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RESEARCH IN MATHEMATICS EDUCATION

**Grand Prairie ISD Secondary Mathematics
Professional Development
Descriptive Report**

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Grand Prairie ISD Secondary Mathematics Professional Development Descriptive Report

Brea Ratliff • Dawn Woods • Anne Garrison Wilhelm • Leanne R. Ketterlin-Geller

Southern Methodist University

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PO Box 750114
Dallas, TX 75275-0114
Contact information: rme@smu.edu

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Abstract

In this descriptive report, we describe the process enacted to support the development of mathematics content and pedagogical knowledge for a small group of middle and high school mathematics teachers at the Young Women’s Leadership Academy (YWLA), a STEM designated public school in Grand Prairie ISD (GP ISD). The administrative team of YWLA worked alongside the district curriculum supervisor to obtain a grant for Professional Development Partnerships for Advanced Mathematics and Science Courses from the Texas Education Agency (TEA). In an effort to increase teacher content knowledge and instruction in mathematics, GP ISD team members developed a partnership with SMU researchers and staff members to design and implement consistent and ongoing professional development for the teachers.

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Grand Prairie ISD Secondary Mathematics Professional Development Descriptive Report

Project Overview

The purpose of this partnership between SMU and a small group of secondary mathematics teachers from the Young Women's Leadership Academy (YWLA) in Grand Prairie ISD was to support the development of their: a) teacher content knowledge, b) instructional design and delivery, and c) leadership and/or mentorship ability. Our goal was to provide differentiated professional development that met the individual needs of participating teachers, while bringing them together as a group of teacher leaders.

Campus Background

The project focused on mathematics educators at YWLA, a school designed to serve young women in Grades 6 – 12. At the time of the partnership, the campus had been open for four years, and received designation as a Texas Science, Technology, Engineering, and Mathematics (T-STEM) Academy. All mathematics classrooms are double-blocked, which allows students to receive between 90 and 100 minutes of mathematics instruction on a daily basis. The campus has one mathematics instructional coach, who was also included as a project participant.

Project Participants

The professional development (PD) project participants were five middle and high school mathematics teachers and the campus mathematics instructional coach.

Teachers from YWLA were invited to apply to participate in the project and were told that they would be compensated financially and would, in return have additional expectations placed on them. PD participants agreed to: a) attend additional training/activities outside normal duty times, b) demonstrate openness to innovation and change, c) train other teachers on campus and at the district level, d) understand that data will be shared with SMU, and e) remain at the campus for a minimum of two years. The participants were selected by the campus principal and the Dean of Instruction, and were expected to become teacher leaders on the campus both informally in their work in grade level teams and by providing professional development experiences for additional campus mathematics teachers. The Dean of Instruction was primarily responsible for communication with the SMU research team because of her supervision of the mathematics department.

Participant 1 has 11 years of teaching experience. She holds a Bachelor's degree in Speech Communications, and is certified in the state of Texas to teach all subjects in Grades 4-8. She has taught 6th grade math, 6th grade math Pre AP, 7th grade math, 7th grade math Pre AP, and 8th

grade math. Her teaching assignment during the year of the project was 6th and 7th grade Pre AP math.

Participant 2 has 3 years of teaching experience. She holds a Bachelor's degree in Secondary Mathematics Education, and is certified to teach secondary mathematics in the states of Arizona and Texas. She has taught Algebra 1 and Algebra 2. Her teaching assignment during the year of the project was Algebra 1 and Geometry.

Participant 3 has 7 years of teaching experience. She holds a Bachelor's degree in Information Systems, and is certified in the state of Texas to teach all subjects in Grades 4-8. She has taught 6th grade math Pre AP, and 7th grade math, and 7th grade math Pre AP. Her teaching assignment during the year of the project was 7th grade math.

Participant 4 has 4 years of teaching experience. She holds a Bachelor's degree in Education, and is certified in the state of Texas to teach all subjects from Early Childhood to Grade 6, and Math/Science in Grades 4-8. She has taught 8th grade math, 8th grade math Pre AP, and Algebra 1 Pre AP. Her teaching assignment during the year of the project was 8th grade math Pre AP and Algebra 1 Pre AP.

Participant 5 has 2 years of teaching experience. She holds a Bachelor's degree in Sociology and Psychology. She is certified in the state of Texas to teach mathematics in Grades 4-8, and English as a Second Language. Her teaching assignment during the year of the project was 8th grade math.

Participant 6 was the campus mathematics and science instructional coach with prior experience as a secondary mathematics teacher.

Professional Development and Learning Outcomes

The learning outcomes of this project included improvements in teachers' a) mathematics content knowledge, b) instructional practices, c) coaching skills, and d) professional collaboration. The SMU team presented the teachers with customized professional development opportunities in order to meet the desired learning outcomes of the project.

The professional development provided for participating teachers included a) graduate-level coursework, b) three in-person workshops, c) personalized coaching sessions and d) participation in a local mathematics conference.

Graduate Level Coursework

A portion of the project's grant funding was used to pay teachers' tuition for an SMU graduate-level mathematics education course in which the teachers could deepen their understanding of algebraic thinking. Two teachers from the project were enrolled in the Algebraic Reasoning and Patterns course. Algebraic Reasoning and Patterns is part of a four-course sequence required by teachers seeking a Master Mathematics Teacher specialization. The Master Mathematics Teacher specialization includes coursework focused on improving teachers' pedagogical content knowledge and connecting research to practice through application and professional discourse.

Through the Algebraic Reasoning and Patterns course, teachers engaged in mathematical investigations that deepened their own algebraic thinking. In addition, they learned about effective instruction for developing students' algebraic reasoning skills. The project teachers chose to enroll in this course based on their own professional goals. Initially, all but one of the teachers expressed an interest and were enrolled in the course, however only two teachers completed the course. The expectation was that the other project teachers would choose from the list of online professional development options (see Table 1) to fit their individual needs, however the other teachers did not participate in the offered supplementary professional development.

In-Person Workshops

The teachers and mathematics instructional coach participated in three workshops facilitated by SMU faculty and members of the SMU team over the course of the semester.

The first workshop was held on the campus of SMU. The agenda for the first workshop included:

- Welcome/Ice Breaker/Consent and Survey Administration
- Introduction to Classroom Observations: Focusing on High Quality Mathematics Instructional Indicators
- Classroom Video Observation 1 and Reflections – Grade 8 Mathematics
- Break
- Classroom Video Observation 2 and Reflections – Grade 6 Mathematics
- Lunch
- Teacher Leadership, Coaching Principles and Practices
- Workshop Debrief
- Tour of the Deason Innovation Gymnasium in the Lyle School of Engineering

The primary purpose was to introduce the participants to *Teacher Noticing* through classroom observations. Other topics included: characteristics of teacher leadership, coaching principles and practices, and the characteristics of high quality instruction. The participants were informed that in order to meet the learning outcomes of the project, they would conduct a series of peer observations throughout the semester. A peer observation form was co-created with the participants during the workshop.

Teacher: _____

Task: _____

What is the mathematical goal?

How did the sequencing of student solutions during the whole class discussions move students towards the mathematical goal?

Things I can't wait to use in my class: _____

Things I wonder about: _____

Figure 1 Peer Observation Form

While practicing their observational skills by watching and critiquing two videos of middle school mathematics classroom instruction, the teachers were asked to complete a form which stressed the importance of identifying evidence during the observation (see *Figure 1*).

During the session on teacher leadership and coaching principles and practices, an SMU faculty member led an article study and roundtable discussion about classroom leadership with a focus on coaching as a teacher leader.

The workshop concluded with the participants working in conjunction with the SMU team to develop a schedule for subsequent professional development opportunities, and a visit to the Deason Innovation Gymnasium in the SMU Lyle School of Engineering.

The second workshop was a half-day meeting at the YWLA campus. Prior to this workshop, members of the SMU team conducted interviews with campus administrators. Based on the results of these interviews, the SMU research team determined the focus of the large group professional development workshops should be the productive use of professional learning communities (PLC). While the broader foci of the professional development program remained unchanged—developing teachers’ content knowledge, instructional design and delivery, and leadership and/or mentorship abilities—a shift to focusing on the PLCs would provide a venue that was directly relevant to teachers’ everyday experiences and support YWLA’s capacity to continue this work on their campus beyond the duration of the PD grant. Administrators reported that PLC time was one of their primary mechanisms for improving teachers’ practices but the teachers were not using the PLC time as productively as they hoped. For example, teachers were expected to bring their lesson plans and then collaboratively improve on them by offering feedback, however teachers often hesitated to provide anything other than superficial positive feedback. We decided that we needed to start with the purposes of a PLC to provide space for these developing teacher leaders to think about how they might lead their colleagues in effectively using PLC time. The first PLC-focused workshop was framed by three guiding questions:

1. What is a Professional Learning Community (PLC)?
2. In what ways are you a professional learning community?
3. How can we help you work to become more of a professional working community?

Through a guided discussion with members of the SMU team, project participants reflected on the core characteristics of PLCs (Kruse, Louis, & Bryk, 1995), and revisited their discussion of high-quality instruction through the Texas Essential Knowledge and Skills (TEA, 2012) and the NCTM Mathematics Teaching Practices (NCTM, 2014).

As a result of this workshop, the participants requested assistance in the development of a tool for analyzing the mathematics lessons developed by their colleagues. The framework would be organized around the 5E model because of their administrators’ expectations around the use of this model. The stages of the 5E model are:

- Engage – grab students’ interest in a phenomenon while eliciting access to their prior knowledge.
- Explore – students participate in an activity that facilitates conceptual change.
- Explain – students generate an explanation of the phenomenon.
- Elaborate – students’ understanding of the phenomenon is challenged and deepened through new experiences and possibly extended to other subject areas.

- Evaluate – students assess their understanding of the phenomenon.

We viewed the joint development of this tool as an opportunity for participating teachers to learn more about effective mathematics instruction, their schools' and districts' expectations for instruction, and to think about their roles as teacher leaders in the development of a mathematics PLC.

As part of the conversation about becoming a PLC and modeling constructive feedback with colleagues, the participating teachers expressed that they did not know each other well enough to comfortably model appropriate trust and vulnerability. As a result, the next workshop included a team-building activity as well as work on the development of the tool for critiquing colleagues' lessons. Because of the important role of the administration in the development of such a tool, we decided to invite the Dean of Instruction to attend the third workshop.

In the third workshop, a full-day meeting hosted on the SMU campus, the project participants began the day with a STEM integration lesson designed as a team-building activity, then collaborated with the SMU team to develop a stronger understanding of the 5E model, and develop a tool to analyze their lessons. The outcome of this session was a draft of a tool (see Figure 2) and a list of things that they would need to do at the start of the school year to lead the development of a math PLC.

The purpose of the instructional coaching from SMU was to provide differentiated instructional support. There was considerable variation in the engagement of project participants with the SMU instructional coaches. Several of the teachers were responsive to emails and had multiple visits from an instructional coach, while other teachers tended to be much less responsive and did not benefit from this form of professional development. Participating teachers were expected to specify their desired outcomes for the observations and feedback. Outcomes specified by the two teachers who participated in ongoing coaching included feedback on: inquiry-based learning, reaching every student, allowing sufficient wait time, transition time, higher-order questioning, differentiation, and challenging the high-level students. The coaching activities included observation and feedback, co-teaching, and co-planning a unit of instruction.

Conference Participation

The project participants also attended the 2016 SMU Research in Mathematics Education Research-to-Practice Conference. The theme of the conference was “Designing for STEM: Teaching Mathematics Outside the Box” and featured panel discussions led by education researchers, industry professionals, and school district leaders, as well as breakout sessions addressing teacher and student needs at the elementary, middle, and high school levels. Throughout the conference, project participants were provided with the opportunity to engage in structured discussions and activities designed to deepen their STEM content knowledge and improve instructional practices. In the plenary sessions, panel discussions involving individuals from education, industry, and the community were focused on the importance of STEM education, and how to plan and design STEM-focused schools. In the middle and high school level breakout sessions, participants were introduced to new ways of transforming mathematics activities into STEM activities, investigating makerspaces, identifying informal learning spaces for STEM education, and how to engage parents in STEM Education.

Conclusion

In this report, we described a partnership between SMU researchers and faculty members and teachers and administrators at YWLA to design and implement consistent and ongoing professional development. The goal of the professional development was to support teachers’ a) content knowledge, b) instructional design and delivery, and c) leadership and/or mentorship ability. Through this project, teachers had the opportunity to participate in a) graduate level coursework, b) three in-person workshops, c) personalized coaching sessions and d) participation in a local mathematics conference. There was considerable variation in participation in these activities. Outcome measures were not administered due to the variability in teachers’ participation.

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