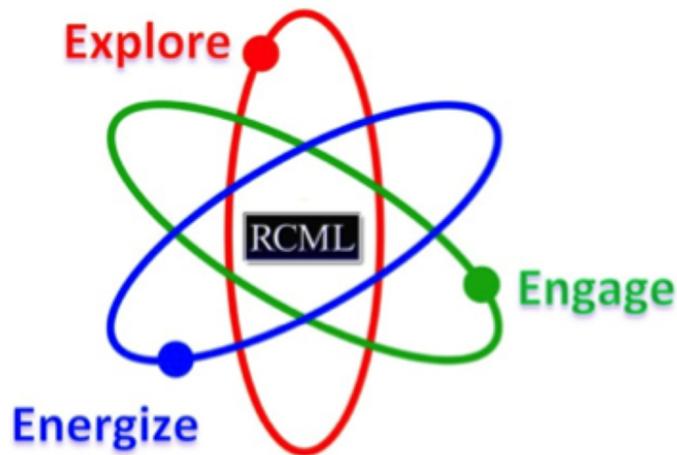


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**BARRIERS TO IMPLEMENTATION OF CONSTRUCTIVIST TEACHING IN A HIGH-POVERTY URBAN SCHOOL DISTRICT**

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*Guided by the “constructivist in practice” dilemmas framework developed by Windschitl (2002), we investigated the conceptual, pedagogical, cultural, and political barriers that K-12 mathematics teachers in a high-poverty urban district encounter when trying to implement constructivist practices they learned through a rigorous professional development (PD) program. Themes that emerged from this qualitative analysis included barriers concerning lack of awareness of constructivist theory, difficulties facilitating constructivist activities in the classroom, poverty, lack of instructional autonomy, and high-stakes testing. Identifying barriers to constructivist teaching may inform teacher educators and school administrators in developing strategies to overcome these obstacles and improve mathematics-teaching quality.*

**Introduction**

At its core, constructivist teaching facilitates an active learning environment where students interact with one another and connect new ideas with existing knowledge to construct a meaningful conceptual understanding of information within an academic discipline (Hennessey, Higley, & Chesnut, 2012). Within the mathematics education community, the constructivist teaching philosophy serves as the framework for reform-based teaching (National Council of Teachers of Mathematics, 2014). Research indicates that this philosophy is associated with greater student achievement in mathematics, enhanced algebraic procedural and conceptual understanding, as well as more sophisticated epistemological conceptions of mathematics (Kim, 2005; Ross & Willson, 2012; Star & Hoffman, 2005). Thus, high-quality teacher professional development aims to develop the conceptual and pedagogical groundwork for mathematics teachers to implement constructivist practices in their classrooms (Garet, Porter, Desimone, Birman, & Yoon, 2001). However, even when mathematics teachers gain the adequate conceptual and pedagogical foundation to implement constructivist practices, they may still face political and cultural challenges to enact these practices in their classrooms (Windschitl, 2002). These challenges may be more pronounced in high-poverty urban schools where emphasis on rote learning, scripted lessons, mandated curriculum, and accountability is more likely to prevail (e.g., Crocco & Costigan, 2007). Perhaps because of these challenges, research has found that teachers working in high-poverty urban school schools are less likely to enact constructivist

instructional approaches that align with mathematics reform standards compared to their counterparts teaching in low-poverty school districts (Berry, Bol, & McKinney, 2009).

Therefore, guided by the “constructivist in practice” dilemmas framework developed by Windschitl (2002), we will investigate the personal, cultural, and political barriers that K-12 mathematics teachers in a high-poverty urban district encounter when trying to implement constructivist practices taught through a teacher professional development program. In addition, we seek to identify motivational and behavioral strategies teachers utilize to overcome these obstacles to sustain constructivist practices. It is the hope that through this research, we will help further the quality of mathematics instruction, and, in turn, students’ mathematics achievement.

### **Theoretical Framework**

To address the dearth of research that seeks to uncover the full spectrum of challenges teachers face in facilitating constructivist classroom environments, Windschitl (2002) developed the “constructivist in practice” dilemmas model to propose that there are four broad dimensions that capture challenges to the implementation of constructivist teaching: conceptual, pedagogical, cultural, and political dilemmas. Conceptual dilemmas involve teachers’ epistemological understanding of constructivism. Pedagogical dilemmas deal with the design of curriculum and classroom activities to align with constructivist teaching. Cultural dilemmas involve the roles that are necessary among teachers to facilitate a constructivist classroom environment. Political dilemmas are encountered when resistance to constructivist teaching arises among various stakeholders within school communities (Windschitl, 2002). This framework will serve as an initial guide to organize our qualitative interview data concerning teachers’ barriers to implementing constructivist practices learned through rigorous PD in mathematics instruction.

### **Research Questions**

1. What types of barriers do teachers working in high-poverty schools encounter when transferring constructivist practices learned through PD into their classrooms?
2. What types of facilitators assist teachers working in high-poverty schools to implement constructivist teaching learned through PD?

## **Method**

### **Participants**

A total of 80 K-12 in-service mathematics teachers from urban school districts in Texas participated in a three-week rigorous summer PD program focusing on mathematical content and pedagogical knowledge informed by constructivist theory. The teachers volunteered or were selected by school administration to participate in the program. The mathematical content focus was: (a) numbers, operations, and quantitative reasoning; and (b) patterns, relationships, and algebraic reasoning. A total of 80 teachers from eight school districts and one private school represented the initial sample. We identified 52 teachers working in high-poverty schools within a high-poverty school district. We categorized these teachers by grade level (K-6 and 7-12) and teaching experience (experienced and novice [less than 5 years of teaching]). We randomly selected two teachers from each cell of this 2X2 design (8 teachers in total).

### **Procedure**

Authors developed a structured interview protocol that included questions about their experience in the PD program, their teaching philosophy, and barriers and/or facilitators to implementation of teaching practices of what they have learned through the PD. Authors interviewed these eight teachers in the spring semester of the 2015-16 academic year following the summer PD. Student research assistants transcribed the interviews. All three authors read through the interviews to identify specific manifestations of Windschitl's (2002) four constructivist dilemmas in the transcripts and met to discuss the themes developed (Patton, 2002). Then, authors categorized these themes within Windschitl's (2002) four dilemmas of constructivist teaching. In addition, within each type of dilemma authors specifically made note of factors that either helped (facilitator) or hindered (barrier) their use of constructivist teaching methods. Authors used Windschitl's (2002) descriptions broadly and included examples that were not explicitly mentioned in the article but were consistent with the overall conception of the dilemma. After developing a first draft of a codebook that included detailed description of the codes, we selected two interviews at random to be coded by all three authors. A second coding meeting was held to discuss what codes authors had applied and why. If there was a discrepancy, authors resolved them to establish interrater reliability. Additional revisions of the codebook were made based on authors understanding of the codes as they were applied to the interview. After establishing agreement and finalizing the codes, each author coded four interview

transcripts so that each transcript was coded by two authors. A final meeting took place between the pairs of authors to resolve any coding discrepancies.

### **Findings**

Below we describe Windschitl's (2002) four dilemmas and how each one manifests for participating mathematics teachers in high-poverty urban school districts.

*Conceptual barriers.* According to Windschitl (2002), conceptual dilemmas refer to the difficulties in understanding the constructivist approach to teaching. Teachers' deep understanding of the constructivist approach might be thought of as a predecessor to effective constructivist techniques because of the inherent philosophical nature of the approach as well as the significant departure from "traditional" teaching methods. Furthermore, teachers may conflate the activities associated with constructivism with the approach itself. In other words, they may implement ostensibly constructivist methods (use of manipulatives, social dialogue) without implementing the core of constructivist theory because of poor understanding of the theory itself.

In our data, we looked for evidence of conceptual barriers, such as teachers being confused about or unaware of the term "constructivism" when asked directly about their opinions about constructivism. Conceptual barriers also included teachers believing that students learned math best via traditional methods. For instance, one teacher noted, "I am old school in that I do like them to learn paper/pencil first before we move on to the calculator."

*Conceptual facilitators.* Conceptual facilitators included endorsing beliefs and implementing instruction that are consistent with a constructivist approach, such as developing understanding through social interaction and implementing student-centered approaches. Though teachers were often unfamiliar with the term "constructivism" and were not able to fully articulate the theory, many teachers conveyed that students learn math best through methods and activities consistent with constructivism. For instance, one teacher said,

*So, I like my kids to learn through play because I think that that works best for kids. Kids learn through each other and they learn through play and they learn through conversation (...) Numbers are just symbols, but if they don't understand what it means. They are not able to manipulate it, then they are not able to do math, because if they don't understand it, then it is just essentially rote versus actually knowing it, and actually being able to argue why you are doing it and then me teaching them a strategy and then they coming up with their own strategy, versus me teaching them this strategy and they are using that without going deeper. So, I like to teach them to think deeper and dig deeper through hand-on interactions and conversations with each other.*

*Pedagogical barriers.* Windschitl (2002) describes pedagogical dilemmas as teachers' application of constructivist theory to the learning environment via tasks and activities. Specifically, these dilemmas refer to teachers' attempts at transforming their instructional technique from traditional, didactic methods to methods consistent with constructivism. As part of this process, teachers must shift their focus from, for example, supplying answers and techniques to acting as a facilitator for student learning; from minimal student interaction to facilitating academically productive student dialogue; or from using pre-determined problem sets to creating complex problems that provoke deep and meaningful work. Pedagogical dilemmas can also refer to teacher attributes, such as deep background knowledge or interest in the material.

In terms of pedagogical barriers, some teachers mentioned the difficulties in facilitating activities, such as the use of manipulatives, noting that students can use them inappropriately. Other pedagogical barriers included teacher attributes, such as poor motivation (“it's about maintaining my motivation, cuz this is a burn-out industry, and I felt it. You know, I have felt it.”) or lack of background knowledge (“And I'm not like a mathematician, like some people are. They get these concepts and they're real fast, and they get it, and their knowledge is real deep right away, and not so with me.”).

*Pedagogical facilitators.* In terms of pedagogical facilitators, several teachers noted that they were able to successfully manage the different demands of a more constructivist classroom (several mentioned coping with the “organized chaos” involved in having students work more cooperatively). There were several different types of activities mentioned, such as using manipulatives, technology, art, real-world data collection, and even yoga to teach math. One teacher describes her use of manipulatives as follows:

*As an 8th grade teacher I always think that my kids are too old for manipulatives. And, there were some really good activities that we did over the summer that I don't know. And I did them in my classroom. And I don't know how I would've done them without the manipulatives. Um, you're never too old. As students, you're never too old for manipulatives, it's just the process changes. And, you know, I used the algebra tiles with my algebra kids. I've used the two color counters with my 8th grade kids. We did a thing with my 8th grade kids, that one of my instructors did with bags for the real number system. And my kids, they got it. Because they had that visual there to see. So, it was really fun. I enjoyed it.*

*Cultural barriers.* Windschitl (2002) defines cultural dilemmas as occurring when teachers encounter difficulties related to learning expectations from students or other stakeholders that do not match constructivist theory. For instance, part of implementing constructivism entails re-writing the “unwritten rules” related to participation and decision-making. The cultural background and expectations of students and even fellow teachers may also be inconsistent with a constructivist approach, creating difficulties in implementing the approach.

In our data, cultural barriers included other teachers’ attitudes as favoring status quo teaching approaches, difficulty implementing the constructivist techniques learned through the PD due to classroom management concerns, or student poverty as a barrier. For instance, one teacher noted, “So the distractions, just just the fact that outside of these walls, there's nothing to motivate them to do what we're doing here. You know, it's just, they're just, they're on survival mode out there.” Related to the attitude of other teachers, one teacher noted:

*Some older teacher, I guess, veteran teachers are gung-ho on having their kids memorize these facts, and I understand memorizing the facts once you know what they mean. But they are like no, I am going to drill and kill. 9 x 7 is what? 5x5 is what? And the kids don't understand the concept and it's mainly because I guess the teachers that they had before didn't do what they needed to do to develop the concept (...) So, I am not for drill and kills, some people are. I understand why you shouldn't do them. I understand why you should. But some people are like adamant. They are like nope, I am gonna do drill and kill it's always worked and I am gonna continue to do it.*

However, other teachers noted their colleagues’ attitudes and behaviors as facilitating their instruction. For example, one teacher said:

*The other teachers in my immediate area, just around me, we're really amazing support system for each other, we keep an eye out for each other, we know the ins and outs of what's going on and what our deeds are, what students need help with in what periods, it's really about building that team around you.*

*Political barriers.* Windschitl (2002) discusses political dilemmas as occurring when systemic barriers interact with the implementation of the constructivist approach. These interactions can occur with a variety of stakeholders, such as campus or district-level administrators or from parents or other community stakeholders. Transitioning from the “traditional” and somewhat expected framework of instruction is apt to produce controversy and tensions amongst a variety of stakeholders. Teachers did report some political facilitators, such as some degree of administrative support (“my principal just kinda lets us go teach, do what you need to do.”). However, there were a number of political barriers that were mentioned by the teachers interviewed.

One of the most common political barriers came when teachers were not able to access the instructional resources they needed in order to implement constructivist learning in their classrooms. In implementing the things they learned through the PD, teachers would need access to resources such as manipulatives, technology, and materials for interactive notebooks. However, teachers reported that they were unable to secure the specific resources they needed to be able to effectively implement what they learned. For instance, one teacher noted, “Well as far as math is concerned, we don't have the manipulatives in order to teach the concepts.”

Another common political barrier to implementing constructivist teaching came when teachers encountered the overlapping concerns of testing, timing, and flexibility. Because of state accountability tests, these concerns are likely related given that schools and districts have come up with a specific curriculum sequence and timeline to ensure students are prepared for the tests. Schools and districts may also use prescriptive methods to ensure teachers adhere to methods they believe will result in higher test scores. These types of barriers were very commonly mentioned especially as they contrast with a constructivist teaching framework. For instance, teachers wished they had more flexibility and time to be able to explore concepts, correct misconceptions, and engage in exploratory learning but found that they encountered some pushback when attempting to deliver those types of strategies into the classroom. For instance, one teacher described a tension between what she described as “real people time” (the actual time it would take to learn a concept) and “artificial time” (the timeline dictated by the testing schedule). One teacher described some negative interactions with an administrator due to these concerns, “Like I have said, I have gotten chewed out multiple times for not being where I should be on the pacing calendar...” Other teachers noted:

*The other thing is that sometimes we're not free to teach the way the concept was brought across in the training here. And so we basically have to adapt to whatever the campus wants to do. Like, however the campus wants to teach the concept, you know, if it's not tested on the STAAR, we don't teach it in the classroom. Or if it's one of the items that are not tested very often on the STAAR, we don't spend a lot of time on it. Even though it's going to be something that they're going to need to have a foundation in algebra for. We gloss over in 8th grade, where we really need to spend the time because it's not one of the important TEKS that will have questions.*

### **Discussion**

This study applies and extends Windschitl’s (2002) “constructivist in practice” dilemmas framework by elucidating how these dilemmas manifest for teachers working in high-poverty urban districts. Perhaps some of the most common dilemmas reported included conceptual

dilemmas and political dilemmas. Results indicate that while teachers develop an understanding through PD of how students learn best that is consistent with constructivism; they still lack full awareness of their underlying teaching philosophy. Based on this finding, we recommend that teacher educators explicitly convey the theoretical framework that informs the pedagogical approaches their programs endorse. Prominent political dilemmas included lack of instructional resources and instructional time constraints due to high stakes testing. These findings imply that additional consideration by district and school administration is necessary to support teachers so that they gain maximum benefit from their constructivism-informed PD experiences.

### **Acknowledgement**

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