

Professional Learning vs. Professional Practice – Bridging the Gap Between Theory and Practice in Mathematics Education: *One Teacher’s Journey*

Tisha Nelson

Question

How does participating in professional learning in mathematics education impact the pedagogical decisions of one teacher?

Abstract

As life-long learners teachers are continuously encouraged to participating in on-going professional learning in order to stay current with effective pedagogical practice within the domain of teaching and learning. But what impact in teacher participation do such engagements have on teacher practice? How can teachers remain accountable to new learning that they have acquired? This study seeks to uncover the impact of engaging in professional learning in the content area of mathematics. Through reflective journaling, one teacher will uncover the changes and continuity is in her practice before and after engaging in a mathematics additional qualification course.

Introduction

Throughout my academic tenure mathematics was always an area of study that I had met with much anxiety and ambivalence. As a student of mathematics, I was neither comfortable nor proficient in this subject area and had accepted that I was not going to ever be a mathematician. I was resolved with going through the motions of mathematics education until it was no longer compulsory. Needless to say, as a teacher, the preference to avoid mathematics was no longer an option. During my pre-service teacher education I was compelled to face my *math-phobia* by engaging in the necessary professional development opportunities that would nurture comfort and ease when dealing with a subject that I once met with much reluctance. Currently, as an elementary school teacher in Ontario for the past four years, I am fueled by my desire to avoid duplicating my experiences as a student in the students that I teach. My commitment to and enthusiasm for ongoing professional learning propelled me to pursue many professional development (PD) experiences (*episodes*) that encouraged improvement of my comfort, content knowledge and pedagogical proficiency in the area of mathematics education. In the past four years I have engaged in many *PD episodes* such as attending workshops, courses and engaging in collaborative inquiry in order to improve my practice.

Recently I enrolled in the Additional Qualification (AQ) course Math Part 1 that focused on deepening teacher’s understanding of number sense and numeration as well as effective pedagogical practices that would impact student learning in a positive way. My experience in this course was phenomenal as I was consistently provoked to reflect on the perspective from which I viewed mathematics and the pedagogical choices I made when engaging in mathematics education. Completing the course seemed like the beginning of a new era in my career and I wanted to

maintain the enthusiasm and learning that I encountered through my tenure in the course. My apprehension was the implementation gap – the gap between theory and practice. I desperately wanted to avoid reverting back to the old and familiar ways of knowing and doing mathematics by neglecting to implement my new learning. In my effort to be accountable to the learning that I acquired through this particular *PD episode*, Math Part 1, I wanted to reflect on and measure the impact of the learning on my actual practice. Hence the development of my research question: “How does participating in professional learning in mathematics education impact the pedagogical decisions of one teacher?”

Review of the Literature

Professional learning, otherwise noted as professional development (*PD*) refers to the learning that teachers engage in by participating in a range of workshops, conferences, online training sessions, additional qualification courses, action research, collaborative inquiry with communities of practice, professional learning teams, reflective practice, to name a few. Sheralyn Dash et. al. (2012) assert that “Professional development for teachers has been deemed the necessary approach to improving teacher quality, meaning teachers’ pedagogical content knowledge and pedagogical practices” (p. 2). To confirm this notion, “Further evidence in the research literature indicates that teachers who receive substantial professional development (an average of 49 hours) can boost their students’ academic achievement by approximately 21 percentile points (Yoon, Duncan, Lee, Scarloss, & Shapley, 2007 in Dash et. al., 2012, p. 3). Given the potential impact that teacher professional learning has on student achievement, what are the elements that make these learning episodes meaningful and effective to improve teacher practice? Michael Garet, et al. (2001) claim that “sustained and intensive professional development is more likely to have an impact...than is shorter professional development” (p. 935). Furthermore they assert that “professional development that focuses on academic subject matter (content), gives teachers opportunities for “hands-on” work (active learning), and is integrated into the daily life of the school (coherence), is more likely to produce enhanced knowledge and skills” (Garet et. Al, 2001, p. 935). Moreover, Borkom Mayfield, Marion, Flexer and Cumbo (2007) as noted in Tracey Muir and Kim Beswick (2007) also noted that *PD episodes* that provided opportunities for teachers to explore new instructional strategies and ideas in the context of their own classroom practice were most effective in promoting and supporting change in teacher practice.

Teacher attitudes toward teaching and learning, and more specifically, the subject content in general directly impacts the ways in which they engage students in the learning process. This is particularly demonstrated in the mathematics classroom as discussed by Kim Beswick (2012) who explores the various ways in which teachers internalize mathematics and how those views shape the ways in which they engage students with it. Bewsick (2012) highlights the range of perceptions of mathematics education from the *Instrumentalist* view which suggest that math is the acquisition of facts, skills and rules in order to derive a solution to the *Problem Solving* view which regards mathematics as a “dynamic and creative human invention, a process,

rather than a product”(Beswick, 2012, 129). “Professional learning practices that have been identified as being effective in promoting mathematical reform engage the participants as learners and prompt them to reflect on their practice” (Muir and Beswick, 2007, p. 76). This view of mathematics education form the trajectory to which professional development in mathematics education leads because it is indeed the ways in which teachers view math that influence the way in which they teach the subject.

Many teachers engage in *PD episodes* in order to become better teachers. This point has been demonstrated by the transformation of beliefs around mathematics education. Thomas Guskey (2002) asserts that “What attracts teachers to professional development, therefore, is their belief that it will expand their knowledge and skills, contribute to their growth, and enhance their effectiveness with students” (Gurkey, 2002, 382). Teachers can only realize the impact of their professional development through thoughtful reflection on their process and practice. Cavanagh and Prescott (2010) suggest that one’s ability to effect in critical reflection is, in fact, the most essential part of one professional growth. Teacher reflection, then, is defined as “a process of making sense of one’s experiences – not found in routine actions undertaken without awareness, but grounded in educative situations that broaden the mind and open up new possibilities of thought and action” (Cavanagh and Prescott, 2010, 148). Muir and Beswick (2007) outline the *Reflection in Action* framework as proposed by Van Manen (1977, cited in Power et al., 2002) as a way to frame teacher’s understanding of how reflection can aid their professional learning and development. They explore three stages of teacher reflection. The first level of reflection is denoted *Technical reflection* where teachers reflect on classroom events without any consideration of the value or importance of those experiences. Next, *Deliberate Reflection* is when critical classroom incidents are identified and explained through the teacher’s lens. Finally, *Critical Reflection* allows the teacher to move beyond identifying and explaining toward taking in consideration to the perspectives of other and other actions that could be taken. Similarly, Mercedes Garcia et al. (2006) offers *Reflection on Action* as an alternative view to reflective practice. “The notion of reflection-on-action is related to how teachers interpret past classroom events... for the purpose of defining future actions” (Garcia et al., 2006, 2). They speak to this activity as occurring in three different ways. They assert that reflection can either occur spontaneously, through professional development or through collaboration with others (Garcia et al., 2006). Ultimately, when teachers reflect on their practice they are able to identify actions that they deem impactful and those they wish to abandon.

Methodology

As the objective of this inquiry is to seek to identify ways in which taking Math Part 1, the *PD episode* discussed throughout this paper, has impacted my professional practice, a qualitative design that focused on reflective journals inspired by classroom photographs and other pedagogical artifacts formed the basis of the data collection. This was completed in two phases. First, I selected artifacts from before I engaged in the *PD episode (pre-PD episode)* and after I completed the course (post-

PD episode) were collected. These included long range plans, student time tables, and a variety of photos of identical lessons that were conducted pre and post the *pd episode* as well as other photograph that documented a change in teacher practice. The second phase of the data collection took the form of personal reflections situated in the *reflection-on-action* framework through journals that responded to the artifact in the first phase of this study. In responding to artifacts, there was a deliberate attempt to provide authentic and grounded descriptions of pedagogical practices that were based on actual occurrences in the classroom. The aim was to be able to identify, through the reflection, evidence of changes and continuities in my practice *pre* and *post* the *PD episode*.

Findings

Holding myself accountable to the learning that I experienced during the *PD episode* Math Part 1, was essential to reflecting on how much my practice, in fact, had changed. After reflecting on the artifacts and photographs *pre* and *post PD episode*, it is concluded that there were many pedagogical decisions that remained salient within my practice as well as those that changed as a result of my new learning. Using wordle, a word cloud generator that gives prominence to frequently used words, as the unofficial quantitative tool for engaging with the qualitative data that my reflective journals provided made clear that throughout my practice “mathematics,” “students” and “learning” were at the forefront of my reflections as they were the most frequent words used. This demonstrates that at the forefront of my practice in engaging students in mathematics is a focus on content, students and their experiences learning.

There were a number of continuities that were noted *pre* and *post* the *PD episode*. My overall philosophy around mathematics education remained the same in that the focus continued to be on nurturing a conceptual understanding of mathematics as opposed to procedural understandings. This was evidenced in the artifacts that demonstrated my focus on inquiry-based mathematics which encouraged student investigation, conceptualization and utilization of math concepts through problem solving activities. A second continuity noted was the focus on conceptual flow in the ways in which I organized mathematic units. This was evidenced in the similar fashion my long-range plans were outline during both the *pre* and *post* contexts of the *PD episode*. Math concepts built on previous ideas to ensure that the connections between mathematic concepts were made explicit for student learning. Thirdly, there was a continued emphasis on the allotted time resources allotted to mathematics education. This was evidenced by the student timetable artifacts during the *pre* and *post* the *PD episode* where at least 50 minutes of every day was dedicated to mathematics instruction.

The multiple examples of change in my practice was encouraging in that it confirmed the learning that I had acquired and justified the time and energy I had attributed to engaging in the *PD episode*. The most notable change that was demonstrated was keeping my new learning at the forefront of my planning. The

“Ms. Nelson’s Professional Learning Corner” was my deliberate attempt to constantly be reminded of the specific question technique, lesson plan formats as well as mathematical strategies that I wanted to implement as a result of my new learning. Another notable change was the increase in time resources dedicated to mathematics instruction. The flexibility to rearrange my teacher timetable within school board parameters facilitated a 100 minute increase to the amount of instructional time allotted to mathematics per week. As noted in my reflective journal, “I decided that my valuing of mathematics education should be demonstrated in the time that I commit to its instruction” (Reflective Journal, 2013). Given that more time was now allotted to mathematics instruction, I felt it necessary to revisit the ways in which I promote inquiry in mathematics by empowering my students to overcome their apprehensions about the subject and view themselves as mathematicians in “authentic ways” (Reflective Journal). This change was demonstrated through what I named *The First 20 Days of Math*, which established a community of mathematicians by fostering comfort in seeing the world through the lens of a mathematician. It was important for students to not only see themselves as mathematicians, but because mathematics instruction after the *PD episode* took on an integrated approach to the curriculum, as opposed to a strand based approach, students needed to be empowered to consistently think critically as mathematicians. This integrated approach to mathematics was also a change of practice that stemmed from new learning acquired. This is evidenced by the long-range plans that were developed *post-PD episode*. This integrated approach to engaging with the mathematics offered a holistic perspective to mathematic concepts. For example, the concept of *units* was explored when investigating place value *units* and *units* of measurement when measuring distance, mass and time. Finally, the most impactful learning that was noted throughout my reflections was the ways in which mathematic concepts were consolidated at the end of lessons. Photographs of the same lesson were taken *pre* and *post* the *PD episode* and the differences were clear. There was a greater focus on the intentional selection of student work that showcased a variety of mathematical strategies and concepts as opposed to having all students articulate their process in the sharing aspect of the lesson. This became the bedrock for learning. Students were taught how to participate in mathematic discussions that responded to rich word problems and as the instructional lead, I became more confident and deliberate in navigating through student work in order to make the learning goals accessible to all students.

By surveying the changes and continuities in the pedagogical choices as they related to mathematics, there is clear evidence of impact. The professional learning that I acquired was inspiring, empowering and motivated me to continue on a progressive course rethinking my role as a teacher. For many years I embraced the notion that teachers were facilitators of learning. By reflecting on the changes to my practice I have now embraced a new philosophy of teaching and learning in that teachers should be regarded as a provocateur of learning. This was clearly demonstrated in the ways in which students were empowered to regard themselves and mathematicians and solve problems as such. Nurturing a community of mathematicians that facilitated students engaging in authentic inquiry and

collaboration positioned my role to promote mathematical thinking that would inspired in them new learning.

Research Issues

The nature of this study was a case study and as such the finding lacked generalizability. The *PD episode* that I experienced may have been unique to my own interpretation of the program and thus my enthusiasm for implementing my new learning was deliberate. Had I not been intentional about being accountable to the learning, I may not have realized the vast change in my practice. My data collection was also biased. As the primary source of data collection for this study was reflective journaling in response to a limited array of self-selected artifacts, salient within the data is the limitation of the influence of perceived reality. Garcia et al. (2006) speaks to the interpretative processes of teacher reflection – that which embodies “a person’s posterior analysis of his/her own actions” (Garcia et al., 2006, 2). “When teachers reflect alone, there is a limit to what can be disclosed, what information can be collected, and the objectivity of the information” (Muir and Beswick, 2007, 78 quoting Day, 1999). As such, the crucial limitation of this study is that the data is biased toward my subjectivity and the reflections were conducted informally and in isolation of a professional mentor or a *critical friend* which would enhance the reflective process. Finally, the findings of this study are limited to one teacher’s context and trajectory and may not be the same for other educators. Having said this, the process of engaging in this study brings value to the researcher in that it names and makes evident the changes and continuities that may or may not exists as a result of the impact of the *PD episode* in focus.

Implications and Recommendations

One of the features of the *PD episode* that made it so impactful was the opportunity to participate in hands-on engagement with the new ideas that were being presented. The unique situation of this learning was that students of the course had regular interaction and practice teaching opportunities with actual students throughout the duration of the course. As such, when a new concept was being explored, teachers had the opportunity to employ new skills and pedagogies immediately in the classroom context through collaborative teaching. In this way the PD changed teacher beliefs by allowing them to experience the immediate impact of the change in practice as opposed to hoping that the change in belief would be implemented in future practice. In other words, when professional development seeks to change teacher beliefs through the opportunity to witness the benefits of such change, then a change in practice is likely to occur. This is conversely different to the type of PD that seeks to transform teacher practice before changing their beliefs and attitudes. PD should focus on hands-on, ready-to-try-tomorrow experiences to ensure that teachers can experience the benefits of changing their practice in order for their thinking to be changed. This is when professional learning will have impact on teacher practice.

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