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To cite this version:

Azimehsadat Khakbaz. What does pedagogical content knowledge (PCK) in the context of university mathematics teaching mean?. CERME 9 - Ninth Congress of the European Society for Research in Mathematics Education, Charles University in Prague, Faculty of Education; ERME, Feb 2015, Prague, Czech Republic. pp.2285-2286. hal-01288654

HAL Id: hal-01288654
https://hal.science/hal-01288654
Submitted on 15 Mar 2016

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What does pedagogical content knowledge (PCK) in the context of university mathematics teaching mean?

Azimehsadat Khakbaz

Although university mathematics teachers have an influential role on developing culture of teaching-learning mathematics in society, little is known about which kinds of teaching knowledge a future university mathematics teacher should have. Pedagogical content knowledge (PCK) provided a suitable theoretical base to study university mathematics teaching knowledge. This study aimed to find out what pedagogical content knowledge (PCK) in context of university mathematics teaching means. To answer this question, this research has done through grounded theory. Data were gathered by interviews from 27 university mathematics teachers (8 mathematics faculty members and 19 PhD students as future university mathematics teachers) and analysed through coding and categorizing. Data analysis revealed a detailed model which described PCK in context of university mathematics teaching.

Keywords: University mathematics teaching, university mathematics teacher, teaching knowledge development, pedagogical content knowledge (PCK).

RESEARCH PROBLEM

PCK was first introduced by Lee Shulman as a “missing paradigm” in teaching in the 1980s. Shulman (1987) identified seven domains of teacher knowledge, one of which is PCK: content knowledge; general pedagogical knowledge; curriculum knowledge; pedagogical content knowledge; knowledge of learners; knowledge of educational context and knowledge of educational ends. He described PCK as a special amalgam of content and pedagogy that is uniquely the province of teachers, their own special form of professional understanding. He also noted that PCK itself includes knowledge of learners, knowledge of educational context, and knowledge of instructional materials.

One of the most important conceptualizations of PCK was proposed by Hill, Ball and Schilling (2008) and was labelled mathematical knowledge for teaching (MKT). These authors divided MKT into two categories: subject matter knowledge (SMK) and PCK. SMK was described as consisting of three domains of knowledge: common content knowledge (CCK), specialized content knowledge (SCK) and horizon content knowledge (HCK). Knowledge of content and students (KCS), knowledge of content and teaching (KCT) and knowledge of content and curriculum (KCC) are defined as being included in PCK.

The MKT model has provided a useful foundation in mathematics education at lower grade. Speer and King (2009) analyzed CCK, SCK and PCK in mathematics teaching at higher levels. Their research concluded with a set of questions that they believe are important for the research community to consider as investigations of teachers’ knowledge more broadly and beyond school contexts.

Speer and colleagues (2015) demonstrate that the nature of SMK, especially CCK and SCK, for university teachers are different from that of school teachers. Therefore, conceptualization of PCK in university mathematics teaching needs more study.

RESEARCH METHODS

This research was conducted through the grounded theory approach. The study took place in Iran, a country with a centralized higher education system. Two universities were selected for gathering data. In each university, participants were 8 mathematics faculty members and 19 PhD students as future university mathematics teachers. Data of this study were gathered mainly through semi-structured in-
What does pedagogical content knowledge (PCK) in the context of university mathematics teaching mean? (Azimehsadat Khakbaz)

terviews of the participants’ experiences of teaching and learning mathematics at university. Interviews were transcribed and analyzed through coding and categorizing.

FINDINGS

Data analysis revealed that we could conceptualize PCK for teaching university mathematics through relationships between four main categories of knowledge:

- Knowledge about the context of mathematical concepts
- Knowledge about students’ understanding of mathematics
- Knowledge about mathematics curriculum planning
- Knowledge about creating an influential mathematics teaching-learning environment

REFERENCES


