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MENTORING AND PREPARING PRIMARY SCHOOL MATHEMATICS TEACHERS

ABSTRACT

This article reports on the mentoring of foundation phase teachers and their development of disciplinary-specific knowledge, particularly how the practicum provides a space for mathematics content knowledge (MCK) and mathematics pedagogical content knowledge (MPCK) for student teachers, given the generalist knowledge base of many primary school teacher mentors. Data were collected through semi-structured interviews with two Grade 2 mentors and focus group interviews with 12 third-year student teachers in an urban university setting. A two-step process of analysis comprising open-ended coding, followed by a form of deductive coding, within a framework derived from literature on the development of MCK and MPCK, led to two main findings. Firstly, mentors might have hindered student teachers' development of MCK and MPCK, thus affecting the building of comprehensive conceptual models of good mathematics teaching practice. Secondly, the efficacy of the university-led training for mentors did not seem to have been successful for preparing them to work effectively with student teachers. We therefore recommend that greater emphasis be placed on the development of subject-specific mentoring practices, especially in scarce-skills areas such as mathematics and argue for a set of standards for mathematics-specific mentoring practices in South African primary school teacher education.

Keywords: *Mentoring practices, student teachers, mentor teachers, mathematics teaching, mathematical pedagogical content knowledge.*

1. INTRODUCTION

The practicum, also referred to as “practice teaching” or “fieldwork”, is an integral component of the curriculum of teacher preparation programmes, as it is a space in which prospective teachers integrate university coursework (theory) with their practical experience (Gravett & Ramsaroop, 2015). We were interested in how the practicum also provides a space for the development of disciplinary-specific mathematics content knowledge (MCK) and mathematics pedagogical content knowledge (MPCK) for student teachers of mathematics. In the large scale international Teacher Education Development Study – Mathematics (TEDS-M), results showed that the quality of opportunities to learn and the practicum experience were



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key contributors to increased levels of student teachers' MCK and MPCK (Tatto *et al.*, 2008). Drawing on the work of Ball, Lubienski and Mewborn (2001) as well as Grossman (2008), Baumert *et al.* (2010:139) argue that MCK and MPCK are not picked up incidentally but rather developed through university courses, mentoring received during practice teaching and "reflection on classroom experience".

This research aligns with the contention of Hudson (2013) and Livy, Vale and Herbert (2016) that in pre-service teacher education there is a growing need for greater focus on mentoring during practice teaching, specifically in the development of student teachers' pedagogical content knowledge. However, quality practicum experiences are dependent on two key components, namely the expertise of the mentor teacher(s) and the suitability of the sites in which the experience is gained (Graham, 2006). We agree with the view that mentor teachers shape students' mathematics teaching practice in particular ways (Hudson & Hudson, 2011) and thus play a significant role in influencing the type of mathematics teachers students will become (Rhoad, Radu & Weber, 2011). We were keen to investigate how the mentoring practices of teachers in the setting of a teaching or laboratory school in which they are appointed and trained as mentors for student teachers of mathematics, using a specific model for the development of numerical concepts was realised (Fritz, Ehlert & Balzer, 2013). In our view, the teaching school is an ideal environment for the creation of cognitive apprenticeships (Collins, Brown & Hollum, 1991) as the mentors and student teachers are being apprenticed, the teachers into mentors of student teachers and the student teachers into teachers. Mentoring informed by cognitive apprenticeship is guided by six methods, namely modelling, coaching, scaffolding, articulation, reflection and control. We focused primarily on the following three in this study: modelling, coaching and scaffolding. According to Collins *et al.* (1991:13), these three are designed to help student teachers to "acquire an integrated set" of teaching skills through observing mentors' teaching and guided practice.

2. MENTORING TO CREATE EQUITABLE MATHEMATICS LEARNING ENVIRONMENTS

Teacher mentors are expected to assist students in blending the mathematics content and underpinning theories studied in university courses in order to understand how to teach mathematics effectively. However, this is not an easy task but requires mentor teachers having a profound understanding of mathematics content (Ma, 1999; Schoenfeld & Kilpatrick, 2008) and mathematics-specific theoretical frameworks (Asikainen, Pehkonen & Hirvonen, 2013). The former is described by Ma (1999) as the ability to make connections between concepts and topics, and to demonstrate conceptual understanding that goes beyond the "what" to the "how" and "why" of mathematical concepts. A combination of a deep understanding of the mathematics content knowledge and theories of teacher knowledge required to teach mathematics plays a key role in mentor teachers' "modelling of quality teaching and helping student teachers in their professional development" (Asikainen, Pehkonen & Hirvonen 2013:80). In addition, mentors should provide student teachers with developmental feedback, including reflection on lessons taught and effective pedagogies that have been identified as successful mentoring strategies (Hudson, 2006, 2009).

However, mentoring of mathematics teaching practice is complicated by a tendency for primary school teachers to be generalists, that is, as Hudson and Peard (2006:229) argue, they may "not be experts in all subjects in primary school and some may not have adequate content knowledge, skills or confidence for teaching primary mathematics". Student teachers

may therefore not receive “equitable mentoring or mathematics-specific mentoring” (Hudson, 2006:13) and, as Lin and Acosta-Tello (2017) found, the lesson planning discussion between mentors and student teachers will focus on the structural aspects of lessons, with a lack of emphasis on the development of MPCK. Student learning and creating mathematical learning environments are core aspects of MPCK. In this study, we have adopted Chick, Baker, Pham and Cheng’s (2006) framework that combines categories of MPCK and MCK and comprises three sections,¹ specifically *Clearly PCK* to describe student and mentor teachers’ views of knowledge needed to teach mathematics and mentoring practices. The *Clearly PCK* consists of nine aspects, listed in Table 1.

Table 1: Clearly PCK (Chick *et al.*, 2006:299).

PCK Category	Evident when the teacher ...
<i>Clearly PCK</i>	
Teaching strategies	Discusses or uses strategies or approaches for teaching mathematical concept
Student thinking	Discusses or addresses student ways of thinking about a concept or typical levels of understanding
Student thinking – misconceptions	Discusses or addresses student misconceptions about a concept
Explanations	Explains a topic, concept or procedure
Cognitive demands of tasks	Identifies aspects of the task that affect its complexity
Appropriate and detailed representations of concepts	Describes or demonstrates ways to model or illustrate a concept (can include materials or diagrams)
Knowledge of resources	Discusses/uses resources available to support teaching
Curriculum knowledge	Discusses how topics fit into the curriculum
Purpose of content knowledge	Discusses reasons for content being included in the curriculum or how it might be used

Student teachers’ knowledge gains from equitable mentoring

Numerous in-depth studies of interactions between mentors and their mentees (Hudson & Hudson, 2011; İmre & Akkoç, 2012) have shown that when the mentoring practices of mathematics teachers are centred on creating equitable learning environments, the student teachers’ MCK and MPCK develop. For instance, Wolf (2003) found a student teacher, through the lesson plan discussion with her mentor, gained deeper conceptual understanding of the mathematics to be taught. Development of the student teacher’s MCK enabled her to make better decisions about selecting appropriate cognitively demanding tasks that would allow learners to engage in productive struggle. In a post-lesson observation discussion the student teacher reported learning in two key areas, firstly, eliciting pupils’ mathematical thinking and “looking for patterns in pupils’ ideas and mistakes and their thinking behind these patterns” (Wolf, 2003:100); secondly, how to orchestrate productive classroom discussions by listening

1 Clearly PCK, content knowledge in a pedagogical context, and pedagogical knowledge in a content context

to pupils' thinking. Similarly, in a study by Peterson and Williams (2008), a student reported that collaboratively planning lessons with the mentor teacher enabled her to advance her understanding of MCK and MPCK, including multiplication, division and fractions, viewing the mathematics content from the perspective of the learners and understanding that they learn best through active participation. As a result, the student teacher's learning was greatly influenced by the mentor teacher's beliefs of mathematics and its teaching.

Developing knowledge of students' misconceptions is a key component of MPCK (Chick *et al.*, 2006), as is developing knowledge of their ideas and mathematical thinking (Ball, Thames & Phelps, 2008). Mentor teachers therefore need to use various mentoring strategies to develop student teachers' MPCK, including aspects such as asking them to read and interpret their performance on a pre-test to gain an understanding of their prior knowledge before teaching a lesson (Lin & Acosta-Tello, 2017). This is particularly useful for anticipating learners' solutions in future lessons and as a guide to asking questions to elicit their thinking. Another important aspect for mentors is the ability to articulate the expert mathematical knowledge underpinning their classroom practices from a theoretical perspective, so that student teachers can link what they learn at university with classroom practice and so grasp its relevance (Asikainen *et al.*, 2013). This is a great challenge for most mentors and, as research in Finland has shown, while the mentor teachers were knowledgeable about the mathematics knowledge needed for teaching they could not articulate it from a theoretical perspective because some of the "theoretical terms seemed ambiguous" (Asikainen *et al.*, 2013:88).

Our overarching view is that equitable mentoring is dependent on a strong link between mentor teachers' profound understanding of mathematics, beliefs of mathematics, views of teacher knowledge and actual mathematics teaching and mentoring practices. Working in a teacher education environment, comprising a university programme that operates in conjunction with a teaching school, we wished to investigate student teachers' views on the mentoring received and mentor teachers' views of their mentoring practices. In this context, with mentor teachers having a prominent role in guiding student teacher development, it was important when assessing the uptake of previous developmental opportunities to determine the focus of further mentor training.

3. RESEARCH METHODOLOGY

In this qualitative study, we sought an in-depth understanding of the mentoring process from the perspective of the participants. We used purposeful sampling to identify two Grade 2 mentor teachers and twelve third-year student teachers in a foundation phase teacher education programme. The following research question guided the investigation:

What are student teachers and their mentors' views of the process of mentoring for mathematics teaching in the foundation phase?

In this laboratory-type school, educational researchers spend considerable time studying teachers' and students' learning and enactment with a view to distilling successful practices that can be fed into the greater school system for further study. As mathematics teaching is so important in the foundation phase and because we are aware of the more generalist nature of the teaching in this phase, we focused on the Grade 2 classroom as an important transition between the first year of formal mathematics teaching (Grade 1) and the last year of the foundation phase (Grade 3). Third-year student teachers were selected as they were in the penultimate year of a four-year degree programme and we reasoned that they had gained

a substantial theoretical knowledge of mathematics and exposure to mentoring that would enable them to respond appropriately to our questions.

We used a combination of focus group interviews for the student teachers and individual semi-structured interviews for the mentors (Creswell, 2007; Danielson, 2002). Questions for both sets of participants focused on obtaining an understanding of the input of the mentor teachers in the students' teaching of mathematics and the development of their MCK and MPCK. The transcribed data were subjected to a two-step process of analysis. In the first, the primary author used methods associated with an inductive process associated with constant comparison (Glaser & Strauss, 1967) to search for recurring ideas and views (Rowley, 2014), eventually arriving at a number of themes. In the second round of analysis, the second author used the findings (themes) as a basis for identifying specific discourse markers (Fraser, 1999) associated with the main aspects of the *Clearly PCK* section. In this respect, the components from the literature served as a framework for scrutinising the themes from the first round and the original raw data for evidence of: a) knowledge of MCK; b) knowledge of aspects of MPCK as described in Table 1; and c) knowledge of theoretical frameworks. The third author provided critical oversight of the two-phase analysis process and the three authors sought consensus in finalising the themes. Approval for the research was obtained first from the overarching committee governing research at the teaching school and then followed by the granting of a second application to the Faculty's Research Ethics committee (Number: 2018-024). In order to preserve the anonymity of the participants the letter S and a number were used to denote the particular student being quoted and the two mentors were named Mentor A and Mentor B. Students 1–6 were in one group and students 7–13 in the second group.

4. FINDINGS

In line with the aims of the investigation, we report on the student teachers and their mentors' views of the process of mentoring for mathematics teaching in the foundation phase.

Student teachers' mentoring experiences

Using the *Clearly PCK* framework to frame student responses we report on the differences between the two student groups in the development of PCK. Student teachers mentored by Mentor A reported that while the mentoring practices were helpful they were overwhelmingly characterised by confusion, conflicting statements and inconsistencies, whereas those mentored by Mentor B found the mentoring practices helpful for their development, particularly for certain aspects of PCK. The expertise of the mentor teacher is a clear differentiator.

Curriculum knowledge and purpose of content knowledge

The student teachers found both mentors' input in the initial stages of lesson planning mentoring useful for their development as teachers of mathematics in that the teachers provided them with the topics to teach and made suggestions on how to present the lesson. However, they were of the view that Mentor A's guidance on the actual teaching of the lesson contradicted what they had learnt in their university methods courses, as evidenced by the following:

S2: *The mentoring sessions were all helpful as in guiding us on what to do with the lesson. Giving us the topic, giving us pointers. But when it comes to actually producing the actual lesson, sometimes the advice given to us by the mentor teacher will contradict what we are learning at the university. Then we are left confused.* (Students all sigh in agreement).

In following up on the dissonance between what they were learning at university and what Mentor A was advising, the student responded as follows:

S2: *Yes, and which I actually do not understand because it is one. So you would expect what we are learning to be similar to what the mentor teachers want. It confuses us as groups and that is how we lose marks because we will do a lesson a certain way and then when our lesson plan is reflected on, then we have to change things. So then it makes it difficult for us because what are we changing it to next because we just know what we have been learning, what we have been taught at the university.*

The students experienced the inconsistencies between university coursework and Mentor A's guidance as extremely challenging. However, they did not explicitly state what they meant by their tertiary learning and it seems both mentor teachers, despite having access to the university coursework and lecturers, did not draw on these as resources when instructing students.

Particular areas in which the student teachers experienced confusion and conflicting guidance were during the lesson planning process, specifically regarding curriculum knowledge and the purpose of content knowledge:

S6: *Like when we were doing our lesson on sharing and the dividing [division]. They said we must bring in the word division but then when we put it in our lesson plan the mentor teacher said we must not use the word "division". They said we can also teach the remainder, then when we put it in our lesson plan they told us we're not allowed to do that. So [we] were confused.*

It seems a thorough understanding of the curriculum and purpose of mathematics content knowledge did not inform the lesson planning guidance received from Mentor A. The Curriculum and Assessment Policy Statement (CAPS, 2011:21) for the foundation phase stipulates that learners in Grade 2 should "solve and explain solutions to practical problems that involve equally sharing and grouping up to 50 with answers that may include remainders". It also indicates that the division of whole numbers up to 100 by 2, 3, 4, 5 and 10, and the use of the division symbol is only introduced in Grade 3 and not in Grade 2. We understand curriculum knowledge to include knowledge of when or by which grade the concept and symbol of division should be introduced. Moreover, the ability to explain to student teachers why the concept and symbol of division are only introduced in Grade 3 illustrates an understanding of the purpose of content knowledge. Instead, the two mentor teachers confused the students as one counselled them to introduce division to Grade 2 learners while the other said not to. Students were then confused in bringing together what they had learnt from their coursework about the age-appropriate conceptual development of mathematics in young children with what was happening in the classroom.

Student teachers who worked with Mentor B highlighted the usefulness of lesson planning guidance, specifically on what to teach:

S7: *Before we do our actual lesson we first observe the teacher doing the lesson before we're going to do our lesson. So that we can know this is what we're going to do and what she has already done. So we have to add on it.*

The student teachers found the guidance on what to teach, with specific attention to the content and concepts, beneficial to their learning. Then, by having the opportunity to observe the mentor teacher's lessons they gained an understanding of the content taught and how

they could build on it. An omission for them in the mentoring process was discussions on how the content fits into the curriculum and why it is included.

Teaching strategies and knowledge of resources

Secondly, student teachers were of the view that both mentors restricted their pedagogical strategies and use of resources in lesson planning and they felt powerless to object:

S1: *I feel like in most cases, a mentor teacher will stay in their comfort zone and is the direction that they will steer you in. So if they like a certain something they will advise you do that and shy away from using different methods or using different resources and what not. So sometimes it does become difficult to expand our lessons because it's just like we feel restricted in a sense and not able to tell this to the teacher.*

S4: *Like she said, I feel that they (the mentor teachers) are not allowing us to do things in a way that we would like to do them. We are mostly limited to doing things in the method they would want us to use. Like what we do is always going to be criticised as to say that our methods are always going to be criticised, that our learners are used to so and so. We can never get the opportunity to say that "Ma'am, since you did it this way how about we take a different direction or a different approach?" to see if learners will understand it better or not.*

The responses indicate that students felt mentor teachers were more comfortable with well-known teaching approaches and resources and reluctant to explore different and/or new ways of teaching mathematics concepts. It also appeared that student teachers were not given clear reasons why the alternative methods and resources they proposed would be unsuitable. Most importantly, there was little or no discussion about why certain teaching strategies and resources were applicable for the teaching of particular concepts but not for others. For instance, student teachers placed with Mentor B indicated that the teacher corrected them on their teaching strategies and emphasised use of the correct mathematical language and teaching strategies to foster conceptual understanding. Their expression of this was, however, vague:

S12: *She does correct us on how we teach, like your teaching method. Teaching skills, she also puts more emphasis on conceptual understanding of mathematics. Like the use of language for mathematics. So she does [place] emphasis on that.*

Other than this generic explanation, the students were unable to name or describe specific teaching strategies or examples of how to foster conceptual understanding of mathematics. The only benefit we could infer was that it seemed to increase their confidence to teach, as expressed by a student teacher:

S10: *I think the mentoring here at the teaching school has helped a lot because when we go to the outside schools we are not scared. We are confident when we are standing in front of the learners because we are used to it here at teaching school.*

A third aspect evident was the disjuncture between the teaching approaches the teachers told the students to use and what they themselves modelled in their teaching:

S3: *I find that they emphasise on how we should include the learners in our lessons but I find that most times they do not. It is like they just tell the learners what to do and then the learners must just do it. ... not always but it happens.*

In university coursework, students are taught ways of selecting appropriate cognitively demanding tasks and the ability to elicit learners' thinking, including their misconceptions. From their responses it appeared that these two key aspects of MPCK were either absent or inconsistently illustrated or modelled in the mentoring processes.

Mentor teachers' views on their mentoring practices

On the other hand, mentor teachers believed they were developing student teachers' teaching strategies, content knowledge and reflection practices, with evidence of general and mathematics-specific teaching strategies being given.

Teaching strategies

Mentor A's descriptions, although responding to the question of teaching strategies, tended to the generic, such as encouraging student teachers to use interactive teaching methods that promoted maximum learner participation:

Mentor A: *I encourage them to use different methods. However, I always encourage them to use a particular method for a particular topic because not all of them are relevant for each topic. For example, even group work is also important but not all the time. So they can use a variety of methods.*

On the other hand, Mentor B's responses showed more evidence of mathematics-specific knowledge and use of a particular model and theoretical framework, namely number sense, for developing conceptual understanding of mathematics:

Mentor B: *Like I said, it's more of looking into the conceptual knowledge when teaching mathematics. If they plan, yes the facts and the procedures will always be there. But it's more of assisting learners in understanding those numbers and understanding mathematics. We all know that mathematics is just a language that we use in our everyday life. So I normally say to them they need to critically look at their lessons. They need to critically look at the activities that they give to the learners and see the opportunity of teaching at that particular point in time. So we've been using the model by Fritz of number sense. I also try and assist them in building their conceptual knowledge of using the number sense, so that then they can be able to assist their learners in the classroom.*

Mentor B explained how she used the Fritz *et al.* (2013) model for the development of numerical concepts from the ages of four to eight years to aid in the development of student teachers' understanding of number sense. There is thus some evidence of conceptual development being underpinned by a theoretical framework and the implementation of development opportunities provided by the university.

Mentor teachers' reflection practices

In responding to the question on the nature of the post-lesson reflection discussion between the mentor teachers and student teachers, both mentors indicated that they focused on certain aspects of PCK, such as the effectiveness of the teaching methods, reasons for selecting activities and resources and whether learning took place.

Mentor A indicated that her discussions with students focussed on the effectiveness of the teaching strategies for reaching lesson objectives and to see if they could recognise flaws in the lesson planning. Mentor B critiqued the university's post-lesson reflection instrument, saying that its generic nature promoted formulaic answers from students. She indicated that instead she constructed her own questions based on what transpired during the lesson, such

as why students used particular activities and resources and how they could tell whether learning was taking place.

5. DISCUSSION

In analysing the data, the authors were interested in understanding how the student teachers' views on the guidance they received from mentor teachers aimed at the development of their MPCK correlated with those of their mentors. The findings showed that not only were there significant differences between the views of student teachers and the two mentors but there was also a great disjuncture with what the mentor teachers seemed to know and what they actually did when they were supposed to be providing mathematics-specific mentoring in a cognitive apprenticeship environment. We surmise the disjuncture had two possible causes. Firstly, the mentor teachers had a superficial rather than profound understanding of the mathematics content regarded by Ma (1999) as essential for the development of students' PCK and MPCK, and, secondly, the mentoring training provided by the university was flawed and/or insufficiently focused on the development of subject-specific strategies.

In mathematics, teachers with a profound understanding of mathematics demonstrate conceptual understanding that goes beyond the "what" to the "how" and "why" of mathematical concepts, and they are able to make connections between concepts and topics (Ma, 1999). Thus, by observing good mathematics teaching practices student teachers are able to build conceptual models of what comprises good teaching (Collins *et al.*, 1991). From the student teachers' responses it was evident that as a result of the mentoring they received they built only fragmented conceptual models of good mathematics teaching practice or development of MPCK, exposing inconsistencies between what teachers instructed them to do and what they actually did. Student teachers had built conceptual models of "the what to teach" rather than "the how to teach".

From the data it appeared that Mentor A was too uncertain or too inexperienced to provide mathematics-specific mentoring, therefore tending to focus on student teachers' compliance with content (the what to teach), probably to work towards curriculum coverage, rather than their learning or development of MPCK. Student teachers' curriculum knowledge development was then also neglected, which puzzled us. The South African curriculum (CAPS) is highly structured and provides teachers with the latitude to enter into discussion with the students about the reasons and means for selecting cognitively demanding tasks that will allow for the eliciting of learners' mathematical thinking. Although Mentor A indicated she encouraged topic specific PCK, this was not evident from the student teachers' responses.

There is some evidence of knowledge of mathematics-specific mentoring in Mentor B's own responses as she spoke about teaching mathematics for conceptual understanding, using the correct mathematical language and linking theory to practice. This was also evident in one of the student mentee's responses but from the others it was evident that Mentor B's knowledge of mathematics-specific mentoring remained at the level of "espoused theory" and did not translate into "theory-in-use" (Schon, 1983). We were unsure whether she genuinely did not know how to make this transition or was telling the interviewer what she wanted to hear. We are hopeful that evidence of positive aspects of her mathematics-specific mentoring, for example, linking theory to practice, was attributable to the mentoring development workshops conducted by the university staff.

The findings did indicate that the mentor teachers provided coaching in the teaching strategies, but these were not explicitly articulated. Nor did the mentors articulate their thinking and reasoning about the (in)appropriateness of certain teaching strategies. *Articulation* as one of six mentoring practices (Collins *et al.*, 1991) and is the ability of mentor teachers to articulate their knowledge and reasoning of the various aspects constituting MPCK. However, the ability to do so about teaching strategies is not restricted to mentor teachers but rather student teachers should also be given the opportunity to make their thinking explicit. The findings showed that the mentor teachers did not explicitly articulate their knowledge and reasoning, nor did they create opportunities for the student teachers to make their knowledge of teaching explicit. Consequently, student teachers were prevented from exercising the autonomy developed over the previous two-and-a-half years of teaching experience. Teacher autonomy is the freedom teachers have to make their own decisions while they carry out their teaching (Tehrani & Masor, 2012), when they have freedom to select their own cognitive demanding tasks, select their own teaching strategies focused on learners' mathematical thinking and eliciting of misconceptions as well as decide on appropriate and clear representations to develop conceptual understanding. As pointed out by Fung (2006:45), the practicum is for "student teachers to experiment, reflect on, learn, and reconstruct their teaching and learning, not to follow or emulate others' practice". We take this to mean that student teachers should engage in various teaching explorations under the guidance of the mentor teachers, something that did not happen optimally with the participants in our study.

The findings suggest the mentoring training provided by the university was flawed and insufficiently focused on subject-specific practices. It focused on mentor teachers creating cognitive apprenticeships with student teachers, but the teachers' inability to do so made us question whether the mentor teachers had themselves been provided with the context in which they could learn through modelling and examples. Furthermore, we remain unsure whether the mentor teachers were supported in ways that enabled them to articulate their knowledge and reasoning about mathematics-specific mentoring, to reflect and to express their autonomy. We were concerned specifically about whether the training focused on the development of a profound understanding of mathematics, as such a deficit of this in foundation phase teachers is well documented (Carnoy, Chisholm & Chilisa, 2012; Taylor & Taylor, 2013; Venkat & Spaul, 2015). If mentor teachers do not receive sufficient training to address it, then teacher education programmes such as the one reported on in this paper, are perpetuating poor mathematics teaching in South African primary schools.

From the perspective of teacher educators, who are also responsible for ensuring that mentors are sufficiently well trained to work with student teachers, we needed to ensure that mentoring programmes focused on generic and subject-specific processes. In the case of mathematics, teachers would develop not only mentoring practices but also a profound understanding of mathematics and mentors' teaching practices. Furthermore, a well-structured mentoring programme needs to include a partnership between the university and the (teaching) school, a coaching relationship between mentor teachers and teacher educators and a sound mentorship between mentors and student teachers (Cheng, Cheng & Tang, 2010). We agree with Hudson and Hudson (2011) that just as there are standards for teaching and assessing so there is a need for a set of standards for mathematics-specific mentoring practices. We believe a set of standards and sufficient mentor training will alleviate inconsistent and confusing mentoring practices.

6. CONCLUSION

While the data set for the study on which this paper is based was a small sample of student teachers and mentors' views on mentoring, they did reveal a clear disjuncture between what teachers espouse and what they practice as well as how mentors and students differ in their perceptions of the usefulness of mentoring practices in their learning. Lacking in the study were observations of the mentor teachers' mentoring practices that might have provided a full picture of the depth and breadth of their MPCK and their understanding of providing mathematics-specific mentoring. Despite this, however, the results were useful in pointing out gaps in the promotion of mentoring for MPCK and highlighting the importance of a mentoring model within a structured practicum curriculum that provides clear guidelines for mentors and student teachers. We agree with many of the publications on mentoring that while there is no formula to provide mentoring informed by cognitive apprenticeship practices, if teacher educators and mentors have a shared understanding of what mathematics-specific mentoring entails and the aspects needed to develop MPCK they will work better with mentors to operationalise this. Ultimately, what we learnt from the study is that we underestimated the type and nature of training mentors require as well as the kind of scaffolding necessary to develop competencies that would enable them to meet the subject-specific mentoring needs of student teachers.

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