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Pedagogical Content Knowledge: A Framework For Teacher Education

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Abstract

Teaching is the noblest of all professions. Teaching is a profession and teacher education is a process of professional preparation of teachers. The professional preparation of teachers has been recognized as crucial for the qualitative improvement of education since 1960s (Kothari Commission, 1964-66).

In its early history, teacher education has emphasized on the teacher's knowledge of subject matter. Critical features of teaching, such as the subject matter being taught, the classroom context, the physical and psychological characteristics of the students were typically ignored in the quest for general principles for effective teaching. Lee S. Shulman first introduced the term pedagogical content knowledge (PCK) a form of practical pedagogical wisdom of able teachers to guide their actions in highly contextualized classroom settings. For Shulman[8] pedagogical content knowledge is the most useful ways of representing and formulating the subject that make it comprehensible to others. Cochran, *et al*.[2] renamed PCK as pedagogical content knowing (PCKg) to acknowledge the dynamic nature of knowledge development and defined pedagogical content knowing as teacher's integrated understanding of four **components pedagogy**, subject matter content, student characteristics, and the environmental context of learning. Magnusson, *et al*.[4] considered PCK as a separate domain of knowledge that is iteratively fueled by knowledge of its component parts: subject matter knowledge, pedagogical knowledge and knowledge of context. Gess-Newsome and Lederman[3] has given the transformative model of pedagogical content knowledge which is considered as the transformation of subject matter, pedagogical and contextual knowledge into a unique form of knowledge that impacts teaching practice. Pedagogical content knowledge includes knowledge of how particular

subject matter topics, problems and issues can be organized, represented and adapted to the diverse interest and abilities of learners and then presented for instruction[1]. Van Driel[9] model integrates the effects of external input, collegial interactions, and experimentation in practice on teachers' PCK through processes of enactment and reflection. Although the term PCK is widely used, the breadth of what the term includes, details of its development has only been thinly developed. From the viewpoint of teacher preparation PCK development is continual as a result of experience in many classroom settings with many students. The teacher education system through its initial, in-service and continuing professional development programmes is expected to ensure adequate supply of professionally competent teachers to run the nation's schools (NCFTE, 2009).

Introduction

Teaching is the noblest of all professions. Teacher plays an important role as transmitters, inspirers and promoters of man's eternal quest for knowledge. The professional preparation of teachers has been recognized as crucial for the qualitative improvement of education since 1960s (Kothari Commission, 1964-66). Stated by NCTE (1998) in Quality Concerns in Secondary Teacher Education-"The teacher is the most important element in any educational program''. It is the teacher who is mainly responsible for implementation of the educational process at any stage. Skillful teaching requires the appropriate use and integration of specific moves and activities in particular cases and contexts, based on knowledge and understanding of one's pupils and on the application of professional judgment. Teaching is a profession and teacher education is a process of professional preparation of teachers.

Scholars and reform initiatives have recognized the importance of subject matter knowledge and pedagogical knowledge as crucial to effective teaching and student understanding. Lee S. Shulman first introduced the term pedagogical content knowledge (PCK) during his President's Address to the American Educational Research Association in 1985 and it first appeared in print in 1986. In Shulman's view, pedagogical content knowledge is a form of practical pedagogical wisdom of able teachers to guide their actions in highly contextualized classroom settings. Improving teaching both as an activity and profession requires an elaborate knowledge base of teaching and it includes:

- General pedagogical knowledge, with special reference to those broad principles and strategies of classroom management and organization that appear to transcend subject matter;
- Knowledge of learners and their characteristics;
- Knowledge of educational contexts, ranging from workings of the group or classroom,

the governance and financing of school districts, to the character of communities and cultures;
- Knowledge of educational ends, purposes, and values, and their philosophical and historical grounds;
- Content knowledge;
- Curriculum knowledge, with particular grasp of the materials and programs that serve as "tools of the trade" for teachers;
- Pedagogical content knowledge is special amalgam of content and pedagogy that is uniquely the province of teachers, their own special form of professional understanding.

Pedagogical content knowledge is the category most likely to distinguish the understanding of the content specialist from that of a pedagogue. Shulman defined pedagogical content knowledge as: The most useful forms of content representation., the most powerful analogies, illustrations, examples, explanations, and demonstrations, in a word, the most useful ways of representing and formulating the subject that make it comprehensible to others. It also includes an understanding of what makes the learning of specific topics easy or difficult: the conceptions and misconceptions that students of different ages and backgrounds bring with them to the learning of most frequently taught topics and lessons[1-5].

Cochran, *et al*.[2] revised Shulman's original model to be more consistent with a constructivist perspective and renamed PCK as pedagogical content knowing (PCKg) to acknowledge the dynamic nature of knowledge development. They defined pedagogical content knowing as teacher's integrated understanding of four **components pedagogy,** subject matter content, student characteristics, and the environmental context of learning. Development of PCKg is continual which enables teachers to use their understanding to create teaching strategies for teaching and enable students to construct useful understanding in a given context. Their definition of PCKg emphasized the development of pedagogical and subject matter knowledge in the context of two other components of teacher knowledge. The first additional component is teachers' knowledge of students' abilities and learning strategies, age and developmental levels, attitudes, motivations, and prior knowledge of the concepts to be taught. The other component of teacher knowledge that contributes to pedagogical content knowledge is teachers' understanding of the social, political, cultural and physical environmental context that shapes the teaching and learning process. Shulman's other two types of knowledge i.e. knowledge of curriculum and educational goals are included in pedagogical understanding. The model in figure 1 shows that these four components of teachers' knowledge contribute to the integrated understanding that is called as pedagogical content knowledge; and the arrows indicate that pedagogical content knowledge continues to grow with teaching experience.

Magnusson, *et al*.[4] argued for the uniqueness and importance of pedagogical content knowledge in teacher preparation. According to them pedagogical content knowledge is often conceived as the transfor-

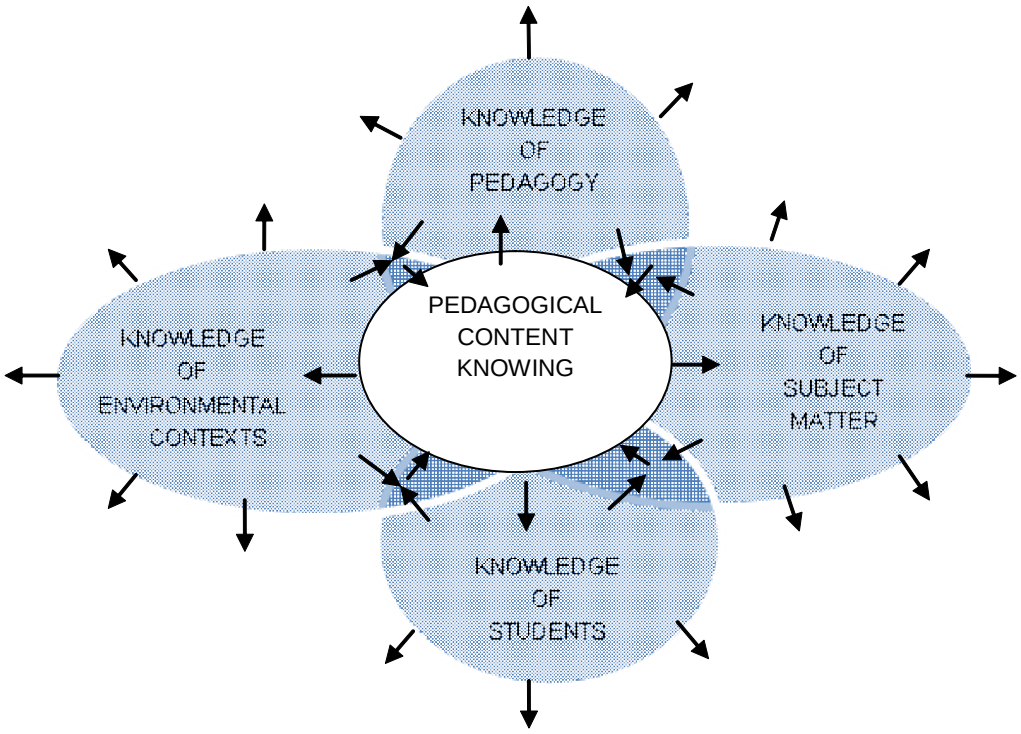

Figure 1: Model of Pedagogical Content Knowing (Cited in Cochran, et al., 1993)

mation of several types of knowledge for teaching that are strongly related, or integrated. They considered PCK as a separate domain of knowledge that is iteratively fueled by knowledge of its component parts: subject matter knowledge, pedagogical knowledge and knowledge of context. Gess-Newsome and Lederman[3] has given the transformative model of pedagogical content knowledge which is considered as the transformation of subject matter, pedagogical and contextual knowledge into a unique form of knowledge that impacts teaching practice. In the Transformative model, initial knowledge bases are inextricably combined into a new form of knowledge known as pedagogical content knowledge, in which the parent domain may be discovered only through complicated analysis. The resulting amalgam is more interesting and powerful than its constituent parts. Gess-Newsome and Lederman[3] have shown their interpretation of the place of full set of seven categories in figure 2. Three points are important to note here. First, they contend that knowledge of educational goals and purpose is inseparable from knowledge about evaluation and assessment procedures. Second, curricular knowledge is fed by both content knowledge and knowledge of goals/ assessment procedures while pedagogical knowledge is fed by both knowledge of learners/ learning and knowledge of goals/ assessment procedures. Third, general

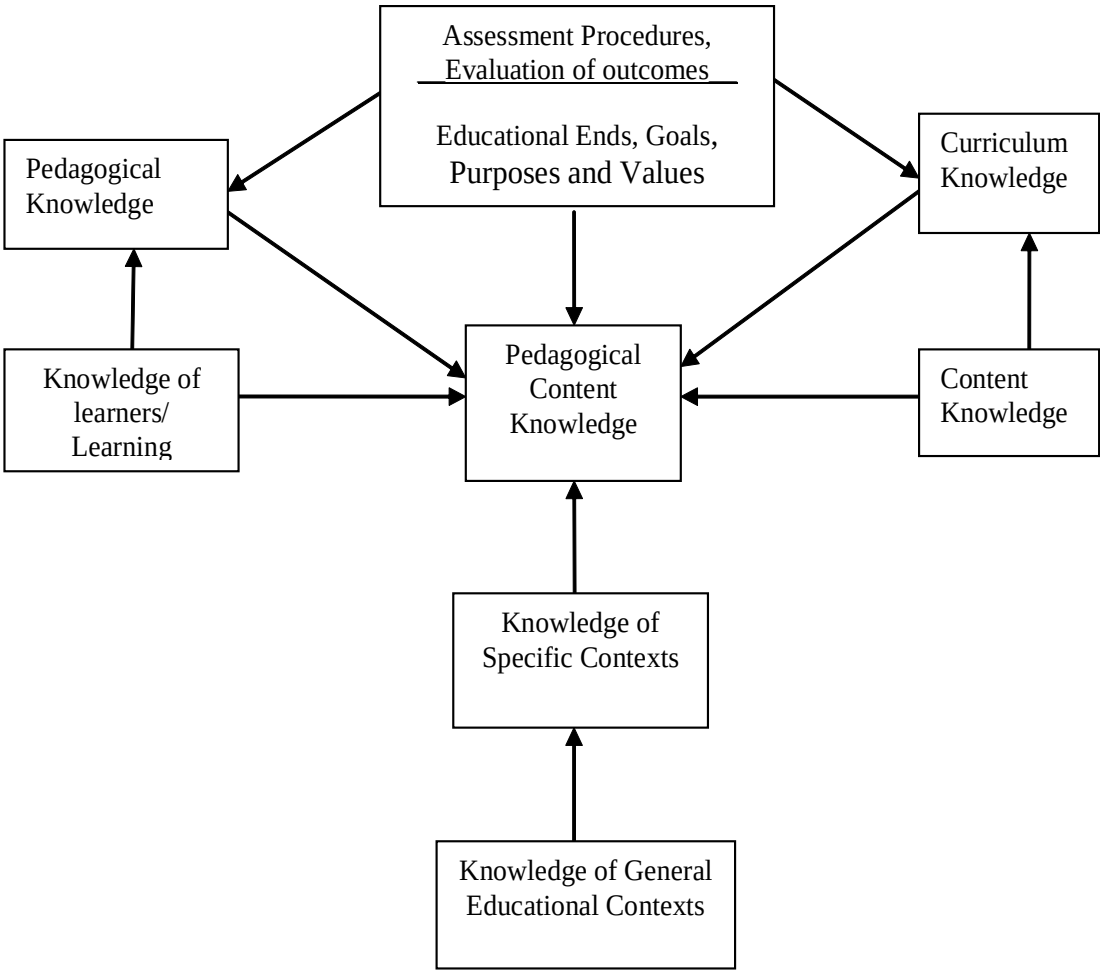

Figure 2: Categories contributing to Pedagogical Content Knowledge
(cited in Gess-Newsome and Lederman,1999)

educational context is further delineated to the sub-category of knowledge of specific contexts.

Pedagogical content knowledge is defined as a teacher's understanding of helping students to understand specific subject matter[1]. It includes knowledge of organizing and representing particular subject matter topics, problems and issues to the diverse interest and abilities of learners and then presented for instruction. They consider "teaching" as everything that teachers must do to support the learning of their students. Most interestingly, teaching may require a specialized form of pure subject matter

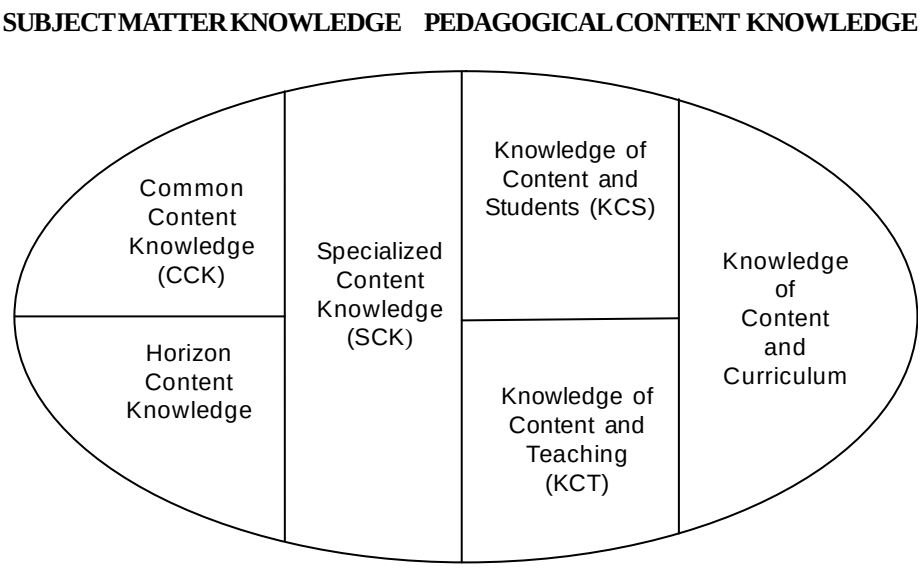

Figure 3: Domains of Mathematical Knowledge for Teaching
(Cited in Ball, *et al*., 2008)

knowledge, "pure" because it is not mixed with knowledge of students or pedagogy and "specialized" because it is not needed or used in settings other than mathematics teaching. This uniqueness is what makes this content knowledge special. Ball *et al.* hypothesized that Shulman's content knowledge could be subdivided into common content knowledge (CCK) needed by teachers and non teachers alike and specialized content knowledge (SCK). Pedagogical content knowledge of Shulman could be divided into knowledge of content and students (KCS) and knowledge of content and teaching (KCT). Shulman's third category, curricular knowledge, is placed within pedagogical content knowledge. Authors provisionally included a third category called horizon content knowledge within subject matter knowledge.

According to Park and Oliver[6], the transformation of content knowledge by the teachers for the purpose of effective teaching and enhancing student learning lies at the center of PCK. This implies that PCK must be understood and explored at two levels: 1) espoused PCK and 2) enacted PCK. Espoused PCK is like a concept map that guides science teachers to make instructional decisions, the use of particular reinforcement materials and

instructional strategies, while providing assessment of student learning. When such knowledge gets enacted in the classroom is called as enacted PCK. The enactment of PCK is a meta-cognitive activity which implies that while the espoused PCK can help science teachers to design a lesson that reflects the best practices, enacted PCK is responsive to the students' learning needs as they present themselves during teaching[6-9].

Van Driel[9] focused on a model for the development of science teachers' PCK. The model integrates the effects of external input, collegial interactions, and experimentation in practice on teachers' PCK through processes of enactment and reflection. It is recommended to provide external input together with opportunities for teachers to experiment with new teaching approaches in their classroom, and to reflect on their experiences, both individually and collectively. In such cases, teachers then act as "architects for change". Collegial interactions provided the input for a collective comparison of ideas about specific learning difficulties of students, or about particular teaching approaches (eg. using certain analogies to explain chemical equilibrium). Park, *et al*.[6,7] has defined PCK as the amalgam of science teachers' knowledge of context, curriculum, pedagogy and assessment that hold potential to result in conceptual understanding among the students when enacted in the classroom.

Pedagogical content knowledge might move from an acceptable academic construct to a useful framework for teachers to develop and share their content-specific wisdom of practice in meaningful ways that can further enhance the development of professional knowledge and practice. Between scholars, differences occur with respect to the elements they include or integrate in pedagogical content knowledge, and to specific labels or descriptions of these elements. A common view of pedagogical content knowledge is that it is bound up and recognizable in a teacher's approach to teaching particular content. Teacher should act as facilitator of children's learning in a manner that the child is helped to construct his/her own knowledge. The teacher education system through its initial, in-service and continuing professional development programmes is expected to ensure adequate supply of professionally competent teachers[5] to run the nation's schools (NCFTE, 2009)

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