# ELEMENTARY MATHEMATICS SPECIALISTS: PREPARATION AND ENGAGEMENT IN TEACHER LEADERSHIP

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*This 5-year mathematics professional development project involves 27 elementary teachers prepared and supported as Elementary Mathematics Specialists (EMSs) in high-need urban schools. They complete a university's K-5 Mathematics and Teacher Supporting & Coaching Endorsement programs and participate in Professional Learning Communities and individual mentoring. Described here are data collected at the end of Year 1, illuminating the ways in which they are engaging in teacher leadership, especially coaching. The EMSs are a distinctive population as informal teacher leaders, with a primary responsibility of teaching students. Central to the project is the university-school-community partnership, with findings illuminating reciprocity with mutual benefits, such as high quality clinical experiences for teacher candidates, coaching for novice teachers, and engagement with families and caregivers.*

Keywords: Professional Development, Instructional Leadership, Elementary School Education

## Purpose of the Study

The context of this study is a 5-year professional development project for 27 elementary teachers in high-need urban schools who are prepared and supported as Elementary Mathematics Specialists (EMSs). They are completing a university's K-5 Mathematics and Teacher Supporting & Coaching Endorsement programs and participating in Professional Learning Communities and individual mentoring. This study specifically examined the ways in which they engaged in teacher leadership during Year 1 of the project. This question guided the inquiry: How are the EMSs providing teacher leadership, including self-reported coaching practices?

## Theoretical Perspectives and Related Research

The specific roles and responsibilities of EMSs vary (Baker et al., 2021), dependent upon the contextual needs and plans of schools, school systems, and states (McGatha et al., 2015). EMSs can serve as classroom teachers, instructional interventionists, and informal or formal teacher leaders. Within these wide-ranging responsibilities, EMSs' work as a teacher leader often involves coaching other teachers. This coaching can occur in a variety of one-on-one and group contexts. Productive activities for mathematics coaches with groups include: engaging in the discipline (e.g., mathematics through worthwhile instructional tasks), examining student work, analyzing classroom video, and participating in lesson study, while those with individuals include co-teaching and modeling instruction (Gibbons & Cobb, 2017). Further, McGatha (2015, 2017) examined related studies and determined that coaches' ways of interacting with individual teachers could be considered on a continuum from more-directive (e.g., modeling lessons, providing resources) to less-directive (a process of collecting data from observed lessons, providing feedback, and engaging teachers in thought reflection), with the latter more powerful for prompting changes in teachers' instructional practices. There are a number of coaching

models evident in the extant literature, including content-focused coaching, instructional coaching, and cognitive coaching (Yopp et al., 2019). Cognitive coaching, which was emphasized in this project, is a particularly powerful approach that relies heavily on coaches' use of reflective questions to encourage teachers to refine their professional knowledge base through self-assessment and self-direction (Costa et al., 2016). All in all, context and need drive EMSs' highly varied ways of working, providing a warrant for studying their differing roles and responsibilities.

EMS preparation programs should focus on the in-depth and multidimensional development of content knowledge for teaching, pedagogical knowledge for teaching, and leadership knowledge and skills (AMTE, 2013). Programs should have a two-fold emphasis: fostering expertise as a teacher of mathematics and as a teacher leader who serves as a *more knowledgeable other*, supporting colleagues' instruction and other efforts within mathematics education such as curriculum development and community connections. When it comes to leadership knowledge and skills, specialized courses should prepare EMSs to "take on collegial, non-evaluative leadership roles within their schools and districts. They must have a broad view of the many aspects and resources needed to support and facilitate effective instruction and professional growth" (AMTE, 2013, p. 8). Several years of program development, implementation, and evaluation have revealed the salience of program experiences being embedded in practice, with strong connections and enactment within EMSs' classrooms, schools, and/or districts (Reys et al., 2017). When considering states offering pathways for advanced specialist certification, there are notable differences in EMS preparation programs related to duration, number of course hours, course emphases, field practicum experiences, and delivery (EMS and Teacher Leaders Project, 2022; Spangler & Ovrick, 2017). This variability is linked to differences in program goals and provides a warrant for study of EMS preparation programs. More inquiry needs to focus on the development of teacher leadership and how EMSs engage in this work, including coaching and associated practices (Yopp et al., 2019).

## Methodology

The design of this study includes a descriptive, holistic singular-case approach (Yin, 2014). The inquiry occurred during the COVID-19 health pandemic, which had changed the functioning of schools and classrooms, thus influencing the EMSs' efforts as teachers and teacher leaders. The researchers were mindful of this contextual element throughout the study.

This study's context is a mathematics professional development project focused on the development of 27 elementary teachers as EMSs in high-need urban schools. Multiple partners are involved, including a university, school district, and non-profit organization. Project goals include the development of EMSs who deliver ambitious mathematics instruction and serve as mathematics teacher leaders in a variety of ways, such as coaching university teacher candidates (henceforth called teacher candidates), providing professional development to their peer teachers, mentoring novice teachers at their school sites, supporting the non-profit's after-school tutoring program, and engaging in community connections that promote key relationships and shared responsibility for students' learning. The project also aims to promote equity and access in mathematics, support teacher retention in high-need schools, and situate teacher candidates in a hiring pipeline. Since the EMSs' primary responsibility is teaching students, their role as a mathematics teacher leader is an informal one. The project is 5 years in duration and at the time of this study, the participants had completed 1 year and were emergent teacher leaders.

The teachers were selected to participate in the project based on criteria that identified them as successful, experienced teachers of mathematics with interest in and aptitude for teacher

leadership. All are employed in a large, urban school district in the southeastern USA. They teach in 22 elementary schools, which collectively serve 91% students of color, with the largest populations being 44% Hispanic and 36% Black; 69% of students are eligible for the federally-funded free and reduced lunch program. The participants self-described as 24 females and 3 males, with 70% self-identifying as persons of color (41% Black, 7% Hispanic, 7% Asian, 7% Hispanic/White, 4% Hispanic/Black, 4% Black/White). They were a highly educated group, with 100% having a master's degree and 33% holding an educational specialist degree; further, they were experienced teachers, on average having 10.5 years of teaching experience (range of 5-22 years). Teaching positions varied widely and included: three kindergarten, one first grade, two second grade, five third grade, one fourth grade, seven fifth grade, four STEM/Math Specials, one English to Speakers of Other Languages, one Special Education, one Early Intervention Program, and one Accelerated Content. Of these participants, two taught in Dual Language Immersion settings, including Spanish (2nd grade) and French (5th grade). Within these differing grade levels and foci, all taught mathematics, including some for part of the day and some for all of the day. Notably, this group of participants represents the diversity of teachers from which students learn mathematics in elementary schools.

In this project, the participants are prepared and supported through completion of a university's K-5 Mathematics Endorsement (K-5 ME) and Teacher Support & Coaching Endorsement (TSCE) programs during the first 2 years, along with participation in Professional Learning Communities (PLCs) and individual mentoring for the entire 5 years. See Table 1 for these elements, along with the timeline. The endorsement programs include four elementary mathematics content courses integrating pedagogy, one course focusing on teacher leadership and coaching, and two internship courses, with one focusing on mathematics and the other coaching. Overall goals of both programs (AMTE, 2013, 2017) are development of: effective and equitable mathematics instructional practices (NCTM, 2014, 2020); deep and broad knowledge of elementary mathematics, including *specialized content knowledge* (Ball et al., 2008); productive mathematical beliefs and professional agency; and teacher leader capabilities, including coaching skills.

**Table 1: Timeline and Project Elements Aimed at Preparing and Supporting EMSs**

| Year 1 | | Year 2 | | | Years 3-5 |
|---|---|---|---|---|---|
| **Fall 2020** | **Spring 2021** | **Summer 2021** | **Fall 2021** | **Spring 2022** | |
| 1 TSCE course (Teacher Leadership & Coaching) | 1 K-5 ME course (Number & Operations) | 1 K-5 ME course (Data Analysis & Probability, 2-week summer institute) | 1 K-5 ME course (Algebra & Rational Number) and 1 TSCE course (the Internship) | 2 K-5 ME courses (Geometry & Measurement and the Internship) | |
| PLC and Mentoring | PLC and Mentoring | | PLC and Mentoring | PLC and Mentoring | PLC and Mentoring |

In addition to preparation for teacher leadership in the endorsement programs, support for the EMSs as they serve as teacher leaders is provided through a PLC and individual mentoring, both facilitated by the project's program director. PLCs and individual mentoring generally focus on: building a community of learners within each PLC, augmented support for developing effective and equitable mathematics instruction, and targeted support for what is called in this project

*teacher leader activities*. The three PLCs are clustered around grade levels/teaching focus, with each having nine EMSs, and meet monthly eight times across the school year.

To lead instructional change and support wide-ranging improvements, the EMSs engage in a number of teacher leader activities across the 5 years in their school, district, community, and other contexts, applying their teacher leader strategies and skills learned in the K-5 ME and TSCE programs and the PLC. Two primary teacher leader activities include coaching a teacher candidate each year and supporting the nonprofit's after-school tutoring program for at least 1 of the 5 years. Other teacher leader activities are selected based upon the needs of the school and in consultation with school leadership. The PLC serves as a context for collaborative selection, planning, and reporting on teacher leader activities, in addition to individual conferences with the program director. Toward the beginning of the school year, each EMS proposes 3-6 specific teacher leader activities in writing to the program director, describing in detail the activities anticipated content, duration, frequency, and outcomes. The program director consults with the project's leadership and collaboratively refines with each EMS a plan for specific teacher leader activities to accomplish across that school year. Check-ins related to progress across the school year are included in both PLC meetings and individual conferences. Each EMS provides documentation at the end of each year of this work in a Teacher Leader Record.

Data were collected at the end of Year 1 in two ways. All participants completed a Teacher Leader Record (TLR), documenting various aspects (i.e., content, duration, frequency, and outcome) of their teacher leader activities across the year. For this study, only the aspect of content is included as data. The content section includes a detailed description of the teacher leader activity and the rationale for implementation, including what exactly the activity was and why they chose to do that activity. Data were also collected from all participants via a survey of mathematics coaching practices (Coaching Practices Survey [CPS], Yopp et al., 2019). The CPS is designed to capture the extent to which a coach uses certain practices related to instructional coaching in mathematics that were drawn from coaching models in the extant literature (Yopp et al., 2019). The instrument contains 20 items and uses a 7-point Likert type scale, with a higher rating indicating more self-report of particular coaching practices (ranging from very descriptive of my coaching to not at all descriptive of my coaching). This collection of 20 items exhibits good internal consistency (Cronbach's alpha estimated at 0.81).

The research team includes four university professors and the project's program director, collectively holding expertise in a variety of methodologies, along with two doctoral students. The analysis of the TLR focused on the content of the teacher leader activities, which largely involved examination for frequency of activities and clustering into categories when possible. Data from the CPS were dichotomized for analysis in order to identify practices that are descriptive or not of participants' coaching. For an item, if the response was descriptive at all (rating of 7, 6, or 5) it was assigned a 1, and the other responses of not descriptive or equally not descriptive/descriptive (rating of 4, 3, 2, or 1) were assigned a 0.

## Results

The analysis of the TLR shows all participants provided teacher leadership in a number of ways, with each participant reporting 3-6 distinct teacher leader activities, dependent upon the scope and scale of each activity. Each participant coached a teacher candidate, serving as a classroom mentor teacher and/or university coach, with a total of 27 teacher candidates impacted.

The analysis of the TLR also shows that during Year 1 over one-third (n=10) of the EMSs supported the non-profit's after-school tutoring program. This support was driven by the needs of

the after-school tutoring program, based upon consultation with the program's leaders. The EMSs' initial efforts largely focused on collecting and organizing tools and resources to support remote learning, then broadened to include curriculum analyses with revisions. All of this work had an intentional focus on supporting mathematical content that students were concurrently learning in their classrooms. The curriculum analyses involved careful review of the existing guidelines and materials used in after-school tutoring sessions, starting in August and spanning the entire school year, and providing feedback on how to increase cognitive demand during instruction, implement tasks that are worthwhile and engaging for students, and utilize more manipulatives and tools to improve conceptual understanding. Further, the EMSs provided additional resources and supplements to that curriculum, with the continued aim of increasing rigor, conceptual understanding, and enjoyment of mathematics.

Additional teacher leadership is evident from the analysis of the TLR. Eleven of the participants reported leading professional development of some kind for fellow teachers at their schools that focused on mathematics education (e.g., PLC, grade level planning sessions, district-wide and school-wide workshops). Ten formally mentored new teachers at their schools, in addition to coaching a teacher candidate. Other teacher leader activities focused on outreach to parents and families. Twelve EMSs facilitated a Math or STEM Community Event for families and students in their respective schools. Twelve led workshops or created resources for parents focused on mathematics as a direct response to remote learning struggles or language barriers (e.g., instructional videos, bilingual resources). While the fore-mentioned categories were the most frequently reported, the EMSs engaged in a number of other mathematics-focused activities. Examples include co-presenting at national conferences, serving on leadership teams within the school district, creating original content for use with teachers and students, facilitating after-school boot camps or tutoring for students, and writing grants to procure resources.

Based on these findings from the TLR the participants were engaged in coaching in a number of ways, and a descriptive analysis of data from the CPS provides insights into their mathematics coaching practices. Since these participants were informal teacher leaders and serving as EMSs in a variety of ways, with their coaching focusing on both teacher candidates and colleagues, these descriptive data show variability and provide contrast with those who serve in a mathematics coach role of primarily working with fellow teachers. The analysis shows that three participants rated 18 of the 20 items as descriptive of their coaching practices and at the other extreme, four participants rated five or fewer of the 20 items as descriptive. Twenty of the 27 participants rated 10 or more items as descriptive of their coaching practices, with seven participants rating fewer than 10 items. The distribution of the dichotomized data is near normal with a negative skew.

An item analysis comparing the identification ratings indicated that 56% of the items are descriptive of mathematics coaching practices. Interestingly, the four lowest-rated items, which were rated by 26%, 26%, 30%, and 33% of participants as descriptive of practices, all focus on collaboration and communication with the principal or other school administrators about mathematics coaching (e.g., discussing the school's vision for mathematics instruction, progress being made toward that vision, and teachers' needs; collaborating to ensure a clear message about effective mathematics instruction). This seems to indicate that the principal or administration at these school sites is not actively involved in the coaching practices of the participants. Since the participants are informal teacher leaders, with a focus in part on coaching teaching candidates, it is not surprising that there is variability in how much they work with school leaders in their coaching responsibilities. In contrast, Table 2 shows the seven highest-

rated items, which 70% or more of the participants indicted as descriptive of their coaching practices.

**Table 2: Most Prevalent Coaching Practices on the CPS (≥70%)**

| |
|---|
| 3. I coach teachers on needs that I observe in the teacher, even when the teacher is unaware of these needs |
| 5. I always make sure that coaching conversations with mathematics teachers are grounded in the mathematics content |
| 9. I try to provide the teachers I coach with an understanding of how the mathematics they teach supports learning beyond the grade level they teach |
| 11. I encourage the teachers I coach to reflect on similarities and differences among mathematics topics in the curriculum |
| 12. I help teachers plan their lessons |
| 16. I reflect on state assessment data to identify curriculum areas that need to be strengthened |
| 19. I encourage teachers to set personal improvement goals for mathematics |

## Discussion

Given the notable variability of EMS preparation programs across the USA (EMS and Teacher Leader Project, 2022), there has been a call for "developing a knowledge base for the preparation of EMSs", including how "elements of an EMS program are necessary for productive outcomes" (Reyes et al., 2017, p. 231). Teacher leadership, including coaching and associated practices, have not been widely studied (Yopp et al., 2019). Further, EMSs ways of working are highly varied, driven by need and context, which provides a warrant for study of their roles and responsibilities. Accordingly, this inquiry focused on how EMSs in a preparation program are engaging in teacher leadership, especially coaching. The participants' primary responsibility is teaching students, thus they are a distinctive population as *informal* teacher leaders. Further, they were largely teachers of color, working in urban schools that served students historically marginalized in mathematics. Notably, these EMSs were selected for this project based upon a rigorous process and are subsequently participating in a rigorous preparation program, which contrasts with the too often practice of those who are simply the most effective mathematics teacher being selected to serve as a teacher leader or coach.

Our project provides an example of a preparation program guided by standards and research, with this study's findings illuminating the important outcome of teacher leadership. The findings of the CPS show mathematics coaching practices that they were and were not using, providing considerations for how they can better communicate and collaborate in their coaching with school administration. The findings of the TLR provide insights into their teacher leader efforts. Each EMS coached a teacher candidate, serving as a classroom mentor teacher and/or university coach. A total of 27 teacher candidates were impacted, strengthening the university-school partnership, contributing to high quality clinical experiences for teacher candidates, and building teacher capacity for coaching and mentoring others at the school sites. The project provides a pipeline of teacher candidates to be hired at the high-need, urban schools, addressing a teacher shortage in school district. For these teacher candidates, program data show 70% are from underrepresented groups in the teaching profession, contributing to the much needed diversity of the teacher workforce as recent data show 78% of public school teachers in the USA are White (National Center for Education Statistics, 2021).

In addition, their teacher leader endeavors supported community connections and intentional interactions with parents and caregivers, which are important for fostering these key

relationships and shared responsibility for students' learning in mathematics. Notably, their work focused on curriculum development in the after-school tutoring program aims to improve mathematical learning experiences for students. Since some of these students are in the EMSs' classrooms, the EMSs should receive direct benefits from this work via their students. Additionally, their teacher leader efforts focused on coaching and facilitating professional development, positioning them as a *more knowledgeable other* for a community of practice within a school, aiming to influence teachers and the school's mathematics program as a whole (Campbell & Malkus, 2014). All in all, their teacher leader efforts across the 5 years of the project and beyond aim to have a wide-ranging effect on mathematics teaching and learning at their school sites. Further, their support for a novice teacher at their schools should foster teacher retention during the novice teachers' induction period in the profession. A body of research shows that individual mentoring of those in the first 3 years of teaching is critical for retention in the profession (Desimone et al., 2014; Ingersoll et al., 2012; Ingersoll & Smith, 2004; Stanulis & Floden, 2009).

It is hoped that the *proximal* goals of improving EMSs' mathematics instruction with them in turn supporting others (e.g., fellow teachers) in doing the same, should influence the *distal* goal of enhanced student learning and understandings in mathematics. This project intentionally supports students who have been historically marginalized and under-served in mathematics education. These students are largely from traditionally underrepresented groups, and selection criteria for the project ensured the EMSs are a diverse group, with 70% identifying as persons of color. This is significant as increasing research shows students of color benefit from having teachers of color (Carver-Thomas, 2018). Further, during the K-5 ME program the EMSs are immersed in mathematics teaching and learning that supports equity, diversity, and inclusion and provides explicit and intentional opportunities for all children to learn rigorous mathematics (Aguirre et al., 2013; Bartell et al., 2017; NCTM, 2020, 2021; National Council of Supervisors of Mathematics [NCSM] and TODOS, 2016). They learn about enacting lessons that leverage children's mathematical, cultural, and linguistic strengths, while nurturing positive student identity in mathematics. For example, not only should instructional tasks have high levels of cognitive demand, they should hold cultural relevance whenever possible and draw on students' home, cultural, and language experiences (NCTM, 2014, 2020). Emphasized are culturally responsive and sustaining pedagogies, instruction for multilingual learners, and mathematics serving as a lens for understanding and critiquing the world (Harper, 2019; NCSM and TODOS, 2016; Rubel, 2017). Equity and access within mathematics education are through-threads of this project, supporting students who have been historically under-served.

This project also aims to support teacher retention of the EMSs, an aspect that is addressed in the high-quality preparation and support as well as the community of teacher leaders being cultivated. Notably, the extant literature shows that teachers who engage in teacher leadership have feelings of an upward professional trajectory, thus increasing their own satisfaction and retention in the teaching profession (Tricario et al., 2015). With this project occurring in the context of the COVID-19 health pandemic, the sudden, unanticipated shift to emergency remote teaching followed by concurrent instruction of face-to-face and virtual learners have generated tremendous challenges and angst for K-12 teachers. Those were and continue to be trying times for teachers, testing their resilience, fortitude, and persistence in the profession. Throughout, the EMSs have found community and comradery with one another. The project is providing a space for supportive and open, safe conversations as they grapple with the tremendous demands placed upon them as educators, which has been illuminated through both anecdotal data and initial

interview findings. Their passion for and commitment to mathematics education are apparent, which brings us hope that our goal of retaining EMSs in the school district will be successful.

Given the numerous and various ways the EMSs are serving as teacher leaders, the results show they are making a difference for a number of stakeholders, including fellow teachers, novice teachers, teacher candidates, students, school administrators, parents and families, and community partners. When considering these various stakeholders, critical to this project is the strong partnership between the university, school district, and non-profit organization. Notably, robust school-university-community partnerships support *simultaneous renewal* (Goodlad, 1994) of all partners. This renewal is a process of partners concurrently changing, growing, and improving, with a focus on innovative, high leverage, research-based pedagogical practices (American Association of Colleges for Teacher Education [AACTE], 2018). Central to these partnerships is *reciprocity*, where there are mutual benefits for all involved (National Association for Professional Development Schools [NAPDS], 2021). Figure 1 displays some of the fore-described mutual benefits, with supporting students and their mathematical capacity for success at the center.

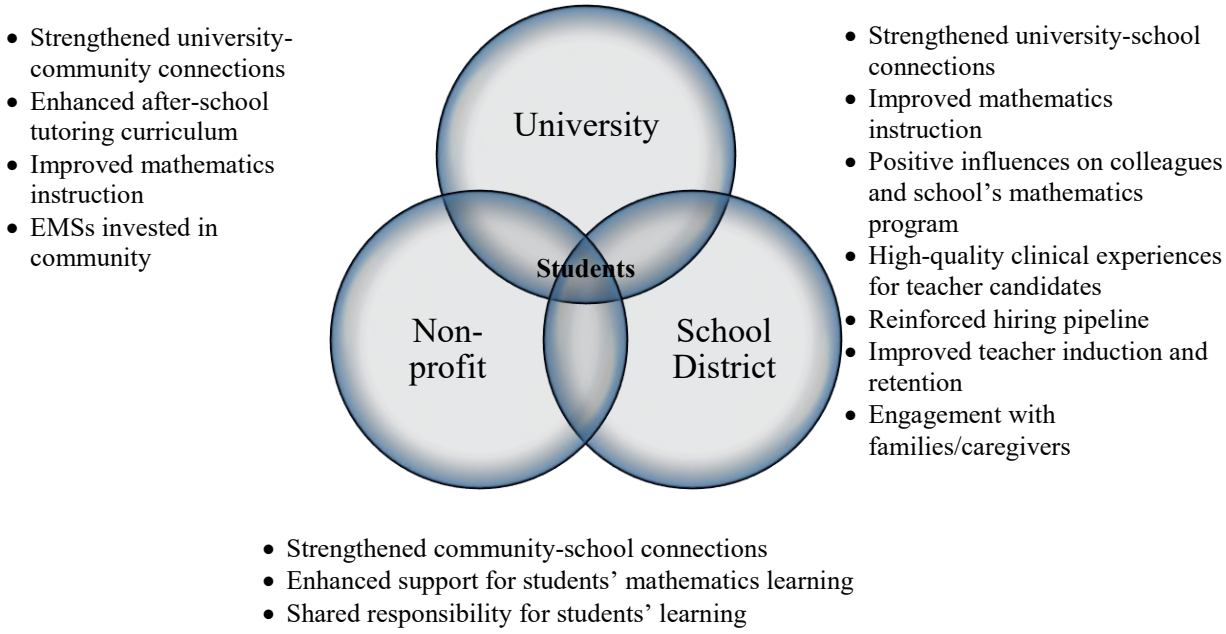


**Figure 1: Project Partners and Mutual Benefits**

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## References

Aguirre, J. M., Mayfield-Ingram, K., & Martin, D. B. (2013). *The impact of identity in K-8 mathematics: Rethinking equity-based practices*. National Council of Teachers of Mathematics.

American Association of Colleges for Teacher Education. (2018). *A pivot toward clinical practice, its lexicon, and*

*the renewal of educator preparation.* Retrieved from https://aacte.org/resources/research-reports-and-briefs/clinical-practice-commission-report/

Association of Mathematics Teacher Educators. (2013). *Standards for Elementary Mathematics Specialists: A reference for teacher credentialing and degree programs.* Author.

Association of Mathematics Teacher Educators. (2017). *Standards for preparing teachers of mathematics.* Available online at amte.net/standards.

Baker, C. K., Saclarides, E. S., Harbour, K. E., Hjalmarson, M. A., Livers, S. D., & Edwards, K. C. (2021). Trends in mathematics specialists literature: Analyzing research spanning four decades. *School Science and Mathematics.* Advance online publication.

Ball, D. L., Thames, M. H., & Phelps, G. (2008). Content knowledge for teaching: What makes it special? *Journal of Teacher Education, 59,* 389-407.

Bartell, T. G., Wager, A. A., Edwards, A. R., Battey, D., Foote, M. Q., & Spencer, J. A. (2017). Toward a framework for research linking equitable teaching with the Standards for Mathematical Practice. *Journal for Research in Mathematics Education, 48*, 7-21.

Campbell, P., & Malkus, H. (2014). The mathematical knowledge and beliefs of elementary mathematics specialist-coaches. *ZDM Mathematics Education, 46,* 213-225.

Carver-Thomas, D. (2018). *Diversifying the teaching profession: How to recruit and retain teachers of color.* Learning Policy Institute.

Costa, A. L., & Garmston, R. J. with Hayes, C. & Ellison, J. (2016). *Cognitive coaching: Developing self-directed leaders and learners* (3rd ed.). Rowman & Littlefield Publishers.

Desimone, L. M., Hochberg, E. D., Porter, A. C., Polikoff, M. S., Schwartz, R., & Johnson, L., J. (2014). Formal and informal mentoring: Complementary, compensatory, or consistent? *Journal of Teacher Education, 65*(2), 88-110.

Elementary Mathematics Specialist & Teacher Leaders Project. (2022). Retrieved from http://www.mathspecialists.org/state-certifications.html

Gibbons, L. K., & Cobb, P. (2017). Focusing on teacher learning opportunities to identify potentially productive coaching activities. *Journal of Teacher Education, 68*(4), 411-425.

Goodlad, J. I. (1994). *Educational renewal: Better teachers, better schools.* Jossey-Bass.

Harper, F. K. (2019). A qualitative metasynthesis of teaching mathematics for social justice in action: Pitfalls and promises of practice. *Journal for Research in Mathematics Education*, *50*(3), 268-310.

Ingersoll, R., Merrill, L., & May, H. (2012). Retaining teachers: How preparation matters. *Educational Leadership*, *69*(8), 30-34.

Ingersoll, R., & Smith, T. M. (2004). Do teacher induction and mentoring matter? *NASSP Bulletin, 88(*638), 28–40.

McGatha, M. B. (2017). Elementary mathematics specialists: Ensuring the intersection of research and practice. In Galindo, E., & Newton, J., (Eds.). *Proceedings of the 39th annual meeting of the North American Chapter Group for the Psychology of Mathematics Education.* Hoosier Associations of Mathematics Teacher Educators.

McGatha, M. B., Davis, R., & Stokes, A. (2015). The impacts of mathematics coaching on teachers and students. In M. Fish (Ed.), *NCTM research briefs.* NCTM.

National Association for Professional Development Schools. (2021). *What it means to be a Professional Development School: The nine essentials* (2nd ed.) [Policy statement]. Author.

National Center for Education Statistics. (2021). *Characteristics of public school teachers.* Retrieved from https://nces.ed.gov/programs/coe/pdf/2021/clr_508c.pdf

National Council of Supervisors of Mathematics and TODOS. (2016). *Mathematics education through the lens of social justice: Acknowledgment, actions, and accountability.* Retrieved from https://www.todos-math.org/assets/docs2016/2016Enews/3.pospaper16_wtodos_8pp.pdf

National Council of Supervisors of Mathematics and TODOS. (2021). *Positioning multilingual learners for success in mathematics.* Retrieved from https://www.todos-math.org/assets/images/NCSM-TODOS%20Multilingual%20Learners%20Position%20Paper%202021.pdf

National Council of Teachers of Mathematics. (2014). *Principles to actions: Ensuring mathematics success for all.* Author.

National Council of Teachers of Mathematics. (2020). *Catalyzing change in early childhood and elementary mathematics: Initializing critical conversations.* Author.

National Council of Teachers of Mathematics. (2021). *Continuing the journey: Mathematics learning 2021 and beyond*. Retrieved from https://www.nctm.org/uploadedFiles/Research_and_Advocacy/collections/Continuing_the_Journey/NCTM_NCSM_Continuing_the_Journey_Report-Fnl2.pdf

Reys, B., Webel, C., & de Araujo, Z. (2017). Elementary mathematics specialist preparation: What's next? What's needed? In M. McGatha & N. Riegelman (Eds.), *Elementary Mathematics Specialists* (pp. 221-234). Association of Mathematics Teacher Educators.

Rubel, L. H. (2017). Equity-directed instructional practices: Beyond the dominant perspective. *Journal of Urban Mathematics Education*, *10*(2), 66-105.

Stanulis, R. N., & Floden, R. E. (2009). Intensive mentoring as a way to help beginning teachers develop balanced instruction. *Journal of Teacher Education, 60*(2), 112-122.

Spangler, D. A., & Orvick, R. L. B. (2017). Models for mathematics specialist program development and delivery. In M. McGatha & N. Riegelman (Eds.), *Elementary mathematics specialists* (pp. 41-52). Association of Mathematics Teacher Educators.

Tricarico, K. M., Jacobs, J., & Yendol-Hoppey, D. (2015). Reflection on their first five years of teaching: Understanding staying and impact power. *Teachers and Teaching, 21*(3), 237-259.

Yin, R. K. (2014). *Case study research: Design and methods, 5th edition.* Sage.

Yopp, D.A., Burroughs, E.A., Sutton, J.T., & Greenwood, M.C. (2019). Variations in coaching knowledge and practice that explain elementary and middle school mathematics teacher change. *Journal of Mathematics Teacher Education, 22*, 5–3