

Effects of Case-Based Professional Development on Teacher Technological Pedagogical Content Knowledge

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Abstract: This study investigated the efficacy of case-based professional development in helping teachers build capacity for technology integration. Specifically, it examined the ways in which case discussion and case development helped teachers deepen their understanding of the relationship between technology, content, and pedagogy. Data sources included content analysis of case discussions, examination of written cases, and teacher questionnaires. Findings indicated that the use of cases enhanced teacher understanding of the inter-relationships between technology, content, and pedagogy.

Introduction

In recent years, researchers emphasized that some of the most powerful professional development opportunities available for teachers are grounded in the systematic study and analysis of classroom practice (Ball & Cohen, 1999). A specific pedagogical approach that engages teachers in a form of practice-based PD is the use of case methods, such as *case analysis* and *case development*. During case analysis, teachers engage in critical assessment of practice and exploration of complex pedagogical issues by discussing cases developed by *other teachers* (Merseeth, 1996). During case development, teachers turn their classrooms into a site of inquiry and critically examine their *own* practice in order to develop cases from which other teachers can learn from (J. Shulman, 2002). Despite the potential of the case approach, little is still known about the impact of case methods on teacher knowledge and practice, as well as the specific features and instructional interactions that make cases most effective (Merseeth, 1996).

This paper has three inter-related objectives. First, it investigates the ways in which teachers assessed, interpreted and made sense of teaching with technology when they read and analyzed cases developed by *other* teachers. Second, it looks at how they integrated different facets of knowledge as they discussed and analyzed the cases under study. Third, it examines the ways in which teachers connected knowledge to practice as they designed, enacted and reflected on their *own* technology enhanced activities in the context of case development.

Theoretical Framework: Defining Teacher Knowledge of Technology Integration

Research has recently conceptualized a new form of teacher knowledge required for effective application of technology in teaching called *Technological Pedagogical Content Knowledge* (TPACK; Mishra & Koehler, 2006). Building upon L. Shulman's work (1986), TPACK consists of three primary bodies of knowledge: Technological Knowledge (TK), Content Knowledge (CK), and Pedagogical Knowledge (PK). TK refers to computer literacy and the ability to apply technological tools for everyday tasks. CK is concerned with the knowledge of the subject matter to be taught. PK involves knowledge of general teaching and learning methods, knowledge of learners, and knowledge of assessment and classroom management strategies. More importantly, TPACK emphasizes the links and relationships that exist *between* these bodies of knowledge. The relationship between technology and content, for example, results in Technological Content Knowledge (TCK), which focuses on the manner in which technology and content are reciprocally related. Similarly, the relationship between content and pedagogy results in Pedagogical Content Knowledge (PCK), which involves knowledge for teaching within a specific discipline (Shulman, 1986). Finally, the relationship between technology and pedagogy results in Technological Pedagogical Knowledge (TPK). TPK includes the ability to identify specific pedagogical techniques and the ways in which they can be applied to the use of technology. Together, these bodies of knowledge represent TPACK, the ability to integrate TK with CK and PK to enhance student learning.

Methods

The study was conducted in the context of graduate level course offered at a Mid-Atlantic University, titled *Cognition and Technology*, taught by the author over a period of 14 weeks. The course focused on learning sciences theories and their role in the design and use of educational technology in real-world settings. In addition to reading relevant materials, participants explored a range of computer-based learning environments developed within a learning sciences framework. As a culminating activity, students were required to complete a project that centered on case development. The course used a hybrid design whereby students met every other week for three hours. When not meeting face-to-face, all students engaged in asynchronous online interactions

where they discussed course readings and analyzed cases developed by other K-12 teachers. To facilitate communication and interaction a course management system available at the university was used.

Participants

A total of 12 students participated in the course. All participants engaged in case discussion and analysis. Of those 12 participants, 8 held K-12 teaching positions and completed the case development project. Three of those teachers taught at the elementary level. The other five taught mathematics, science, social studies, language arts or foreign languages at the middle and high school level. Six teachers were in their first 5 years of teaching. One teacher had 5-10 years of experience while the other one was seasoned with more than 10 years of experience. With the exception of one teacher, all others taught at public schools.

Use and Pedagogy of Case Methods in this Study

The use of case methods in this study was divided in two phases. In *Phase 1* (Weeks 2-9), participants discussed and analyzed a set of three cases developed by other K-12 teachers who had previously engaged in a case development project. Each case provided a detailed account of a real teaching experience that focused on the design and implementation of a technology enriched curriculum unit consistent with state standards. All cases were built around the same format and included both a narrative and a reflective section. Teachers discussed the cases online using the communication features of the course management system. A set of open ended questions was provided to scaffold case discussions and analysis.

In *Phase 2* (Weeks 4-14), 8 participants engaged in a case development project. The process of case development was divided in four stages. In *stage 1*, teachers identified a current pedagogical problem from their classrooms (e.g., helping students see the application of mathematics in real-world) and considered ways in which technology can offer solutions to this problem. In *stage 2*, teachers developed a technology integration plan to address the identified problem. In *stage 3*, teachers enacted their technology integration plans in their classrooms and collected relevant artifacts. In *stage 4*, teachers wrote a narrative case based on the cycle of preparation, enactment, and reflection of the technology integration plan in their classroom. To facilitate case development participants followed a template, which incorporated a series of *writing* and *reflection* prompts.

Data Collection and Analysis

Data were collected from three sources: online case discussions, examination of written cases, and written questionnaires on the value of case analysis and case development. These data were first analyzed qualitatively to identify emerging patterns. Subsequently, verbal analysis (Chi, 1997) was employed to count and represent facets of knowledge evident in participants' discussions and cases, using an a priori coding scheme.

Findings

Findings indicated that case analysis provided an engaging context for discussing technology integration where multiple perspectives were generated and theoretical principles were illuminated through practice. Further, both case analysis and case development helped teachers strengthen their knowledge by helping them build or link connections among the different facets of TPACK. What is most promising is the fact that issues related to technology did not dominate case discussions or case narratives, as is typical in traditional professional development opportunities on the use of technology. Rather, issues related to pedagogy such as learners, instruction and assessment, both independently and in relation to technology were emphasized. In addition, teachers did not only strengthen their knowledge of technology integration, but they also had an opportunity to connect their knowledge to the daily work of the classroom.

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