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Developing Ambitious Practice: A Case Study of a Novice Mathematics Teacher

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Abstract

To investigate how novice mathematics teachers work on developing ambitious practice during their first year of teaching, I used a case study design to examine the work of one nontraditional novice teacher at a Title I urban high school in Texas. Analysis of survey data, classroom observations, reflective journals, and a semi-structured interview indicated that creating a classroom culture is one of, if not the most salient, high-leverage practice that novice teachers should master during their first year of teaching. I found that building classroom culture affects the implementation of other high-leverage practices such as facilitating mathematical discourse, assessing student understanding, and differentiation, as it sets the tone for doing math during the school year.

Keywords: case study design, novice teachers, high-leverage practices, ambitious mathematics instruction

Developing Ambitious Practice: A Case Study of a Novice Mathematics Teacher

I have an ideal vision of what I think a perfect mathematics classroom should look like. However, that vision is often constricted by some unfortunate realities. I don't want to make excuses, and I generally [don't like] the attitude that lists excuses for why things can't be. There should be some general underpinnings for good mathematics instruction—learning should be student-centered and differentiated and build critical thinking skills. – Mr. Tyler¹

Many novice mathematics teachers struggle between their ideal vision of a perfect classroom and the realities that they face on a day-to-day basis. Crowded classrooms, accountability pressure, multiple student needs, diverse skill levels, as well as students testing the limits of classroom rules and negotiating workloads sometimes cloud this ideal vision. Many times, a novice teacher's ambitious vision does not address the means or provide a method of creating a learning environment that can accommodate the circumstances they face (Kennedy, 2008). This dilemma, described by Mr. Tyler in the vignette above, is an important problem that many novice mathematics teachers struggle with on a daily basis. Additionally, novice mathematics teachers confront any number of additional questions: Am I supposed to keep my students quiet? Should my students stay in their seats? How should students enter the classroom? What am I supposed to teach? How do I get my students to talk about mathematics? How do I know what my students really know about mathematics? These questions fall under the broad categories of classroom management, pedagogical skills, and pedagogical content knowledge representing some of the biggest challenges that Mr. Tyler and other novice mathematics

¹ The individual has been provided with a pseudonym.

teachers manage on a daily basis. The story of Mr. Tyler's practice is carefully chosen to exemplify the challenges of novice mathematics teachers who have relatively ambitious instructional visions. In order to understand the dilemmas that Mr. Tyler and these novice teachers face, this study takes up how a novice mathematics teacher negotiates the fulfillment of his ideal vision by investigating how he goes about implementing ambitious mathematics instruction within the context and realities of his classroom.

Research on Novice Teacher Learning

To take up the question of how a novice teacher develops ambitious teaching practice, I reviewed teacher education literature specifically focusing on how mathematics teachers learn to implement high-leverage practices. In mathematics, ambitious teaching emphasizes conceptual understanding by calling for content-rich and learner-centered teaching that provides students with opportunities to solve problems, apply critical thinking skills, and connect mathematics to the world outside of school (e.g., Kazemi, Franke, & Lampert, 2009; Lampert et al, 2013). Ultimately, the goals of ambitious teaching practices are to provide learning opportunities that support student learning across different cultures, income levels, or those who are learning the English language, in order to foster deep understanding of mathematical ideas (McDonald, Kazemi, & Kavanagh, 2013; Thompson, Windschitl, & Braaten, 2013). In order to implement ambitious teaching practice, teachers enact high-leverage practices. High-leverage practices are teaching practices that when proficiently enacted by teachers provide learning opportunities that lead to large advances in student achievement (Ball, Sleep, & Boerst, 2009). Some examples of high-leverage practices are creating a positive classroom culture (Lampert, 2001), launching and enacting complex tasks (Jackson, Garrison, Wilson, Gibbons, & Shahan, 2013; Stein, Grover, & Henningsen, 1996), structuring classroom participation structures so that students are positioned

as competent (McDonald et al., 2013), and eliciting and responding to student thinking (Grossman et al., 2009; Lampert et al., 2013). These specific, routine aspects of teaching, demand teachers to exercise professional judgment (McDonald et al., 2013) and are important aspects of the work of teaching (Ball et al., 2009).

Although many novice mathematics teachers aim for ambitious teaching and learning, teachers' own prior experience as students provide a powerful socialization into teaching (Ball & Cohen, 1999; Hammerness et al., 2005; Kennedy, 2008). Lortie (1975) called this the apprenticeship of observation while Feiman-Nemser and Buchmann (1985) refer to this socialization as the familiarity pitfall. Both terms refer to the learning about what it means to teach that takes place by being a student for twelve or more years in traditional classroom settings. The teacher education literature suggests that this socialization into the teaching profession is typically more powerful than formal teacher education (Ball & Cohen, 1999; Hammerness et al., 2005). Moreover, the lessons from this apprenticeship are typically at odds with ambitious teaching since the lessons learned tend to reinforce an emphasis on procedural understanding within teacher-centered instruction (Ball & Cohen, 1999).

As novice teachers begin teaching students, they are learning how to put their knowledge of content and students into action while doing a variety of things simultaneously (Hammerness et al., 2005). Sometimes novice teachers struggle with wanting to implement ambitious teaching practices, but feel pressure to adapt to the norms of the school where they teach (Feiman-Nemser & Buchmann, 1985). Moreover, research suggests that when novice teachers are exposed to best practices for instruction that they may not know how to enact these ideas when they enter a classroom, or they may dismiss the complexity of these practices and resort to teacher-centered practices (Ensor, 2001; Thompson et al., 2013) learned within their apprenticeship of observation

(Lortie, 1975). This challenge is referred as the two-worlds pitfall (Hammerness et al., 2005; Thompson et al., 2013). In the vignette, Mr. Tyler struggles with the realities and constraints of his classroom practice. This struggle exemplifies the two-worlds pitfall as he defines and shapes his instructional practice while continuously negotiating between his coursework and related ambitious instructional vision and the realities he faces in his classroom.

Hence, teaching is complex work that challenges teachers to move beyond familiarity while managing the complexity of day-to-day life of a classroom as they enact their practice. Moreover, the work of teaching involves more than content that can be taught during a pre-service program, (Ball et al., 2009). The process of learning to teach expands beyond the completion of a program since novice teachers have learning needs that are specific to the teaching that they are doing inside of their classrooms (Ball & Cohen, 1999; Feiman-Nemser, 2003; Kennedy, 1999). By focusing on high-leverage practices within teacher education settings (e.g., certification coursework), novice teachers are provided with opportunities to address the complex task of teaching under the guidance of teacher educators, thereby putting practice at the center of curriculum (Grossman et al., 2009). Therefore, addressing high-leverage practices in a teacher education setting attempts to weave together content and pedagogical content knowledge with novice teachers' capacity to enact ambitious teaching within their mathematics classrooms (Ball et al., 2013; McDonald et al., 2013).

In this study, as I analyze survey data, classroom observations, professional learning community observations, reflective journals, as well as a semi-structured interview, I work on answering the question about how a novice teacher begins to carry out ambitious mathematics instruction. Specifically, I analyze the struggles that he faces with the two-worlds pitfall as he works on enacting ambitious instruction while negotiating the complexity of daily classroom

interactions. To clarify my intentions, this study does not assess a novice teacher's pre- or in-service training on high-leverage practices, but attempts to understand how one novice mathematics teacher works on implementing ambitious mathematics instruction within the context and realities of his classroom situation.

Research Design and Methods

This research takes place in the context of a larger project, *Understanding Supports for Novice Teachers*. The overarching goal of this project is to learn about the experience and development of alternatively certified novice teachers and learn how their instructional practices, orientations towards teaching, formal classroom experiences, and support network develops over their first year in the teaching profession. In this study, I take up the problem of understanding how a novice teacher who is simultaneously enrolled in alternative certification coursework at a private university and teaching full time, negotiates the complexities of classroom practice as he works to make sense of ambitious mathematics instruction within the context of his classroom. I approach this study qualitatively in order to give a detailed, in-depth description of one first-year teacher's development. I investigate how Mr. Tyler thinks about and enacts high-leverage practices through the analysis of survey data, field notes from classroom observations, professional learning community observations, coursework reflections, and a semi-structured interview.

Mr. Taylor's alternative certification program, placed him within a mathematics department in a Title I, urban school located in Texas. Prior to participating in this alternative certification program, Mr. Tyler was a student for 16 or more years, receiving an undergraduate degree from a university in the northeastern United States. As part of his certification program, he was involved in coursework that provided him the opportunity to think about ambitious

mathematics instruction in relation to his classroom teaching experience. Because of his experiences, Mr. Tyler regularly faced the two-worlds pitfall between best practices taught in his coursework and the realities of his classroom. Therefore, the guiding question for my work is as follows: How does a novice mathematics teacher work on implementing ambitious mathematics instruction during his first year of teaching? Although the results from this study cannot fully address all aspects of learning to implement ambitious mathematics instruction, I designed this study to highlight instances of attention to high-leverage practices, as they provide valuable insight on how teacher educators could support the development of novice teachers and their practice.

Research Site

At the time of the study, South High School's² student body was 52 percent male and 48 percent female, and the total minority enrollment was 100 percent (U.S. News and World Report, 2015). Standardized assessment data from the 2012-2013 school year indicate that 77 percent of students were rated "unsatisfactory" on the State of Texas Assessment of Academic Readiness (STAAR) test for English proficiency, and 89 percent of students were rated unsatisfactory on the STAAR test for mathematics proficiency (U.S. News and World Report, 2015). In 2015, the district reported that the percentage of grade 10 students in the school with a college-ready score for mathematics, as determined by the PSAT, was only 12% with the average score of 34. In addition, there has been a lot of teacher turnover at the school, which is one of the reasons this non-traditional novice mathematics teacher was placed at South High School. It is also important to note that because of their academic standing, it was observed during their professional leaning

² The school has been provided with pseudonym.

community meetings that the mathematics department met weekly to align their practices with the core beliefs of the school and district, as well as to work together to improve student performance on a variety of district and state mandated accountability measures.

Data Collection

As part of the larger project, *Understanding Supports for Novice Teachers*, our project team's data collection plan sought to understand the supports of nontraditional novice teachers within the context of their certification coursework and classroom practices during their first year of teaching. Therefore, we collected survey data from a sample of 102 novice teachers across three time points and followed five focal teachers in and beyond their certification coursework to their subject-specific professional learning communities and classroom practices to better understand how their certification coursework supported the development of ambitious instruction and what supports were in place to help novice teachers enact these practices. In particular, during a twelve-month period, we collected audio and video recordings of certification coursework activities, observations of professional learning communities, field notes from classroom observations, semi-structured interviews, and coursework, school, and classroom artifacts, with the goal of understanding how novice teachers are supported in the development of high-leverage practices.

Data Analysis Procedure

This analysis started with a single question: How does a novice mathematics teacher work on implementing ambitious mathematics instruction during his first year of teaching? To approach this question, I needed to find instances that made visible the novice teacher's work on the development of ambitious mathematics instruction. I used the literature to create a coding scheme with respect to what constitutes ambitious mathematics instruction as defined by high-

leverage practices (i.e., creating a positive classroom culture, launching and enacting complex tasks, treating students as sense makers, eliciting and responding to student thinking, creating routines for students' independent and collaborative activities, (Jackson et al., 2013; Grossman et al., 2009; Lampert, 2001; Lampert et al., 2013; McDonald et al., 2013; Stein et al., 1996.)) Then I examined classroom field notes and reflective journal entries for moments that high-leverage practices were made visible so that these instances provided insight into a novice teacher's challenges in implementing high-leverage practices.

To accomplish this task, I used discourse analysis to make meaning of language (Gee, 1996). Specifically, I employed the interpretive stance of ethnographic inquiry, drawing on techniques that allow a focus on how the self can be revealed and concealed through interactional routines in concern for holistic meaning (Erickson, 1992; Schiffrin, 1994). Further, I looked for emerging patterns (Stake, 1995) and narrowed my focus by using embedded analysis to understand one specific aspect of the case (Creswell, 2013; Yin, 2014). Within this round of analysis, I noticed that classroom culture emerged as a central high-leverage practice in Mr. Tyler's enactment of ambitious mathematics instruction. In fact, I found that classroom culture either hindered or allowed him to take steps towards the implementation of his ideal vision while negotiating his two-worlds of certification coursework and the context of his school, fighting the urge to fall back on instructional methods learned through an apprenticeship of observation. Because of this emergent finding, my next round of analysis focused on classroom culture more specifically: I began to analyze how a novice mathematics teacher works on developing a classroom culture during his first year of teaching and how this work affects implementation of other high-leverage practices. I broke down the high-leverage practice of classroom culture into smaller descriptive units such as developing relationships with students, positioning students as

competent, helping students develop positive relationships with each other, managing transitions between activities, creating routines for students' independent and collaborative activities, (Lampert, 2001) in order to develop assertions about how a novice mathematics teacher works on developing a positive classroom culture during his first year of teaching and how perceptions of this development affect implementation of other high-leverage practices.

Findings

In this section, I report the major finding of my study and provide illustrative examples from the case study. I argue that creating classroom culture was a foundational high-leverage practice that this novice teacher worked on throughout his first year of teaching. I also argue that he weighed the perceived benefits of implementing other high-leverage practices (i.e., collaborative learning, mathematical discourse, differentiating instruction) based on the implications for his classroom culture. In particular, as he confronted the two-worlds pitfall and fought the urge to revert to teacher-centered instructional practices he learned through his apprenticeship of observation, classroom culture emerged as central to his ability to enact ambitious instruction.

Negotiating Ambitious Instruction

Choosing mathematical activities or tasks to complement collaborative culture-building practices is an important part of negotiating ambitious instruction (Horn, 2012; Lampert, 2001). According to Lampert (2001), it is important to deliberately choose the content that you want students to learn while teaching students the routines for working on high-level tasks and appropriate mathematical discourse. However, implementing high-level or ambitious math tasks are sometimes difficult to negotiate within a classroom. As Mr. Tyler reflected in his journal,

To make math meaningful, I want to make the math relatable to real-world ideas. I want

students to be challenged to think rather than memorize procedures. To reach all students, I need to develop differentiation strategies such that each student can be challenged at the appropriate level. As a teacher, I try to take ownership of my classroom and avoid thinking about what happens outside of my classroom whether in the school or at my student's home life as an excuse.

During this moment, Mr. Tyler recognizes the importance of ambitious mathematics instruction by making visible the need for conceptual understanding and differentiation based on the readiness of each student. However, he notes that he sometimes struggles to reach his ideal method of instruction when faced with the complexities of his students' experiences both inside and outside of school. Mr. Tyler further explained, "When I attempt to teach high-level tasks, I very often revert to modeling specific procedures and providing examples in notes." Taken together these statements make visible how Mr. Tyler negotiates the two-worlds pitfall of wanting to enact ambitious practices but not knowing quite how to implement them, and falls back on methods learned through his apprenticeship of observation. Moreover, in his journal Mr. Tyler elaborated on his dilemma as he thought about implementing whole class discussions.

As much as possible, I avoid addressing the whole class. It seems I am much more likely to engage with students in smaller settings while I am at each group's table. When I am lecturing the class and modeling a problem, the instruction is certainly not differentiated— each student is listening and recording notes. I worry that whole class discussions will be subject to some of the same concerns. However, I can certainly utilize [questioning strategies] for group discussions. I can go around and ask each student within a group to share the strategy.

In this vignette, Mr. Tyler offers a solution to his concerns about incorporating whole class

discussions within the learning environment of his classroom. He feels that by working with students in smaller groups he can be more effective in meeting the individual needs of students. Taken together, both of these vignettes highlight Mr. Tyler's awareness of his tendency to fall back on lecturing a class or modeling specific procedures, similar to how his teachers taught when he was a student, especially when confronted by the two-worlds pitfall.

Another example of the struggle that Mr. Tyler faced as he worked on implementing ambitious mathematics instruction is when Mr. Tyler decided to build procedural understanding instead of encouraging students to develop their conceptual understanding through discussions that could build meaning. In his journal Mr. Tyler elaborated:

I often tell my students that math is not about memorizing a set of steps and repeating them but rather learning how to think. Unfortunately, I do not always practice what I preach and end up teaching procedures to students who struggle with the material. I love posing thought-provoking questions, but I fear classroom management suffers when students are unable to devise a solution.

This moment not only made visible his challenges in counteracting his apprenticeship of observation, but also helped us to understand that establishing classroom control can be a problem when it comes to implementing ambitious instruction. To counteract this problem Mr. Tyler felt that his students would learn better by working with procedural material. He concluded in his journal,

Collaborative learning through problem solving tasks is generally best utilized in environments where students have already built the procedural fluency and know when to apply it.

Interestingly, this moment emphasizes Mr. Tyler's ongoing two-worlds struggle and resorts to the lessons learned from his apprenticeship as he continues to be drawn to a practice where teacher-centered instruction and procedural understanding of knowledge are becoming his norm because of the complexities of his classroom culture.

These four vignettes demonstrate: 1) how Mr. Tyler faced and handled the two-worlds pitfall when attempting to implement high-leverage practices, and 2) how classroom culture emerged as central to Mr. Tyler's decisions. In the following section I elaborate more on Mr. Tyler's experience with the high-leverage practice of developing classroom culture.

Negotiating Classroom Culture

From the beginning of the school year, it was visible that Mr. Tyler worked on developing a classroom culture where he could enact his ideal vision, but seemed to struggle with his effectiveness in implementing a culture for ambitious teaching. During the fall of Mr. Tyler's first year of teaching, he participated in a survey prompting him to rate, on a five-point Likert scale, the kinds of things that created difficulties for teachers in school activities. At this time, he rated himself as neither effective nor ineffective in the extent he could control disruptive behavior in his classroom, motivate students who show low interest, calm a student who was disruptive or noisy in the classroom, get students to follow classroom rules, get students to believe they can do well, and in establishing a classroom management system in the classes that he teaches. These ratings signaled that although he was working on classroom culture in his practice, he was still negotiating how to best build a culture that established and maintained "norms of action and interaction within which the teacher can teach and students can study" (Lampert, 2001).

Through analysis of the field notes from observations in Mr. Tyler's class, it became

evident that he worked on the problem of arranging the physical environment to support a classroom culture that would enable students to do math (Lampert, 2001). Negotiating this high-leverage practice, Mr. Tyler sat students in grouped desks, or companies of three to five students. These companies were designed to promote a collaborative learning environment in his classroom. Mr. Tyler reflected on his seating arrangement in his journal: “My classroom is organized into groups or ‘companies’. There is a business theme in the classroom, in which groups are named after companies. Many students take considerable pride in their company.” He elaborates, “The companies can earn money—fake million dollar bills—for strong performance.” Additionally, he noted in his journal that there were advantages and disadvantages to this physical arrangement. He wrote:

In terms of advantages, the classroom is more “fun” for many as they have a chance to interact with friends while staying on-task. On the downside, there is often a lack of individual accountability. Students can easily copy others’ work, and it will not be evident until the quiz or test that there is a profound lack of understanding.

In creating a classroom culture, Mr. Tyler realized that he needed to think about the physical arrangement of the room so that students could have the opportunity to learn. Moreover, he negotiated how to create a learning environment that supported student participation (Bransford, Brown, & Cocking, 2000). He thought about the context, roles, and relationships that students have as they interact with the content (Horn, 2012). As Mr. Tyler studied group-worthy tasks (Horn, 2012; Lotan, 2003) as part of his certification coursework, he reflected in his journal about some of the accountability strategies that he implemented to mitigate the disadvantages of the physical arrangement of his classroom. As he reflected on his reading assignment from *Strength in Numbers: Collaborative Learning in Secondary Mathematics* (Horn, 2012), Mr.

Tyler described one strategy as similar to the checkpoints strategy that required a group to check their understanding before moving onto the next part of a task. He wrote in his journal:

On some review days, I have divided the work into three levels of difficulty. Upon completion of a certain level of difficulty, a group would call me over for a check. During this check, I randomly call on each student in the group to explain a certain question. If all students complete the check successfully, [their company is] awarded money. The strategy was very effective at first, as group members made sure every member understood the material.

This vignette explains the complexity of negotiating the high-leverage practice of classroom culture. Noticeably, students have time to work on mathematical problems as a group, creating a sense of collaboration. Also, it is clear that Mr. Tyler provides problems that are differentiated by levels of difficulty, thereby taking into account the range of abilities within his classroom. He also reflects on holding students accountable by awarding companies a payment as an incentive for working together. This moment, when broken into these parts, shows that Mr. Tyler is working on implementing other high-leverage practices, such as differentiating content and assessing student understanding, as he works on instilling a sense of classroom culture.

Therefore, it could be argued that developing a classroom culture is one of the most critical high-leverage practices that novice teachers should learn to implement, since the nature of classroom culture that a novice teacher establishes early in the year lays the foundation for future teaching and learning activities (Grossman et al, 2009). Take into the account the following reflection from Mr. Tyler's journal,

I want to remain open to new ideas and be willing to take risks. Too often, teachers (myself included) think about reasons why things cannot be done... [However,] after

school one day last semester, I walked out of the building headed toward my car and saw students throwing their cell phones off the balcony onto a grassy area. I asked them what they were doing, and they joked they were doing a physics experiment where it was clear the students were just messing around. I was ready to go home after a long day, but I decided to stay and actually make it a physics experiment. I brought out my clipboard and calculator and wrote down some formulas. We tested the formulas and solved for missing variables like height and time. Students were remarkably engaged and eager to test out ideas. One of my students told me after the rather lengthy “lesson” that we should do something like this in class. At the time, I regretted not doing enough exploration learning and resolved to do more. Several months later and only a month from the end of the school year, I regret to say that although I have done more, I do not think I have done enough to engage students with real-life, hands-on exploration.

As this vignette and the many of the other moments highlighted through this analysis indicate, this novice teacher had the potential to be a teacher who practices ambitious mathematics instruction. He understood the importance of high-leverage practices and ambitious instruction and wanted to implement these practices within his classroom. However, when faced with the two-worlds pitfall and the complexities of the classroom, be it the readiness levels of students or a test-driven environment, he fell back on his socialization into teaching that he received through his apprenticeship of observation, especially when he felt that his classroom management was suffering due to the high-level tasks that he attempted to implement.

Interestingly, in response to an interview question about how to support novice teachers, Mr. Tyler made a point that he viewed classroom culture as a foundational high-leverage practice for novice teachers. He explained,

At first, I'd walk through just the very basics. What would your classroom look like? Now let's think about what your classroom would look like on a day-to-day basis? People walk in and they get a "Do Now". Where are you getting that "Do Now"? What is the most efficient way to do that? Are you making it yourself? Do you really want to do that everyday? Okay, this lesson. How are you going to walk through the points? Are students going to write it down in a notebook or students going to write it down on [a copy of] your notes? Having a very detailed picture of what that structure looks like in your classroom and planning that before you even start your first year is something I wish I had done.

This vignette suggests that Mr. Tyler believes that classroom culture should be the first high-leverage practice that a new teacher should consider and plan for. Looking across these vignettes, it is clear that the development of classroom culture was foundational within Mr. Tyler's practice as he worked to develop ambitious instructional practice.

Discussion

Many novice mathematics teachers like Mr. Tyler aim to provide ambitious instruction for their students. However, as Mr. Tyler's case indicates, a teachers' prior experience as students—their apprenticeship of observation—provides powerful socialization into teaching (Ball & Cohen, 1999; Hammerness et al., 2005; Kennedy, 2008) that is usually at odds with the ambitious teaching practices learned in teacher education settings. Although the goals of ambitious teaching practices are similar to many novice teachers' visions of an ideal classroom, when it comes time to provide learning opportunities that support the development of deep understanding of ideas for *all* students, novice teachers may feel the pressure of the two-worlds dilemma and either adapt to the norms of the school where they teach (Feiman-Nemser &

Buchmann, 1985) or abandon ambitious instruction due to the complexities of their classroom (Ensor, 2001; Thompson et al., 2013) and fall back on their apprenticeship of observation (Lortie, 1975). In addition to exemplifying the relationship between these dilemmas of practice, this case study suggests that classroom culture is a salient high-leverage practice that is foundational to the successful implementation of other high-leverage practices that ultimately lead to ambitious instruction. Throughout this case study, I describe moments where classroom culture emerged as foundational, in Mr. Tyler's enactment of ambitious mathematics instruction. In these moments it seems as if classroom culture either hindered or allowed him to take steps towards the implementation of his ideal vision while setting the tone of what it looks like to do math within his classroom.

Limitations to the Analysis

Although this analysis reveals important dimensions to how a novice teacher works on the high-leverage practice of building a classroom culture and how classroom culture affects the implementation of other high-leverage practices, it is limited in its access to the full complexity of this process. While sustained classroom opportunities and related debriefing sessions would have provided a more robust image of Mr. Tyler's development of instructional practice, they were not possible due to situational constraints. Additionally, this analysis only studied a nontraditional teacher who was simultaneously enrolled in certification coursework and working as a full-time first-year teacher, and does not take into account how traditionally certified novice teachers develop ambitious instructional practice.

Despite these limitations, this analysis reveals moments describing how a novice mathematics teacher works on developing a classroom culture during his first year of teaching and how this work is a foundational piece to the implementation of other high-leverage practices.

The decisions that a novice teacher makes when faced with opportunities to practice other high-leverage practices are affected by how a novice teacher arranges his physical environment, develops routines for independent and collaborative activities, as well as chooses the mathematical tasks of his lessons.

Implications

During the first year of teaching, a novice teacher has so many ambitious goals for their classroom, yet they also have to confront the reality of their teaching context. They quickly learn to prioritize their goals with the intent to layer on additional dimensions as they become more experienced. This study attempts to understand a few of the daily dilemmas that novice teachers face as they begin teaching students by investigating how a novice mathematics teacher works on developing a classroom culture during his first year of teaching and how this work affects implementation of other high-leverage practices while making ongoing decisions. During this study, I unpacked the idea that classroom culture is one of, if not the most foundational high-leverage practice that a novice teacher should master. Classroom culture affects the implementation of other high-leverage practices such as mathematical discourse, assessing student understanding, and differentiation. Furthermore, I argue that the two-worlds pitfall and the apprenticeship of observation are related problems of practice since novice teachers may feel pressure to either adapt to the norms of the school where they teach (Feiman-Nemser & Buchmann, 1985) or abandon ambitious instruction due to the complexities of their classroom environment (Ensor, 2001; Thompson et al., 2013), thereby falling back on teacher-centered instruction learned during their apprenticeship of observation (Lortie, 1975).

The findings of this study have implications for how teacher educators and school or district leaders can support the development of novice teachers and their practice so that they are

able to implement their ideal visions with out falling back on their apprenticeship of observation. First, given the foundational nature of classroom culture, it should perhaps receive greater attention within mathematics methods coursework and other supports for teachers. For example, it is notably absent from the mathematics teaching practices in *Principles to Actions: Ensuring Mathematical Success for All* (National Council of Teachers of Mathematics, 2014). Second, one possible in-service teacher support could be to provide novice teachers with in-the-moment support or coaching. For example, instructional coaching could provide novice teachers an opportunity to engage in professional learning activities with more accomplished colleagues that are directly applicable to their classroom practices (West & Staub, 2003). I argue that if a novice teacher was provided with such a support, they would be able to take-up high-leverage practices with out the continuous struggle between the two-worlds and thereby be ultimately able to implement ambitious mathematics instruction.

References

- Ball, D. L. & Cohen, D. K. (1999). Developing practice, developing practitioners: Toward a practice-based theory of professional education. In G. Sykes and L. Darling-Hammond (Eds.), *Teaching as the learning profession: Handbook of policy and practice* (pp. 3-32). San Francisco: Jossey Bass.
- Ball, D. L., Sleep, L., Boerst, T. A., & Bass, H. (2009). Combining the development of practice and the practice of development in teacher education. *The Elementary School Journal*, 109(5), 458–474.
- Bransford, J.D., Brown, A.L., Cocking, R. (2000). *How people learn: Brain, mind, experience, and school*. Washington D.C.: National Research Council.
- Creswell, J.W. (2013). *Qualitative inquiry and research design*. Thousand Oaks, CA: SAGE Publications, Inc.
- Ensor, P. (2001). From pre-service mathematics teacher education to beginning teaching: A study in recontextualizing. *Journal for Research in Mathematics Education*, 32, 296–320.
- Erickson, F. (1992). Ethnographic microanalysis of interaction. In M. LeCompte, W. Millroy and J. Preissle (Eds.), *The handbook of qualitative research in education* (pp. 201–225). San Diego, CA: Academic Press
- Feiman-Nemser, S. (2001). From preparation to practice: Designing a continuum to strengthen and sustain teaching. *Teachers College Record*, 103(6), 1013-1055.
- Feiman-Nemser, S. (2003). What new teachers need to learn. *Educational Leadership*, 60(8), 25-29.
- Feiman-Nemser, S., & Buchmann, M. (1985). Pitfalls of experience in teacher preparation. *Teachers College Record*, 87, 53–65.

- Gee, J. (1996). Discourse analysis: Status, solidarity and social identity. In *Social Linguistic and Literacies: Ideology in Discourses, Second Edition* (pp. 90–121).
- Grossman, P., Hammerness, K., McDonald, M. (2009). Redefining teacher: Reimagining teacher education. *Teachers and Teaching: Theory and Practice*, 15(2), 273-290.
- Hammerness, K., Darling-Hammond, L., Bransford, J., Berliner, D., Cochran-Smith, M., McDonald, M. & Zeichner, K. (2005). How teachers learn and develop. In L. Darling-Hammond & J. Bransford (Eds.), *Preparing teachers for a changing world*. San Francisco, CA: Jossey-Bass.
- Hiebert, J., Capreter, T.P., Fennema, E., Fuscon, K.C., Wearne, D., Murraray, H., Oliver, A., Human, P. (1997). *Making sense: Teaching and learning mathematics with understanding*. Portsmouth, NH: Heinemann.
- Horn, I. S. (2012). *Strength in numbers: Collaborative learning in secondary mathematics*. Reston, VA: National Council of Teachers of Mathematics, Inc.
- Jackson, K. J., Garrison, A. L., Wilson, J., Gibbons, L., & Shahan, E. (2013). Exploring relationships between setting up complex tasks and opportunities to learn in concluding whole-class discussions in middle-grades mathematics instruction. *Journal for Research in Mathematics Education*, 40(4), 646-682.
- Jackson, P.W. (1968). *Life in classroom*. New York, NY: Holt, Rienhart and Winston.
- Kazemi, E., Franke, M., & Lampert, M. (2009). Developing pedagogies in teacher education to support novice teachers' ability to enact ambitious instruction. *Crossing Divides: Proceedings of the 32nd Annual Conference of the Mathematics Education Research Group of Australasia (Vol. 1)*, 1, 11–29. Ka

- Kennedy, M. M. (2008). Teachers thinking about their practice. In T. Good (Ed.), *21st century education: A reference handbook* (pp. 21-28). Thousand Oaks, CA: SAGE Publications, Inc. doi:10.4135/9781412964012.n3
- Lampert, M. (2001). *Teaching problems and the problem of teaching*. New Haven, CT: Yale University Press.
- Lampert, M., & Franke, ML, Kazemi, E., Ghouseini, H., Turrou, A.C., Beasley, H., Cunard, A., Crowe, K. (2013). Keeping it complex using rehearsals to support novice teacher learning of ambitious teaching. *Journal of Teacher Education*, 64(3), 226–243.
- Lotan, R. (2003). Group-worthy tasks. *Educational Leadership* 60(6), 72-75.
- Lortie, D. C. (1975). *Schoolteacher*. Chicago, IL: The University of Chicago Press.
- McDonald, M., Kazemi, E., & Kavanagh, S. S. (2013). Core Practices and Pedagogies of Teacher Education: A Call for a Common Language and Collective Activity. *Journal of Teacher Education*, 64(5), 378–386. doi:10.1177/0022487113493807
- McDonald, M., Kazemi, E., Kelley-Petersen, M., Mikolasy, K., Thompson, J., Valencia, S. W., & Windschitl, M. (2014). Practice makes practice: Learning to teach in teacher education. *Peabody Journal of Education*, 89(4), 500–515. doi:10.1080/0161956X.2014.938997
- National Council of Teachers of Mathematics. (2014). *Principles to actions: Ensuring mathematical success for all*. Reston, VA: The National Council of Teachers of Mathematics.
- Schiffrin, D. (1994). *Approaches to discourse*. Malden, MA: Blackwell Publishers Inc.
- Stake, R.E. (1995). *The art of case study research*. Thousand Oaks, CA: SAGE Publications, Inc.

- Stein, M. K., Grover, B.W., Henningsen, M. (1996). Building student capacity for mathematical thinking and reasoning: An analysis of mathematical tasks used in reform classrooms. *American Educational Research Journal* 33(2), 455-488.
- Thompson, J., Windschitl, M., & Braaten, M. (2013). Developing a theory of ambitious early-career teacher practice. *American Educational Research Journal*, 50(3), 574–615.
doi:10.3102/0002831213476334
- U.S. News and World Report (2015). Best high schools rankings. *U.S. News and World Report*. Retrieved from <http://www.usnews.com/education/best-high-schools/national-rankings>
- West, L., & Staub, F. C. (2003). *Content-focused coaching: Transforming mathematics lessons*. Portsmouth, NH: Heinemann / Pittsburgh, PA: University of Pittsburgh.
- Windschitl, M., & Thompson, J. (2011). Ambitious Pedagogy by Novice Teachers : Who Benefits From Tool-Supported Collaborative Inquiry into Practice and Why? *Teachers College Record*, 113(7), 1311–1360.
- Yin, R. K. (2014). *Case study research: Design and methods*. Thousand Oaks, CA: SAGE Publications, Inc.