Many of the interviewees (n = 8) described how they felt nervous about

Open Science Index, Educational and Pedagogical Sciences Vol:13, No:1, 2019 publications.waset.org/10009915.pdf

Open Science Index, Educational and Pedagogical Sciences Vol:13, No:1, 2019 publications.waset.org/10009915.pdf

speaking in front of students and cooperating teachers; for example, PST15 described how she had felt "too scared to stand in front of the blackboard" during her first few teaching experiences. However, two PSTs reported that having self-confidence helped them feel more prepared and most (n = 10) believed that overcoming challenges during their practicum and learning from early mistakes had increased their sense of preparedness and had helped them become more self-confident and efficacious. For example:

> *At the beginning, I felt that I did not have the ability to teach, then at the end, my feeling started to change; I felt I have the ability to teach. I believe that as much as you teach, you will gain more experience and become better. Now I am feeling I am prepared for teaching.* (PST3)

One particular aspect of the practicum experience that has been found to be important in developing feelings of preparedness in other studies is the role of feedback and mentoring. Likewise, the interviewees and the responses to the open-ended survey question indicated that feedback and mentoring had a strong influence on PSTs' feelings of preparedness, with at least one PST reporting that this was "the most important factor that has a positive effect on my sense of preparedness" (PST6).

PSTs described receiving both positive feedback and negative from their students, reporting that they had received positive feedback about several facets of their teaching (e.g., clear explanations, helping students improve, and providing in-class practical work) as well as complaints about becoming angry, not using effective strategies, being boring or hard to understand, and not managing unruly behavior. Some PSTs actively solicited student feedback and reported that this had boosted their sense of efficacy.

Feedback given by the cooperating teachers had an even stronger effect on PSTs' sense of preparedness. Some interviews described how receiving specific feedback had helped them improve key teaching skills, such as lesson preparation, worksheet design, and classroom management. Most PSTs felt they had received good quality feedback from their cooperating teachers, but others (n = 5) believed that the feedback they received was unfair, sometimes arising from conflicting visions of good teaching. One PST (PST8) reported how she had received criticism because she permitted classroom noise, with the teacher seeing this as negative but the PST seeing this as an indication that "the students are excited about participating". Other PSTs felt that they had received feedback that was not specific enough. For example, PST16 expressed frustration that her cooperating teacher had not suggested any areas in which she could improve, stating that, "I would like to know what my mistakes were so that next time, I can avoid doing them again."

Surprisingly, three PSTs reported receiving no feedback at all from their cooperating teacher and six PSTs said that their cooperating teachers had never observed them or had only observed them for a short time.

Feedback from university supervisors was discussed as a factor that had helped the PSTs feel better prepared, particularly when the supervisors had provided constructive criticism, especially in areas that were found to be a challenge, such as strategies of behavior management and managing lesson time.

Most PSTs were satisfied with the advice given by supervisors, but two PSTs felt that they had received unfair criticism, including criticism about minor issues such as the amount of homework. One PST (PST15) reported that receiving continual negative and unjustified feedback from a "despotic and demanding" supervisor had lowered her feelings of efficacy and preparedness.

Similar to the findings about feedback from cooperating teachers, some PSTs (n = 3) said that the feedback from their supervisors was vague and inadequate. Notably, five PSTs reported that their supervisors had not observed them at all.

V. Discussion and Conclusion

In general, the practicum played the most dominant role in supporting the PSTs to develop feelings of preparedness and efficacy. In line with previous studies [15], [20], [24], [32], [35], [48], [59], this influence could be positive but aspects of the practicum, such as the classroom environment, challenges, and school culture lowered the PSTs' feelings of preparedness. Although most PSTs felt prepared to teach, their wish to spend more time in the practicum was in agreement with the findings of other studies [33], [50], including another study of female Saudi teachers [3].

Facing challenges sometimes helped PSTs apply what they had learned through their ITE courses, but, as discussed by earlier studies, they often struggled to apply the theory taught by their teaching methods courses in actual classrooms [13], especially classroom and behavior management [7], [47]. In line with [7], this study found that classroom and behavior management were significant challenges that made PSTs feel less prepared—indeed, many indicated that this was the area in which they felt least prepared.

The PSTs reported that the desire to use student-centered strategies was frequently hindered by issues of classroom management or conflict with teacher practices. The interviewees indicated that although they knew some teaching strategies that could be used in teaching mathematics, they had been unable to apply these because of difficulty in managing time and space. Unless resolved, the practicum will have a less than optimal impact in developing PSTs' sense of preparedness.

Equally, however, the interviews revealed that sometimes, the PSTs did not know how to put theoretical PK into practice in the mathematics classroom, describing how their general teaching methods courses emphasize on theory had not indicated how teaching strategies could be applied to mathematics. As discussed by [40], problems with applying PK frequently result in PSTs feeling less efficacious and, consequently resort to focus on only classroom management. These findings indicate that ITE courses should concentrate on integrating practice and theory so that PSTs can feel better prepared and obtain more benefit from their practicum experiences [18].

PSTs benefited from working with and observing their cooperating teachers, although this was sometimes hindered by the school environment. Importantly, about half of the PSTs

Open Science Index, Educational and Pedagogical Sciences Vol:13, No:1, 2019 publications.waset.org/10009915.pdf

perceived the school administrative systems and learning environment, sometimes coupled with ineffective individual mentors, as inadequately prepared to support PSTs. The interviewees described several challenges that reduced their feelings of efficacy, such as the attitudes of disrespectful students who treated PSTs as not being "real teachers", the attitudes of the cooperating teachers, and school administration towards PSTs and the school system and environment.

Some interviewees reported that their cooperating teachers encouraged older teaching strategies such as rote learning rather than the use of student-centered strategies. That PSTs could not observe these new reform teaching strategies being used is similar to the findings of [18].

Some PSTs described how they had not been observed by their university supervisors and others reported how the practicum school had treated them as relief teachers. According to other studies [12], [39], this can result in the practicum failing to help PSTs develop strong feelings of efficacy.

Another difficulty encountered in the present study, similar to findings reported by [3], was that half of the PSTs stated that their practicum schools were insufficiently prepared or resourced, especially regarding the use of technology in the mathematics classroom. This is, in fact, another aspect of the theory–practice divide. Frequently, the schools did not have access to technological tools in the classroom such as projectors, computers and the internet. This problem has been encountered by PSTs in other developing nations [1], [46]. Although the use of technology is emphasized by teaching methods classes, putting strategies that use technology into practice in the math classroom was difficult. PSTs reported limited use of technology matched their limited observations of their cooperating teachers using technology to teach mathematics.

While many of the issues discussed above related to systems, resources, and curriculum, it is important to acknowledge the role of affective issues in PSTs' developing sense of preparedness. As noted, other challenges encountered during the practicum by this group of female Saudi PSTs arose from feelings of low self-confidence, especially about standing and speaking in front of students and cooperating teachers. Another study in Saudi Arabia [3] also described how female PSTs felt less confident about standing in front of and addressing a class. Although Rodie [50] suggested that PSTs who felt their CK to be inadequate had lower self-confidence about speaking to a class, the fact that the PSTs in the present study felt very confident about their level CK may possibly be countered by traditions and cultural norms that encourage women to keep silent in public. It is highly likely that the practicum was the first time that these female PSTs had spoken to a group in the role of an authority figure.

The findings about the influence of feedback provided by the cooperating teachers and their feedback were mixed. According to the survey responses, feedback did not appear to be a significant influence on feelings. However, other studies [15], [32], [36], [41], suggested that the role of the cooperating teacher, including the relationship role, is vital in helping PSTs develop a sense of preparedness. In line with these earlier studies, and explaining the conflicting findings of the survey, the interviews showed that some PSTs received positive feedback that had increased their sense of preparedness, but others received little feedback or poor feedback. In some cases, this was because the cooperating teacher did not observe the PSTs teaching, and this is an area highlighted for improvement, as also recommended by [3].

The interviews revealed that some PSTs had invited their peers to observe their lessons and their peers had given feedback that increased their feelings of preparedness. Seeking feedback from peers to overcome the quantity or quality of feedback from supporting teachers is a phenomenon that has not been noted in earlier studies and could be a topic to be explored in subsequent research. However, in spite of the mixed feedback from cooperating teachers, the interviewees also reported how interacting with and observing cooperating teachers had helped them increase their feelings of preparedness and efficacy. Given the importance of the practicum in shaping PSTs' feelings of preparedness, this study could be extended to longitudinal studies investigating how PSTs' feelings of efficacy and preparedness change over time, such as how PSTs' feelings of preparedness, confidence, and efficacy change before and after the practicum.

Overall, many of these disconnections could be addressed by closer partnerships between the ITE providers and the practicum schools [26], [56]. Efforts to bridge the theory–practice disconnect enabling PSTs to apply the PK they have learned into practice [56] could be accomplished by providing professional development courses for the cooperating teachers in practicum schools. The focus should be on aligning teaching practices with the methods currently taught in ITE programs, especially given recent curriculum changes in Saudi Arabia. Certainly, that the quality of support during practicum, school cultural attitudes, and the theory–practice divide are issues that will need to be addressed to improve ITE and PSTs' sense of preparedness in this context.

Other measures that could connect the practicum schools and universities more closely could include visits by PSTs to the schools to meet and observe cooperating teachers prior to the practicum, extended and/or more practicum experiences, and introducing post-practicum workshops in which PSTs can reflect on their experiences (e.g., through journaling) [42]. Alongside better communication between schools and universities, these measures will help to integrate the two and create a "hybrid space" bridging the theory–practice divide [38], [58] and helping PSTs obtain more benefit from their practicum and thus increase their sense of preparedness and efficacy.

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Open Science Index, Educational and Pedagogical Sciences Vol:13, No:1, 2019 publications.waset.org/10009915.pdf

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