The Teacher Knowledge/Classroom Practice Nexus: Professional Learning in the Classroom

Dr Kathryn Holmes
The University of Newcastle
<Kathryn.Holmes@newcastle.edu.au>

Teaching quality is increasingly recognised as the key determinant of school effectiveness while poor quality teaching, particularly in mathematics, is often understood as resulting from deficiencies in teacher knowledge. This paper focuses on dominant frameworks that have been touchstones for teacher knowledge in mathematics education during at least the past two decades. For example, there have been consistent references to Shulman's Pedagogical Content Knowledge (PCK) and derivations such as Ball's Mathematical Knowledge for Teaching (MKT). These frameworks provide a structured lens for distinguishing among various types of knowledge thought to be important for teaching. We consider shortcomings associated with focussing predominantly on such conceptions of the knowledge needed for teaching, especially given that the impact of such knowledge will always be mediated by teacher choices in relation to classroom instruction. We suggest that at least equal attention must be given to teachers' knowledge of teaching (that is, teachers' broad pedagogical knowledge) in the quest for improving teaching quality. In order to facilitate the translation of PCK or MKT into effective teacher action in the classroom, we suggest that teachers also need access to a comprehensive pedagogical framework to guide reflection, analysis, and improvement. We report on early findings from projects involving such a framework, known as Quality Teaching, to illustrate the potential of this broader conceptualisation of what teachers need to know if they are to succeed in the classroom.

Teachers are required to draw on an extensive bank of knowledge as they plan, teach, and assess student learning on a day-to-day basis. When teaching mathematics, for example, teachers require a profound understanding of the mathematics content, along with a vast repertoire of pedagogical strategies judiciously linked to particular content. This knowledge must then be applied to the planning and implementation of lessons within diverse contexts, requiring spontaneous adaptation according to the learners' responses. Clearly, there is no simple recipe for developing the knowledge needed and the expertise required to implement it effectively in the classroom. This paper will consider frameworks specifically developed for understanding the knowledge required for mathematics teaching, alongside a more general pedagogical framework and an associated implementation technique that is showing promise as a professional development technique for all teachers.

Frameworks for understanding knowledge bases for teaching

Scholarship about the knowledge needed for teaching has been developing for many decades. One of the most influential contributions, made by Lee Shulman in 1986, was the development of the concept of Pedagogical Content Knowledge (PCK), which has been followed by many derivations, for example, Mathematical Knowledge for Teaching (MKT). Over this same time period, a parallel strand in teacher education has focussed on the development of general pedagogical models encompassing a broad conception of the knowledge required by teachers and practices applicable to all teaching contexts. One such model, Quality Teaching, and a related model of implementation, Quality Teaching Rounds, will be outlined in this paper for their contribution to debates about knowledge for teaching.

Pedagogical Content Knowledge

Various revisions have been made to Shulman's (1986) original conception of PCK with most emphasising some form of adaptation for particular subject matter. Park and Oliver (2008) thus provide the following definition:

> PCK is teachers' understanding and enactment of how to help a group of students understand specific subject matter using multiple instructional strategies, representations, and assessments while working within the contextual, cultural, and social limitations in the learning environment. (p. 264)

Such a definition emphasises the interplay between teacher knowledge and the enactment of that knowledge within specific classroom contexts. Park and Oliver (2008) highlight that while teachers act on the basis of their existing PCK, they also acquire further PCK through their interactions with students. The dynamic classroom environment, therefore, acts as an incubator for the production of PCK, though how this knowledge is reflected upon by teachers and integrated with their existing knowledge is unclear.

Within the mathematics education literature, Depaepe, Verschaffel, and Kelchtermans (2013) provide a comprehensive review of how PCK is conceptualised. They emphasise four general characteristics that emerge from various authors' definitions. Firstly, that PCK consists of some form of integration of pedagogical knowledge and content knowledge; secondly, that PCK is a practical form of knowledge concerned with carrying out the act of teaching; thirdly, that PCK is specific to the particular content knowledge being taught; and finally, that content knowledge is a necessary precursor to the development of PCK.

Mathematical Knowledge for Teaching

Ball and colleagues (Ball, Thames, & Phelps, 2008) further unpack PCK as Mathematics Knowledge for Teaching (MKT), delineating between two types of subject matter knowledge (Common Content Knowledge; Specialised Content Knowledge) and three types of PCK (Knowledge of Content and Students; Knowledge of Content and Teaching; Knowledge of Curriculum) and have developed an empirical means of testing the degree to which teachers develop these forms of knowledge[1]. Using this approach they provide some evidence of a positive link between teacher knowledge and student learning outcomes. Importantly, they also distinguish between a cognitive understanding of teacher knowledge and a situated perspective which takes into account real actions in classrooms, rather than predictions of action.

The Quality Teaching Model

While PCK and MKT can be understood in relation to teachers' practice, they have primarily been used to understand or to measure the knowledge types that teachers need prior to enacting classroom practice. In contrast, the Quality Teaching (QT) model is designed to structure teachers' thinking about classroom practice to assist with planning, reflecting, and building further knowledge for teaching. The model (NSW Department of Education and Training, 2003), developed by Ladwig and Gore for New South Wales (NSW) public schools, is a well-established model of effective pedagogy that is comprehensive in scope. The model is a refinement of the Productive Pedagogies model (Hayes, Lingard, & Mills, 2000) which in turn was an extension of Authentic Pedagogy

---

1 Interestingly, they have not expanded on the PK component of PCK, perhaps assuming that general pedagogical knowledge is self-evident

(Newmann & Wehlage, 1996). It was developed as a framework for teachers' professional self-reflection and for school improvement practices and has been used extensively in public schools in New South Wales and the Australian Capital Territory for over a decade. The QT model is a pedagogical framework, applicable to all teaching contexts and subject areas, with an emphasis on classroom practice and can be used as an observational tool to assess the quality of classroom teaching across three dimensions: Intellectual Quality, Quality Learning Environment, and Significance. Each of the three dimensions consists of six elements, detailed in Table 1 in the appendix. Descriptors for each element explain how they can be observed in a lesson and rated on a 1-to-5 scale.

While the QT model has been widely adopted in NSW, more recently interest has turned to a related model of professional learning, Quality Teaching Rounds (Bowe & Gore, under review), which has potential to be both sustainable and transformational for teachers and students (Gore, 2014).

Professional Learning for Teachers

There is evidence that professional learning for teachers is most effective when teachers are engaged in inquiry-based professional learning within communities of practice involving other teachers and external experts (Holmes & Mockler, in press). A complementary view is expressed by Wiliam (2014) who emphasises the need for teachers to be involved in professional learning focussed on their practice rather than the traditional view of professional learning as a means of increasing teacher knowledge in either content or pedagogy. He laments that "changes in what teachers know … will not benefit students unless teachers also change what they do in the classroom" (p.11). In other words, links between professional learning and the ensuing changes in teachers' pedagogy is crucial if it is to be effective and sustained.

The next section will describe one approach to professional learning that is demonstrating promise as a sustainable, practice-focussed model for teacher development.

Quality Teaching Rounds

Quality Teaching Rounds (QTR), a professional learning approach, has been developed to enable teachers to work in collaborative teams guided by the QT model to improve the quality of their teaching (Gore, 2014). The QTR approach involves teachers working in small teams to observe each other's teaching, followed by an in-depth discussion of each teaching episode with reference to the 18 elements of the QT model. The discussion of each element is guided by an inquiry question, rather than a "rigid directive about what every lesson or every classroom should look like" (Bowe & Gore, under review, p. 11).

Preliminary studies indicate that the QTR approach is an effective means of improving both teaching quality and student learning outcomes (Gore, 2014)[2]. In a related project University of Newcastle pre-service mathematics teacher education students (n = 40) have participated in a teaching experience with associated QTRs with practising teachers as a new approach to the development of practice based PCK[3].

---

2 The research team at the University of Newcastle (Gore, Bowe, Lubans, Smith and Mockler) is currently undertaking a randomised controlled trial involving 24 schools, to further test the effectiveness of the QTR approach for improving teacher quality and student learning outcomes.

3 Results will be published in a forthcoming article in Mathematics Teacher Education and Development.

Conclusion

As a general pedagogical model, QT does not specify types of teacher knowledge in the same way that models of PCK and MKT do. Rather, it provides teachers with a comprehensive pedagogical model and a common language to discuss and reflect on observable features of classroom practice. During QTR discussions some aspects of practice that could be considered as representative of teachers' applications of components of PCK or MKT will arise. QTR provides a mechanism by which these aspects of teacher knowledge are discussed among colleagues with reference to classroom practice within the teachers' actual workplaces, thereby optimising the potential for teacher change and growth. Teachers do need specific types of knowledge before they begin to teach, but without an effective means of reflecting on and building this knowledge as it "plays out" in the classroom, there is no guarantee that it will have the desired impact on student learning.

References

Ball, D. L., Thames, M. H., & Phelps, G. (2008). Content knowledge for teaching what makes it special? *Journal of Teacher Education, 59*(5), 389–407.

Bowe, J. M., & Gore, J. M. (under review). Reassembling teacher professional development: The case for Quality Teaching Rounds.

Depaepe, F., Verschaffel, L., & Kelchtermans, G. (2013, July). *The conceptualization and operationalization of pedagogical content knowledge in mathematics education research.* Paper presented at the 16th biennial conference of ISATT "Excellence of teachers? Practice, policy, research", Ghent, Belgium.

Gore, J. (2014). Towards quality and equity: The case for Quality Teaching Rounds. In *Quality and equity: What does research tell us?* (Proceedings of the annual conference of the Australian Council for Educational Research, Adelaide, pp. 86–91). Melbourne: ACER.

Hayes, D., Lingard, R., & Mills, M. (2000). Productive pedagogies. *Education Links, 60*, 10–13.

Holmes, K., & Mockler, N. (in press). Ongoing professional learning. In G. Romeo, & M. Henderson (Eds.), *Teaching and digital technologies: Big issues and critical questions*. Cambridge, UK: Cambridge University Press.

Newmann, F. M., & Wehlage, G. (1996). *Authentic achievement: Restructuring schools for intellectual quality*. San Francisco, USA: Jossey-Bass.

NSW Department of Education and Training. (2003). *Quality teaching in NSW public schools: An annotated bibliography*. Sydney: Department of Education and Training, Professional Support and Curriculum Directorate.

Park, S., & Oliver, J. S. (2008). Revisiting the conceptualisation of pedagogical content knowledge (PCK): PCK as a conceptual tool to understand teachers as professionals. *Research in Science Education, 38*(3), 261–284.

Shulman, L. (1986). Those who understand: Knowledge growth in teaching. *Educational Researcher, 15*(2), 14–14.

Wiliam, D. (2014). Optimizing talent: Closing educational and social mobility gaps worldwide. Retrieved 05 January 2015 from the World Wide Web: http://www.dylanwiliamcenter.com/files/pdf/Optimizing-Talent-20140829.pdf

Acknowledgement

The author would like to acknowledge the support of Prof Jenny Gore in the preparation of this manuscript.

Appendix

	Dimensions		
Elements	*Intellectual Quality*	*Quality Learning Environment*	*Significance*
	Deep knowledge	Explicit quality criteria	Background knowledge
	Deep understanding	Engagement	Cultural knowledge
	Problematic knowledge	High expectations	Knowledge integration
	Higher order thinking	Social support	Inclusivity
	Metalanguage	Students' self-regulation	Connectedness
	Substantive communication	Student direction	Narrative

Table 1. Dimensions and Elements within the Quality Teaching Model