EXPLORING MATHEMATICS TEACHERS’ PERCEPTIONS TO CHANGE: A CASE STUDY

Abstract

This case study investigated teachers’ motivation to attend professional development sessions. In particular, this study explores why teachers engage in professional developments as well as how personal and organizational factors influence teachers’ professional development experiences. Using a qualitative methodology, six teachers from K-6 grade band and their math coach were interviewed at three different schools in a rural Midwestern County in the US. In addition, field observations were conducted. Data were analyzed through there major categories—motivators, professional development activities, and work context. The study concludes that professional development activities form complex inter-relationships with teacher motivation consisting of intrinsic and extrinsic motivators, a range of learning activities, and teacher work context. There is bidirectional interaction between each contributor and professional development.

Keywords: professional development, teacher motivation, work context

ÖĞRETMENLERİN HİZMETİÇİ EĞİTME BAKIŞ AÇILARI: ÖRNEK OLAY İNCELEMESİ

Özet

Bu çalışma öğretmenlerin hizmet içi eğitimlere katılma sebeplerini ve kurumsal ve kişisel faktörlerin bu süreci nasıl etkilediğini incelemiştir. Nitel çalışma teknikleri kullanılarak, Amerika Birleşik Devletlerinde görev yapan anaokuldan altıncı sınıflara kadar olan bölümdede derslere giren altı öğretmen ve onların matematik koçları ile bireysel görüştülmüştür. Öğretmenler ve onların matematik koçları ile yapılan bireysel görüşmelerin yanı sıra, bu öğretmenlerin devam etmekte olduğu hizmet içi eğitim seminerleri gözlemlemiştir. Toplanan verilerin analizleri üç

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kategoride-öğretmen motivasyonu, hizmet içi eğitim seminerleri, ve kurumsal şartlar-incelemiştir. Yapılan analizler sonucunda bu üç kategorinin öğretmenlerin hizmet içi eğitim seminerleri için kompleks bir yapı oluşturduğu görülmüştür. Bu çalışma, öğretmenlerin motivasyonları, hizmet içi eğitim etkinlikleri, ve kurumsal faktörlerden oluşan bu üç ana kategori arasında iki yönlü ilişki olduğunu tespit etmiştir.

Anahtar Kelimler: Hizmet Içi Eğitim Seminerleri, Öğretmen Motivasyonu, Kurumsal Faktörler

INTRODUCTION

Recent developments in education policy increase expectations for teachers to improve student learning. Every proposal to reform schools emphasizes professional development as an important vehicle in efforts to bring about the necessary change (Guskey, 2002). Sowder (2007) recognizes the school environment as a key determinant of variation in teacher learning and, in turn, student achievement. Thus, the quality of teaching is not simply determined by an individual’s knowledge or ability, but also by the contexts in which teachers work.

The purpose of this study is to examine the relationship between teachers’ motivations and their work context. By professional development, we broadly refer to learning activities, which are intended to enhance teachers’ professional growth, such as teacher networks, workshops, conferences, or in-service activities. Specifically, this study explores why and how teachers engage in professional development, as well as investigate what they seek to gain at the conclusion of the professional development training. The study also addresses how teachers’ work contexts influence their professional development experiences. By work context, we refer to teachers’ school environments and all aspects of teachers’ work, including their recognized work such as classroom teaching, school and district obligations, or formal professional development, and also, their unpaid work such as after school activities. To understand the relationship between teacher development and their motivation to engage in professional development, we address the following research questions:

1- Why do teachers attend professional development sessions? Specifically, what are the factors that motivate teachers to engage in professional developments?

2- According to teachers, how does the context of work influence teacher professional development?

Literature Review

This review of the literature is organized into two main sections. First, we provide a brief overview of the role of professional development. Then, we focus on studies that address teacher motivation.

Effective Professional Development

Researchers agree that high-quality teacher professional development can be a catalyst for teacher change (Wu, 1999). Furthermore, research tells us that effective professional development models include improving teacher knowledge (Garet et al., 2001). However, reviews of professional development research also point out the ineffectiveness of most programs. Thus an important question remains: What are the characteristics of high-quality professional development? In this section we will address this question.

Researchers have provided evidence for the causal relationship between enhanced teacher knowledge with student learning (Guskey, 2002). However, what counts as knowledge...
for teaching has remained inadequately specified in research studies (Ball, Thames, & Phelps, 2008). Ball, Thames, and Phelps (2008) propose a refinement to Shulman’s categories by subdividing content knowledge into common content knowledge (CCK), specialized content knowledge (SCK), and knowledge on the mathematical horizon and similarly pedagogical content knowledge into knowledge of content and students (KCS), knowledge of content and teaching (KCT), and knowledge of curriculum. Therefore, we believe that in order for a professional development program to increase teacher knowledge, it should not only focus on content knowledge, as Wu (1999) argues, but also on all aspects of teacher knowledge required for teaching.

Professional learning activities are more likely to be effective if they are part of a coherent program of ongoing professional development that supports teachers in developing sustained ongoing professional communication with other teachers (Garet et al., 2001). Furthermore, research has shown that teachers report greater changes in their instructional practice as a result of professional learning activities that involve their active participation and engagement (Desimone et al., 2002).

Thus overall features of promising professional development sessions should include providing opportunities for teachers to develop further expertise not only in subject matter knowledge, but also in different aspects of knowledge needed to teach effectively; providing active engagement and accessibility to every teacher and demonstrating respect toward their existing beliefs as well as for them as professionals they are (Desimone et al., 2002).

Teacher Motivation

As stated by Pintrich and Schunk (2002), the term motivation is derived from the Latin verb “movere” meaning to move. Thus, the idea of movement is reflected behind the idea of motivation as something that gets us going, keeps us moving, or helps us complete tasks. In this section, the question we will try to answer is, then: What triggers teachers’ attendance to goal-directed professional development activities?

Teachers’ motivation to engage in professional development appears to be a key factor in change. Stout (1996) proposed four motivations teachers have for participating in professional development: salary enhancement, certificate maintenance, career mobility, and gaining new skills or knowledge. A national study from The National Foundation for the Improvement of Education (NFIE) reveals that teachers’ first and last motivation of continuous learning is student learning (77 percent) while financial reward and maintaining professional certification (5 percent) are bottom motivators (Renyi, 1996).

This review shows us that teacher motivation varies from intrinsic motivators such as improving content and/or pedagogical knowledge to extrinsic motivators such as maintaining certification or financial reasons that affect teachers’ willingness to attend professional development activities. Thus, we have the hypothesis that there are two big clusters of motivators— intrinsic and extrinsic— consisting of several different motivators that motivate teachers to attend professional development activities.

Research Methodology

In this study we used qualitative research methods to identify factors that influence teachers’ engagement in professional development. The data comes from a Mathematics Partnership (MP), a collaborative endeavor among five school corporations in one rural Midwestern county, several mathematics and mathematics education professors from a local university, and a math coach, to improve mathematics achievement in grades K-6. The grant
has a two-year timeline from August 2008 until August 2010. The grant was awarded to the county through a Math Partnership (MP) grant, which was funded by the National Science Foundation (NSF) to increase the academic achievement of students in mathematics (and science) by enhancing the content knowledge and teaching skills of classroom teachers (US Department of Education, 2009).

Sample

In order to address the two research questions, we believe that individuals who teach at different grade levels may provide different perspectives on teachers’ motivations to attend professional development activities. Teachers, the primary unit of analysis, were selected based on two criteria: being a participant of the MP grant and teaching different grade levels. Being a participant of the MP grant was an important criteria due to the reason that those teachers had already committed to a two year professional development. Teaching different grades, on the other hand, might provide different perspectives on teachers’ motivations to attend professional development. The target population consisted of six elementary teachers from the different grade level. One kindergarten (Ms. Tara), one first grade (Ms. Shannon), one third grade (Mr. Bryan), two fourth grade (Ms. Tiffany & Ms. Carla), and one fifth grade (Ms. Debra) teachers participated in the study. We also interviewed the math coach who was working with the teachers on weekly bases. Therefore, she knew what teachers need or looking for from a professional development.

Data Collection and Analysis

The data included here relied on teacher interviews as the main source of data collection. Each participant was interviewed individually for about 45-60 minutes in a semi-structured manner using open-ended interview questions. All interviews took place near the end of the two-year grant. Additionally, follow-up interviews were conducted via e-mail. Furthermore, observations were conducted during monthly professional development sessions and planning meetings.

In order to address the research questions and understand both the ways in which teachers experience professional development and the impact of their work context on their motivation and learning, we used a multi-site case study. Yin (2003) describes a case study as an empirical inquiry to investigate “how” and “why” questions within a real life context when the boundaries between phenomenon and context are not clear (p.13). This study is embedded in a multi site case study because it involves more than one level of analysis. At one level of analysis is the organizations-the schools-within which are embedded numerous other cases-the teachers. By studying teachers from different schools, the study was more likely to construct an explanation about the nature and the process of teacher professional development in schools as well as the role of schools in facilitating/impeding professional development.

The data analysis started with a reading of all the data sources (interviews and observation notes). All answers for each research questions were read again separately to develop initial categories related to each of three research questions (themes): what motivates teachers to learn, how they learn, and the ways their work context stimulates or inhibits their learning. Within these three themes, the initial categories were developed by grouping similar answers into a broader category. Using Strauss and Corbin’s (1990) open coding technique guided the process of analyzing the data. A team of experts that consists of two-three graduate students were asked to code a sample of the data in order to assure consistency.

Findings
In his article, Guskey (2002) reports that teachers mostly state that they engage in professional development programs because they want to become better teachers. In this part we will discuss teachers’ reasons for engaging in professional development including their expectations to better understand what they mean by “becoming better teachers”. However, to fully explore the influence of personal and organizational factor on teachers’ professional learning, it is necessary to provide background information about the participant teachers and their schools. For each school, we will provide general information about enrollment, ethnicity, or student academic achievement in ISTEP from DOE’s website; and for each teacher, we provide basic background information drawn primarily from interview data first.

Setting of the Study

Linux elementary school. Linux Elementary School consisted of 788-768 White, 2 Hispanic, 2 Asian, and 16 Multi-racial students according to 2008-9 data. Of these students, 41% of the students were eligible for the free lunch, 6% for the reduced, and 53% for the paid lunch program. According to data, the ISTEP average pass rate of the school was 75.8% in 2008-9 while the average pass rate of the state was 71.4%.

East Gray elementary school. East Gray had an enrollment of 521 in 2008-9 which consisted of 2% Multi-racial, 1% Asian, and 1% Hispanic students. Of these students, 39% of the students qualified for the free lunch, 46% for the paid lunch, and 14% for the reduced lunch program. The ISTEP average pass rate was 71.4% for the state while the school’s pass rate was 62.6% in 2008-9.

Worthmore elementary school. The third elementary school, Worthmore, was the smallest school in this study and one of the smallest in the district with 261 White and 2 multi-racial students in 2008-9. Of these students, 32% of these students qualified for the free lunch and 8% for the reduced lunch program. The rest of the students, 60%, qualified for the paid lunch program. ISTEP pass rate was a little higher than the pass rate of the state in 2008-9. The school pass rate was 77.4% while the state’s was 71.4% that year.

Ms. Debra. Ms. Debra was a 51-year old 5th grade teacher with fourteen years of teaching experience. She held three degrees from the local university (B.A. Journalism/Psychology), B.S. (Elementary Ed), M.S. (Elementary Ed), with additional study in environmental science at another university. She was passionate about environmental education and had many experiences related to environmental education such as camps or programs at the nature centers with the department of natural resources. She emphasized her passion about environment and how she tried to incorporate it into her own classroom while she was explaining her focus of learning.

Ms. Shannon. Ms. Shannon was one of the youngest teachers at her school and in this study. She was 26 years old with the least teaching experience. She had taught third grade for one year and first grade for two years. Therefore, extending her pedagogical knowledge and learning new ways of teaching constituted her top reasons to attend professional development sessions. She earned her BS in Education.

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3 The data for introducing the schools were drawn from http://www.doe.in.gov/. All names used in this study (both teachers’ and schools’ names) are pseudonyms.
Ms. Tiffany. Ms. Tiffany was one of the two lead teachers in this study. She was 49 years old and had taught 1st grade to 12th grade through her 27 years of teaching experience. She held three degrees, B.S. in Special Education (grades 1-12), B.S. in Elementary Education, and M.S. in Elementary Education from a local university and took many master's classes at another local university.

Mr. Bryan. Mr. Bryan was the only male teacher in this study and one of the few male teachers in the grant. He was the other lead teacher in this study. He had a B.S. degree in general education and was currently pursuing his master’s degree in Elementary Education at the local university. His colleagues had currently awarded him as teacher of the year in his school.

Ms. Tara. Ms. Tara was one of the most experienced teachers in this study. She had taught kindergarten for 22 years and first grade for 3 years. She had a B.S. in Early Childhood Education and a master’s degree in Elementary Education. Ms. Tara strongly emphasized during the interview that she was not attending professional development for licensure requirements, because she was the only teacher in this study and one of the few teachers at her school with a lifetime teaching license.

Ms. Carla. Ms. Carla was a fourth grade teacher with seven years of teaching experience. She had a B.S. degree in General Education and was currently pursuing her master’s degree in Elementary Education. Unlike Ms. Tara, Ms. Carla emphasized that her reasons for attending professional developments was for class credits.

Teacher Motivation

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<th>Table 1 Motivators to Engage in Professional Development</th>
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<td>Intrinsic Motivation</td>
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<td>Pedagogical knowledge</td>
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<td>Content knowledge</td>
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<td>Classroom management</td>
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<td>Students’ academic achievement</td>
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<td>Personal Interest</td>
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This section is organized into two subsections. First, we address intrinsic motivators that influence teachers’ engagement in professional development. Second, we address extrinsic motivators. Table 1 above contains the summary of motivators and their characteristics, which emerged from the data (See Table 1).

Intrinsic motivators. As Table 1 shows, we identified the following subcategories of intrinsic motivators: (1) pedagogical knowledge, (2) content knowledge, (3) classroom management, (4) students’ academic achievement, and (5) personal interest.

Pedagogical knowledge. Pedagogical skills ranged from using different teaching techniques to implementing standards in their classrooms. Specifically, the data suggest that the teachers in this study favored activities focusing on pedagogy over other intrinsic motivators.
For various reasons, teachers often felt challenged when trying to devise multiple strategies to connect with their diverse students. For example, some teachers mentioned that they needed help to incorporate some of the ideas that they learned from some of the professional development programs they attended into their own classrooms. As one of the teachers explained,

I guess, I was hoping to get a lot of ideas, activities, a greater understanding of how to incorporate types of ideas even in younger grades or for those students that struggle with math, that might be developmentally delayed, how to incorporate some of those math ideas so they would have a better foundation as they grew up, knowing how to attend algebra or even any kind of problem solving, multi-step problems.

As her comments and the comments of other teachers suggest, acquiring pedagogical knowledge was attractive to teachers when the knowledge acquired was directly applicable to their classrooms. These teachers sought professional development associated with their classroom teaching to improve some aspect of their own practices.

**Content knowledge.** According to the interview data, another major catalyst that affected teacher participation in professional developments was their interest in content. Some teachers were motivated by the opportunity to deepen their math knowledge, while the others saw professional learning opportunities as a chance to extend their knowledge into other content areas.

Professional development just helps us keep thinking of the content we are teaching. I appreciate it, you know. I know that if I have changed grade level, I would probably need to have more professional development for preparation than maybe the person who might have taught the same grade for thirty years . . . Thus, I look at it [professional development] as enrichment; I look at it as strengthening, building on what you already know of the content to keep us up to date.

**Classroom management.** Across schools, teachers also discussed another aspect of their professional lives that were neither pedagogically nor content-oriented. Instead some teachers discussed pressure to learn brought on by the challenges of classroom management. In this regard, teachers were especially concerned about issues of classroom discipline. Teachers in this study described unexpected and new discipline challenges that caused them to reflect on their own approaches to classroom management.

**Student academic achievement.** Consistent throughout the interviews with teachers in these three schools was the message that professional learning was motivated by teachers’ intent to increase their students’ achievement on standardized exams. This motivator underlay all of the other motivators in that teachers want to learn new ways of teaching mathematics or to learn/extend their content knowledge in order to increase students’ academic achievement.

Students in the three schools showed only average achievement on the standardized exams according to DOE data. Therefore, increasing student academic achievement is a strong incentive for participating in professional development activities.

The main reason is if I see a need in my students. Whenever I see that there is something I really like and there is .., I will look at myself and try to decide what can I do better to do that, so that is kind of I guess my first and most important outreach whenever I, you know, whenever my kids seem like they are really stuck at something or the way I presented it is not working to reach out the other programs and try something new. That would be my most important reason.
**Personal preferences.** Personal interest appeared to be a motivator in that some teachers found themselves more motivated to participate in activities in which they were interested in and which dealt with material that they were passionate about. The focus of my learning, to be truthful, is always environmental education, so if I can include social studies, math, language arts, anything at all through outdoor education, I do it. It is my passion. It is what I enjoy most, so if there is a professional development about environmental education, I try to attend.

**Extrinsic motivators.** In addition to intrinsic motivators, two major extrinsic motivators influenced teachers’ engagement in professional developments: licensure renewal, and salary advancement. Teachers often mentioned that they were attending professional development programs when they could accrue credits that would count toward license renewal. In addition to licensure renewal, some teachers mentioned that they were more willing to participate in professional development activities when they were reimbursed for their time. However, these extrinsic motivators did not apply to all teachers in this study, especially experienced teachers. For instance, teachers with a lifetime teaching license stated that they do not need to accrue credits that would count toward renewing their license. The findings of this study indicate that experienced teachers were most likely to attend professional development programs in response to intrinsic motivators rather than extrinsic motivators.

**Teacher Work Context**

Work context clearly emerged as a key category in this study. Work context affected teacher professional development in two levels: district and state level, and school level (See Table 2).

**Table 2 Effects of Work Context**

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<th>District/State Level</th>
<th>School Level</th>
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<tbody>
<tr>
<td>Licensure requirements</td>
<td>Leadership</td>
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<tr>
<td>District professional development requirement</td>
<td>Structure: (1) time (2) funding</td>
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**The impact of district and state policy on professional development.** Teachers in this study perceived district policies as playing an influential role in their learning experiences. As mentioned in the teacher motivation section, one of the ways the state influences the nature of teacher work is to require license renewal every five years. Most of the participant teachers cited license renewal while they were explaining their reasons for attending professional development programs. However, some of the teachers mentioned that incentives for continuing education were uneven across career stages.

The other district policy that was mentioned as having a notable impact on teachers’ work life is AYP: Adequate Yearly Progress (AYP), a tool that is required by the No Child Left Behind (NCLB) legislation to determine which school districts and schools are making adequate academic progress, and which schools will be identified as needing improvement, corrective action or restructuring. As the math coach explained, the three participant schools provided many professional development programs in order to meet the goals of AYP, and they finally met them the previous year.
School context impact on professional development. When asked to describe factors that influenced their opportunities to learn professionally, teachers mostly mentioned factors at the school level.

Based on teacher and math coach interviews, it became apparent that school leaders played an important role in fostering or impeding professional development. From the data, it could be concluded that teachers whose individual and organizational goals were aligned with those of the administrators’ were more likely to characterize their administrators as supportive. On the other hand, some of the teachers mentioned that administrators can only provide limited professional development, which might apply to the majority of teachers’ needs but not the needs of specific teachers. Therefore, these teachers stated they preferred to attend their own professional development activities besides the programs offered by schools.

The data show that teachers believe one of the most imposing obstacles to participating in professional learning activities is the lack of time. It is important to note that most teachers indicated their vital concern of how to carve out time to attend professional development activities after the state took away the half-day release for professional development activities. In addition, professional development can be particularly troublesome when substitutes are used to release teachers for planning and professional growth activities as it may result on more work for the teachers who will need to prepare much more detailed lesson plans for their substitute teachers to use.

Another common obstacle to attending professional development programs was funding. Lack of funding touches every level of continuing education and makes it particularly difficult to provide teachers with a rich variety of professional development opportunities. When schools and districts are faced with shrinking budgets, providing professional development based on individual teachers’ needs is not considered a priority, according to several teachers.

Conclusions

Renyi’s (1996) broad survey cited time, teachers’ role in developing professional development, community organizations, and funding as issues that impact the quality of professional development. Findings from this study align with those of that report. However, this study also revealed that the context of work had a major influence on professional development. By documenting the influence of teachers’ work context on their learning, this study adds this dimension to the three conceptions of how teachers learn by Cochrane-Smith and Lytle (1999).

Furthermore, this study also uncovered various intrinsic and extrinsic factors that motivated the participant teachers to engage in professional development activities. Teachers in this study perceived professional development as a phenomenon with broad application situated at the intersection of two contributors: teachers’ motivation to learn, and their work context. Given the importance of work context and teacher motivation on teachers’ professional development experiences, we believe school administrators need to create and support an environment in which teachers are motivated to meaningfully explore individual practices as well as organizational objectives.

In line with previous studies (Pintrich and Schunk, 2002), our data underscores the bidirectional interaction between motivation and professional development as well as between work context and professional development. Therefore, it is not enough to regard the effects of professional development activities on teacher motivation to change, and work context. We should also recognize the effects of each contributor to professional development and the work
context in order to provide effective programs for teachers. Figure 1 below shows how major categories related to the phenomenon of professional development fit together.

![Figure 1. Professional development schematic.](image)

**Implications of the Study**

This study underscored the complexity of teacher professional development and showed that district, state, and school level policies that affect teacher professional development were closely linked to teacher practice. Therefore, professional development at the school level should certainly be examined and evaluated in order to implement reforms successfully. Based on the data, this study yields several implications for school, district and state levels.

First, if professional development programs are to improve teacher practice and thereby student achievement, districts and schools need to critically evaluate their own policies to help schools reshape their cultures into continuous learning organizations.

Second, state, district, and school policy makers need to ensure that a rich variety of learning activities are incorporated into teachers’ professional development activities. Traditional approaches to professional development often do not help teachers to meet the challenges they face.

Third, at the school level, school administrators need to create an environment in which teachers can meaningfully explore individual practices and organizational objectives. Also, principals should work individually with teachers to develop plans that address the unique needs of teachers based on past experiences and current classroom issues.

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