**Academicians as Teachers: Nurturing Teaching Experience**

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Four academicians volunteered to teach 5th grade mathematics for one year in a Turkish public school. Academicians met every week for 40 weeks where they discussed what to teach, how to teach and reflected on implementation of their shared planning. Videotapes of first six Regular Meetings and six weeks of Research Meetings were analyzed. The focus of qualitative analyses was on how the knowledge of teaching was constructed differently in those two settings. References evidencing academician teachers’ knowledge of students, instructional strategies and assessment were found to occur more frequently during the Research Meetings compared to Regular Meetings. Academicians discussed more frequently what questions to ask in the classroom and exchanged comments about students’ thinking with more evidence. Using learning theories and framing planning and reflection discussions with a focus on research appeared to be a productive way of nurturing teaching experiences of academicians as teachers.

INTRODUCTION

What teachers should know in order to teach mathematics effectively has been a topic of debate for some time in the teacher education field. Although in the past mathematics content knowledge was considered to be the most important part of knowledge for teaching, today there is a wide agreement that teachers should have knowledge and practices related to pedagogical content knowledge (PCK), i.e. both content knowledge and how it is taught. Accordingly, recent recommendations for beginning teachers recommend that teachers should know how students learn a particular topic and develop pedagogical knowledge specific to teach mathematics.

One of the most widely accepted constructs to explain the nature of knowledge for teaching, PCK, is introduced by Shulman (1986) as: “special amalgam of content and pedagogy that is uniquely the province of teachers, their own form of professional understanding” (p. 227). According to Shulman, PCK contained the most effective examples and explanations to teach a particular topic. In this vein, Lannin et al. (2013) conceptualized PCK to include: Knowledge of student understandings within mathematics, Knowledge of instructional strategies for mathematics, Knowledge of curriculum for mathematics, and Knowledge of assessment for mathematics. In this adaptation of PCK, researchers viewed “PCK as knowledge for mathematics teaching that may or may not involve strong connections to the actual teaching and learning of mathematics.” (Lannin et al. 2013; p. 406) In this study we framed PCK according to this recent perspective, where personal justifications or beliefs of teachers are also considered as part of their PCK.

Although development of teachers’ PCK has been relatively well explored (Depaepe, Verschaffel, & Kelchtermans, 2013), research on the development of teacher educators’ PCK of mathematics teacher educators is scarce. In general, it is widely acknowledged that teacher educators should have K-12 teaching experience before they pursue doctoral degrees. In contrast, majority of Turkish teacher educators do not have K-12 teaching experience. Especially in this context where there is a large gap between teacher education practices and school experiences (Çakıroğlu & Çakıroğlu, 2009; Author, 2013), there is a need to know how teacher educators themselves construct PCK, would help them design better learning experiences for pre-service teachers. This proposal is part of a larger project, *University within School* (Author, 2013), which aimed to improve teacher education and student learning by closing the gap between teacher education practices and school experience in Turkey. Project also aims the professional development of teacher educators by regularly renewing their teaching experiences in K-12 schools. In the context of this project, academicians acted as 5th grade mathematics teachers in a public school, which collaborated with the Faculty of Education. This one year long experience constituted as a valuable professional development experience for the teacher educators involved in the project and positively impacted students’ mathematics achievement in an otherwise disadvantaged school located in a low-level socio-economic neighborhood (Authors, submitted).

The research team investigated how academicians as teachers constructed different domains of PCK by adopting Lannin et al. (2013)’s conceptualization as they planned and debriefed lessons during the one-year implementation of the project. This paper is specifically focused on exploring differences in the development of PCK when the research team focused on a research agenda in the meetings versus not focusing on a research agenda.

METHODS

Participants and Data Collection

Four academicians acted as both teachers and researchers during a-year-long 5th grade mathematics teaching experience. While academicians had different teaching experiences previously, teaching 5th grade mathematics was a novel experience for all of them.As a group, academicians attended planning and reflection sessions every week during the 2014-2015 academic year. There were 40 sessions in total and sessions usually lasted 2 hours. All of the sessions were videotaped and transcribed for analysis. In each session, the group discussed how to plan future lessons for 5th grade and reflect on the past lessons. The sessions included discussions about best instructional moves (i.e., flow of the lesson, examples, explanations, questions, and anticipating student responses etc.) and reflections after implementing such instructional moves. In this sense, meetings could be considered as an adaptation of Lesson Study design (Lewis, Perry, & Hurd, 2004). Throughout the data collection process, the research team also conducted research on how students progressed within the project with a particular focus on the topic of fractions, which is known to be difficult for students (Author, 2015).

It is noteworthy that we differentiated two types of lesson study meetings: Regular Meetings (n = 6) and Fraction Research Meetings (n = 6). For this study, we analyzed 6 of each of those sessions. During the Regular Meetings, the lesson plans were developed based on the 5th grade mathematics textbook (National Ministry of Education). Because of this arrangement; academicians did not have much freedom on what to teach or how to teach. In contrast, during Fraction Research Meetings, we designed and reflected upon the implementation of a curriculum based on the Fraction Scheme Theory (Steffe & Olive, 2010). Furthermore, during Fraction Research Meetings, videotapes of classroom instruction were discussed and certain noticing and instructional moves were shared with reference to the daily teaching experiences of each academician.

DATA ANALYSIS AND FINDINGS

Qualitative methods, namely, content analysis (Stemler, 2001), was utilized to analyze the transcriptions of group meetings. We first identified significant excerpts in the transcripts, which had a potential to reveal different domains of PCK. Secondly, we specifically ascribed each component of PCK framework to group members’ reflections, comments, and questions within those excerpts. Finally, we calculated frequencies of each knowledge domain that emerged in each meeting. Total frequencies for Regular Meetings and Fraction Research meetings were calculated respectively (see Table 1).

The findings revealed that frequencies of coding related to components of PCK: Knowledge of Student Understanding, Instructional Strategies, and Assessment have increased substantially for Fraction Research Meetings compared to Regular Meetings. On the other hand, coding of Knowledge of Curriculum in Fraction Research Meetings dropped substantially compared to the Regular Meetings. (see Table 1).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | A. Knowledge of student understanding | B. Knowledge of instructional strategies | C. Knowledge of assessment | D. Knowledge of curriculum |
| 6-Regular Meetings | 20 | 21 | 18 | 17 |
| 6-Fraction ResearchMeetings | 24 | 28 | 22 | 9 |

Table 1. Total frequencies of PCK Components Observed in Regular and Fraction Research Meetings.

Typical examples for Regular and Fraction Research Meetings are provided below (examples of coding associated with different knowledge domains are italicized).

During one of the Fraction Research Meetings (09.03.2015) the academicians reflected on *how they could introduce the concept of “unit fractions” in their classes* (Knowledge of Instructional strategies and Knowledge of Curriculum). One of the group members shared her experience: “using Cuisenaire rods, I asked the class: ‘what could we name the brown rod if the purple is 1?’ Her goal was to help students understand and use the concept of unit in answering this question. She reported that *her students came to use of “multiple” for comparing small rods to the larger rods* (Knowledge of Student Understanding). Based on this shared experience, *the group members suggested they could introduce unit fractions by reversing the comparison; starting with a larger rod and assigning it as “1” and posing the question: “what name would you call the smaller rod*?” (Knowledge of Instructional strategies). In this example, we observed that academicians discuss how to ask better questions based on their shared experience. This excerpt, which is shortened here, resulted in coding as Knowledge of Instructional strategies, Knowledge of students, and Knowledge of curriculum. In contrast, during the Regular Meetings academicians followed the official curriculum and they spent most of their time discussing the order of the topics and examples. For example, on 18.09.2015, a teacher academician discussed teaching patterns by using the examples in the book. She shared *how students were not able to make a transition from drawing figures to thinking mathematically in a given situation* (Knowledge of Students). In response to this comment, another group member wondered “*what is the purpose of teaching patterns to 5th graders?*” (attempt to construct Knowledge of Curriculum). This discussion did not lead to writing new goals for the lesson or producing new examples related to the topic. Academicians were tentative in terms of changing what to teach and how to teach. Therefore, even though sometimes questions were posed in the discussions, new Knowledge of Curriculum or Knowledge of Instructional strategies were not constructed. This was one of the many examples comparing how discussions in Fraction Research Meetings were more productive with regards to building instruction on students’ thinking and also leading to the creation of meaningful curriculum (Chval & Chavez, 2011) compared to the Regular Meetings.

CONCLUSION

Overall, findings indicated that planning and conducting lessons as a whole group within an adaptation of a lesson study was productive and illuminated alternative ways -to help teacher educators’ professional growth. More specifically, the Fraction Research Meetings where the focus of discussions was on building a curriculum based on Fractions Scheme Theory and students’ thinking appeared to help academician teachers improve their PCK in different domains (see Table 1). Only the frequency of Knowledge of Curriculum has decreased. The decrease in the frequency of the Knowledge of Curriculum can be explained by the fact that the research team built their own curriculum during the Fraction Research Meetings. Curriculum was based on students’ thinking and it was rather difficult to differentiate the curriculum as stand alone component.

Additionally, after implementing the lessons, the academician teachers tended to share different ways of students’ thinking in more specific ways during the Fraction Research Meetings. In those meetings, the group members also shared video clips of their teaching and discussed how their actions might have influenced student thinking. Use of videos in Fraction Research Meetings may also offer an explanation for the way academician teachers have developed their PCK, i.e. in more productive ways where PCK components are more connected to each other as seen in the excerpts.

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