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Exploring the Role of the Mathematics Education University Supervisor

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ACCEPTANCE

This dissertation, EXPLORING THE ROLE OF THE MATHEMATICS EDUCATION UNIVERSITY SUPERVISOR, by KRISTIE ALTHEA FOUNTAIN, was prepared under the direction of the candidate's Dissertation Advisory Committee. It is accepted by the committee members in partial fulfillment of the requirements for the degree, Doctor of Philosophy, in the College of Education & Human Development, Georgia State University.

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EXPLORING THE ROLE OF THE MATHEMATICS EDUCATION UNIVERSITY SUPERVISOR

by

KRISTIE ALTHEA FOUNTAIN

Under the Direction of Dr. Nickolaus Ortiz

ABSTRACT

Teacher preparation in secondary mathematics in an educational degree-seeking program at an accredited college or university is a complex endeavor. The program requires preservice teachers to complete coursework requirements, noncoursework requirements, and a clinical experience. The clinical experience is a core component of the teacher preparation program wherein university supervisors mentor and support preservice teachers in an authentic classroom setting. Although the work of university supervisors plays a vital part in preparing preservice teachers for secondary mathematics teaching and learning, there has been limited research to explain the university supervisor's role when mentoring secondary mathematics preservice teachers. For this investigation, the phenomenon of interest was the role of the university supervisor. This study aimed to investigate the lived experiences of university supervisors as

they support secondary mathematics preservice teachers during the clinical year. The following questions guided this phenomenological qualitative research study: (a) What are the lived experiences of a university supervisor while supporting preservice teachers of secondary mathematics during the clinical year? (b) What mentoring strategies do university supervisors use to support the development of well-prepared beginning mathematics teachers? Heidegger's phenomenological theories served as a framework for the study, and data collection occurred through in-depth interviews with each research participant. A hermeneutic phenomenological approach was appropriate to interpret interview responses. The study's findings show effective university supervisors (a) have previous K–12 classroom teaching experiences that significantly influence their approach to mentoring, (b) build relationships with preservice teachers throughout the clinical experience, (c) are life-long learners with the capacity to embrace mentoring strategies connected to the culture and context in which the preservice teachers are emersed, and (d) demonstrate characteristics of the implementation component of Knight's coaching model in the context of teaching in urban schools.

INDEX WORDS: Phenomenology, secondary mathematics teacher preparation, university supervisors, university supervision, clinical year

EXPLORING THE ROLE OF THE MATHEMATICS EDUCATION UNIVERSITY SUPERVISOR

by

KRISTIE ALTHEA FOUNTAIN

A Dissertation

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DEDICATION

This work in dedicated in loving memory of my father, Mr. David Fountain and my sister, Ms. Karen D. Fountain. Although you departed this earthly life, your spirit will forever live in my heart. I love you dearly.

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"Dreams without goals are just dreams, and they ultimately fuel disappointment. On the road to achieving your dreams, you must apply discipline, but most importantly, consistency. Because without commitment, you'll never start, but without consistency, you'll never finish."

—Denzel Washington

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1 THE PROBLEM

Secondary mathematics teacher preparation in an educational degree-seeking program at an accredited college or university is complex. Degree programs for preservice mathematics include courses in mathematics content and education, social foundations, educational psychology, and teaching and learning. Preservice teachers complete their degree program with a year- or semester-long clinical experience, depending on the program of study. Preservice teachers practice teaching in secondary schools and classrooms to experience authentic mathematics teaching and learning during the clinical experience, also known as practicum, field experience, or student teaching. Student teachers complete the clinical experience with the support of a university supervisor and a mentor teacher in the classroom, sometimes called the cooperating teacher. The cooperating teacher is the teacher of record who provides a host classroom for the student teacher during the clinical experience. In some cases, preservice teachers with provisional teacher certification may be the teacher of record in the classroom. In either case, the preservice teacher works with an assigned university supervisor who provides mentoring and support during the clinical year. The university supervisor is the university or college designee who engages with the preservice teacher to promote growth as a professional educator.

The university supervisor plays a significant role in mentoring preservice teachers as they develop essential skills and behaviors for teaching and learning secondary mathematics. The purpose of this study was to investigate university supervisors' lived experiences supporting secondary mathematics preservice teachers during the clinical year. This was a phenomenological investigation of university supervisors' roles and responsibilities in mentoring and supporting preservice teachers seeking teaching certification in secondary mathematics.

Background on the Role of the University Supervisor

Teacher programs have designated university supervisors who mentor preservice teachers during the clinical experience. University supervisors assume multiple responsibilities when assisting preservice teachers in completing the clinical experience and should have significant and successful teaching and learning experience (Association of Mathematics Teacher Educators [AMTE], 2020). In addition, university supervisors must have the pedagogical skills and practices to aid preservice teachers in meeting the learning needs of 21st-century students. As liaisons between the secondary mathematics classroom and higher education institution, university supervisors should understand the context of K–12 schools to assist student teachers with learning the roles of parents, administrators, and other stakeholders in the learning community (AMTE, 2020). The AMTE Standards for the Preparation of Mathematics Teachers indicates that university supervisors should help develop well-prepared beginning mathematics teachers. The standards provide a national vision for mathematics teacher preparation, which includes using meaningful tasks, making connections between procedural and conceptual understandings, and developing new mathematical knowledge (Kartal & Tillett, 2021).

In their role as mentors, university supervisors share the responsibility of aiding and developing preservice teachers in pedagogically and professionally developing (Cuenca, 2010). University supervisors assist preservice teachers with pedagogical development by conducting preobservation conferences, observations, and postobservation conferences. In classroom observations, the university supervisor may engage with the cooperating teacher to support the preservice teacher's progress. During preobservation conferencing, university supervisors encourage preservice teachers to reflect on their teaching and learning practices. Postobservation conferences often occur as triads with the university supervisor, cooperating teacher, and

preservice teachers (Lloyd et al., 2020). In the postobservation conferences, university supervisors review artifacts such as lesson plans and assessments and provide feedback on the teacher candidate's progress, including positive, supportive commentary to promote professional growth (Sağ, 2008). The purpose of university supervisor feedback is to encourage preservice teachers to reflect on their instructional practices and adjust as needed. Reflexive feedback and positive interactions between the university supervisor and preservice teacher should produce mutual respect and trust, increasing the likelihood of preservice teachers using theories and practices from university coursework (Asplin & Marks, 2013). Preservice teachers who have positive relationships with their supervisors may view their supervisors as knowledgeable and be more receptive to advice and feedback.

Conversations with preservice teachers and cooperating teachers and reflections are helpful practices for university supervisors facilitating learning during the clinical experience (Blanton et al., 2001). The university supervisor should discuss student teachers' and cooperating teachers' beliefs regarding schools, teaching practices, learning communities, and professional development to challenge their predispositions (Ritter et al., 2011). University supervisors could engage in these conversations to implement transformative practices and support and improve student teachers' instructional behaviors and teaching and learning routines. University supervisors also interpret college and university policies and philosophies; encourage participation with professional organizations; assist with forming teaching and learning philosophies and setting goals; help preservice teachers identify personal strengths and weaknesses; recognize changes in the curriculum; teach child development and psychological principles; and evaluate professional behaviors, teaching performance, and teacher intern portfolios (Sivakumaran et al., 2011)

University supervisors share the responsibility of growing and developing preservice teachers; however, different interpretations of their work could result in inconsistent mentoring and support for preservice teachers. Therefore, there is a need to refine and develop preservice teacher supervision during the clinical year for consistent secondary mathematics teacher preparation. Researchers have conducted limited studies on how university supervisors describe their role in preparing secondary mathematics preservice teachers during their clinical experience, and minimal literature includes university supervisors' experiences and perspectives regarding mathematics teacher preparation research. University supervisors' views of support and mentorship could contribute to extant knowledge due to their integral role in mathematics teacher preparation. There is a need for more research on university supervisors' responsibilities in mentoring secondary mathematics preservice teachers. University supervisors' voices and perspectives could indicate the best practices for colleges and universities to mentor and support preservice teachers during the clinical year.

Purpose and Research Questions

For this investigation, the phenomenon of interest was the university supervisor role. The purpose of this qualitative study was to explore four university supervisors' lived experiences supporting novice mathematics educators during the clinical year. The following research questions guided this study:

RQ1: What are the lived experiences of a university supervisor while supporting preservice teachers of secondary mathematics during the clinical year?

RQ2: What mentoring strategies do university supervisors use to support the development of well-prepared beginning mathematics teachers?

This study included the AMTE'S standards for well-prepared beginning mathematics teachers (see Appendix A). Chapter 2 contains a discussion of the AMTE indicators in the study's context.

Preparing novice educators to teach in K–12 classrooms requires a significant understanding of content knowledge, theories, and practices to make teaching and learning meaningful for all learners. There are various guidelines and mandates for promoting high-quality, equitable education for all students (U.S. Department of Education [USDOE], 2019). However, education policies often shift. Varying policies and procedures can significantly impact how university supervisors mentor and train new mathematics educators to teach adolescents. This study contributed to the literature on the best practices for mentoring and supporting new teachers. The findings could show how to encourage consistent practices for university supervision to enhance the teacher preparation process for novice educators, mentors, faculty, and partner schools.

Theoretical Frameworks

In qualitative research, the theoretical framework provides a point of focus and organization. The theoretical framework is a way to increase objectivity and consider the key contributors' thoughts while connecting the research to prior scholarly work (Peoples, 2021). The qualitative phenomenological method was an appropriate approach to frame the university supervisors' descriptions of their lived experiences supporting preservice secondary mathematics teachers during the clinical year. Among the qualitative approaches, the phenomenological design focuses on lived experiences of the phenomenon of interest from different perspectives.

Social sciences researchers may use phenomenological methods with other philosophies when applicable. This study on university supervisors' lived experiences required understanding

their roles and responsibilities as college or university designees during the clinical experience. The core responsibility of the university supervisor is supporting preservice teachers during the clinical experience. University supervisors frequently observe preservice teachers during mathematics instruction and provide feedback on their progress to aid their pedagogical development. Knight (2007) identified instructional coaching and its implementation as including the following responsibilities: modeling effective teaching strategies, conducting classroom observations, providing feedback, and offering support. The implementation of instructional coaching closely aligns with the university supervisor's role. Therefore, Knight's coaching theory and phenomenology served as the framework for this exploration of university supervisors' lived experiences supporting secondary mathematics instructors during the clinical year.

Phenomenology

Phenomenology is a philosophical approach to studying consciousness and the essence of direct experiences (Peoples, 2021). Phenomenological studies focus on the lived events of phenomena "as [they are] structured through consciousness" (Henriksson & Friesen, 2012, p. 1). The purpose of phenomenological research is to understand the phenomenon in question (Peoples, 2021). Phenomenological researchers explore phenomena from different perspectives using two models to situate their work: Husserl's transcendental philosophy and Heidegger's interpretative theory (Peoples, 2021). Scholars have developed different views based on Husserl and Heidegger, whose philosophies are the foundation of other philosophies. In this research, Heidegger's phenomenological perspective was the lens used to frame the research of university supervisors' lived experiences of mentoring preservice secondary mathematics educators during the clinical year.

Heidegger's Interpretative Theory

Heidegger developed the interpretative (hermeneutic) phenomenology theory. Interpretative (hermeneutic) phenomenology involves analyzing the meaning of lived experiences (Henriksson & Friesen, 2012) and finding interpretations immersed in life experiences and practices (Lopez & Willis, 2004). Heidegger challenged assumptions of meaningful thinking and posited that people cannot eliminate their biases when analyzing experiences because their judgments exist in the world (Peoples, 2021). Thus, attempting to eliminate bias does not enable the researcher to understand the phenomenon under investigation. As investigators study an experience, they should revise their judgments and biases.

Heidegger also developed the terms *dasein*, *fore-sight*, and *fore-conceptions*. Dasein is the state of being present or "being there" (Peoples, 2021, p. 34) in the circumstances of one's existence. Heidegger used fore-sight and fore-conception interchangeably to refer to the investigator's predetermined perspectives about an occurrence. In addition, Heidegger suggested using hermeneutics circles to understand a given experience (Dibley, 2022; Peoples, 2021). With hermeneutics circles, researchers explore events as a whole, seek to make sense of them as parts, and reexamine the whole to develop a new understanding of phenomena. Heidegger used hermeneutics circles to make sense of interpretations (Peoples, 2021), considering interpretation a process requiring constant revision. Phenomenological scholars often use multiple lenses. In interpretative (hermeneutic) phenomenological research, "The meanings that the researcher arrives at in interpretive research are a blend of the meanings articulated by both participant and researcher in the focus of the study" (Lopez & Willis, 2004, p. 730).

Educational scholars have used interpretative (hermeneutic) phenomenology in qualitative research to combine the analysis of lived experiences with their meanings

(Henriksson & Friesen, 2012). Educational researchers use the interpretative (hermeneutic) phenomenology method to focus on the participants' descriptions of being and "how these meanings influence" (Lopez & Willis, 2004, p. 729) their decisions. Interpretative (hermeneutic) phenomenology suggests that "expert knowledge on the part of the researcher are valuable guides to inquiry" (p. 729); therefore, scholars should "make the inquiry a meaningful undertaking" (p. 729). Phenomenological investigators seek to make meaning in the confounds of the lived experiences in the inquiry process. In this study, I investigated university supervisors' lived experiences using the interpretive (hermeneutic) phenomenological design, a suitable approach because it is "all about understanding the lived experiences of others" (Farrell, 2020, p. 1). In alignment with Heidegger, I applied the hermeneutic approach because I "already know something about the phenomenon at hand" (Farrell, 2020, p. 3). I am a secondary mathematics educator with strong roots in the discipline. Therefore, the hermeneutic approach provided the opportunity to explore and modify my understanding of university supervisors' lived experiences during the clinical year by exploring the phenomenon from different lenses.

Knight's Theory of Coaching

Knight's (2007) theory of coaching provides a detailed description of instructional coaching in the academic setting. Through instructional coaching, teachers receive the guidance and support to "incorporate research-based instructional practices" (p. 12) and reflect on their progress with pedagogical development. In the coaching process, the partnership philosophy focuses on how individuals work together. Tenets from Knight's instructional coaching and the partnership philosophy aligned with exploring how university supervisors interact with preservice teachers during the clinical experience. The following subsections present an explanation of instructional coaching and the partnership philosophy.

What Is Coaching? Coaching is the process of leading and guiding individuals to master a skill or technique. This study focused on instructional coaching. Knight (2007) described instructional coaches as professionals working full-time in school settings to support teachers' professional development. Instructional coaches have strong communication skills and assist teachers with incorporating and implementing research-based strategies in their instructional practices. Instructional coaches "empathize, listen, and build trust and relationship" (Knight, 2007, p. 13) and regularly collaborate with teachers to determine the best instructional practices for students' academic needs.

The work of instructional coaches may vary depending on the instructional setting, but there are common elements. According to Knight (2007), the customary components include overcoming fears, identifying starting points, developing emotional connections, promoting implementation, and partnering with a school administrator. In instructional coaching, overcoming fears involves resolving the notions that teachers do not wish to collaborate or engage with the coach. Instructional coaches could overcome this fear by communicating, listening to, and respecting the teachers they support in small groups or one-on-one meetings. Identifying a starting point includes remaining focused and intentional with support practices and addressing immediate concerns; instructional coaches could begin by concentrating on "behaviors, content knowledge, direct instructions, and formative assessments" (Knight, 2007, p. 22). Developing emotional connections entails establishing partnership approaches and communication skills. Knight supported using a "partnership mindset" (p. 24), which the next section addresses. Promoting implementation includes the assumption "that knowledge is learned efficiently when it is learned on the job" (p. 27). Instructional coaches effectively promote implementation by "collaborating, modeling, observing, providing feedback and support" (p. 27)

to teachers (see Appendix B). Instructional coaches could magnify their impact by partnering with school administrators. Instructional coaches have the most impact when the coach and school principal share a vision (Knight, 2007).

The Partnership Philosophy. The partnership philosophy (see Appendix C) is a "theoretical framework for instructional coaching" based on the concepts of "equality, choice, voice, dialogue, reflection, praxis, and reciprocity" (Knight, 2007, p. 37). Equality in instructional coaching presents teachers and instructional coaches as "equal partners" (Knight, 2007, p. 40). In collaboration, teachers and their voices, thoughts, ideas, and opinions are as important as coaches. Choice indicates that teachers should have a say in what they learn; otherwise, they are treated as unprofessional. Voice suggests that professional learning should include teachers' voices. As teachers learn, they need opportunities to "communicate openly" (p. 53) and articulate their thinking. Dialogue means teachers should have options to engage in "authentic dialogue" (p. 46) because meaningful conversations support thinking in a community of learners. Reflection indicates that teachers may accept or reject ideas as they see fit, and current learning impacts what the teachers have done before and what they will do in the future. Praxis suggests that teachers apply what they have learned to their instructional practices and behaviors as learning occurs. Learning has the most impact when teachers "reflect and recreate" (p. 54) knowledge to use personally and professionally. Reciprocity means that the teacher and instructional coach should benefit from learning. Teachers and instructional coaches have equally important knowledge and expertise (Knight, 2007).

Alignments to Hermeneutics Phenomenology and Knight's Theory of Coaching

Knight's (2007) coaching theory and interpretative (hermeneutic) phenomenology have tenets compatible with research on university supervisors' lived experiences during the clinical

year. Interpretative (hermeneutic) phenomenologists study lived experiences while recognizing that "ontology and phenomenology are inseparable" (Tan et al., 2009, p. 4). When using hermeneutic phenomenology, scholars should recognize their preexisting knowledge of a phenomenon and make their biases explicit (Peoples, 2021). As scholars study lived experiences, they should determine why they understand those experiences in a certain way. Interpretations of an event may change as scholars explore events through different lenses. Many university supervisors consider instructional coaching part of their duties and responsibilities. Therefore, Knight's coaching theory aligned with university supervisors' articulations of coaching and mentoring teacher candidates.

I also considered Knight's (2007) theory when identifying my biases and perceptions of how university supervisors interact with student teachers. I had thoughts about how university supervisors interact with preservice teachers, but investigating how the supervisors support secondary mathematics teacher candidates during the clinical year provided additional understanding. Few studies have included the voices and perspectives of university supervisors who mentor educators seeking secondary mathematics certification. This study contributed to the knowledge of university supervisors with Knight's coaching theory and hermeneutic phenomenology. I used both philosophical ideas to explore how the participants adjusted their mentoring strategies to accommodate student teachers' pedagogical needs during the clinical year for effective and efficient teacher preparation.

Rationale and Significance of the Study

The purpose of this study was to understand university supervisors' role in secondary mathematics teachers' clinical experience. The goal was to explore university supervisors' perspectives and experiences supporting and mentoring mathematics teacher candidates during

the clinical year. Abundant research has focused on mathematics teacher preparation, but there is a dearth of research on university supervisors' role in secondary mathematics teacher preparation. Some studies have addressed the characteristics of well-prepared mathematics educators and the mathematics teacher preparation process; other scholars have approached the university supervisor's role by focusing on university supervisors and preservice teachers with university supervisor mentors. However, little research has focused on how university teachers mentor and support university supervisors and their roles and responsibilities during the clinical year of mathematics teacher preparation. Some studies on instructional coaching provide useful information for university supervisors; however, there is little rich information on the university supervisor role. This study contributed to the scholarly knowledge and understanding of the university supervisor role and its importance for secondary mathematics teacher preparation.

This study contributed to the knowledge of the university supervisor role during secondary mathematics teacher preparation. Higher education leaders and faculty could use this study's findings to learn the best practices for mentorship during the student teaching experience. The findings could also show university supervisors the significance of their roles, responsibilities, and mentorship in supporting preservice teachers during the clinical experience. School district leaders and personnel could use this study to better understand the university supervisor role for the preservice teachers embedded in classrooms.

University supervisors often have partnerships and collaborate with cooperating teachers to support preservice teachers. This study could contribute to cooperating teachers' knowledge of university supervisors' work in local schools. The findings may provide local school districts, education agencies, instructional coaches, and cooperating teachers with an understanding of the partnerships with postsecondary institutions for effective and efficient collaboration between

school districts and universities. This study could have implications for further research in professional mathematics organizations and the mathematics education community to improve mathematics teacher education. This study contributed to the knowledge of how university supervision impacts teacher preparation for secondary mathematics.

Summary

University supervisors who support secondary mathematics preservice teachers should stay abreast of trends in mathematics education preparation, as there may be a need to adjust mathematical teaching and learning education programs to support novice educators. Education program providers should consider university supervisors' perspectives on the best practices and strategies for new teacher development because they are crucial to teacher preparation. Additionally, university supervisors' lived experiences may show how program educators nurture, mentor, and support novice teachers during their practicum experience. Interpretative (hermeneutic) phenomenological research involves analyzing lived experiences with their meanings. I used the interpretative phenomenological method with Knight's coaching theory to explore university supervisors' lived experiences of mentoring and coaching secondary mathematics preservice teachers. This study's findings could show how to support new mathematics educators during the clinical year to enhance teacher preparation, development, and mathematics teaching and learning.

2 REVIEW OF THE LITERATURE

A qualitative literature review presents the research related to the topic under study. The research in this review falls into three categories: (a) the university supervisor role, (b) the influential mentor role for novice mathematics educators during the clinical experience, and (c) the guiding frameworks for university supervisors' work regarding what teacher candidates should know and learn. This chapter addresses the limitations and gaps in the literature to show how this study provided an understanding of university supervisors' lived experiences mentoring and supporting new secondary mathematics educators.

Defining the Role of the University Supervisor

In teacher preparation, educational program providers designate university supervisors to observe and support preservice educators during the student teaching experience. A university supervisor assumes multiple responsibilities in supporting new educators. The extant research has addressed university supervisors' roles and responsibilities in the teacher preparation process. Some literature has presented university supervisors' and student teachers' perspectives of the university supervisor role.

The Role of the University Supervisor: From Their Perspective

Researchers from the early 21st century broadly classified the university supervisor role. Cuenca (2010) suggested that university supervisors share the responsibility of growing and developing new educators, and field supervisors aid new teachers with pedagogical and professional growth. The university supervisor assists with pedagogical development by conducting preobservation, observation, and postobservation conferences. Cuenca indicated that university supervisors use nominal, prescriptive, or reflexive supervisory practices. Nominal supervision involves monitoring teacher candidates for compliance and accountability;

prescriptive supervision focuses on linear teacher training and behaviors for consistency and uniformity with teaching and learning practices; and reflexive supervision involves the field supervisor asking the intern teacher in-depth questions to encourage reflection, critical consideration, and a different viewpoint of their work (Cuenca, 2010). Steadman and Brown (2011) expanded the university supervisor role by studying the lived experiences of 14 university supervisors in a teacher education program. The authors explored how university supervisors defined and described their role in the teacher preparation process. The participants viewed their work as essential to the student teaching process. In addition, the participants saw the university supervisor as the liaison between the college or university and the K–12 classroom (Steadman & Brown, 2011).

Other studies have suggested that university supervisors are a significant part of the teacher preparation process. Sivakumaran et al. (2011) examined the clinical preparation of new teachers at three institutions and found that university supervisors were responsible for the following:

- Interpret the policies and philosophies of the college or university.
- Assist with scheduling classroom observations.
- Encourage participation in professional organizations.
- Assist with forming teaching and learning philosophies and setting goals.
- Help intern teachers with identifying personal strengths and weaknesses.
- Aid in recognizing changes in the curriculum, child development, and psychological principles.
- Evaluate professional behaviors, teaching performance, and teacher intern portfolios.

University supervisors should examine their beliefs about schools, teaching practices, learning communities, and professional development to challenge predispositions while encouraging student teachers to reflect on their conceptions of teaching and learning practices (Ritter et al., 2011).

Some studies have addressed the role of the university supervisor in the triad of the student teacher, mentor, and supervisor. Lloyd et al. (2020) found that university supervisors considered themselves responsible for conducting formal and informal classroom observations, reviewing artifacts such as lesson plans and assessments, and providing feedback as needed based on the teacher candidates' progress. The university supervisors also participated in "periodic triad conversations" (Lloyd et al., 2020, p. 503) to aid intern teachers in implementing effective instructional practices. The literature includes detailed descriptions of how university supervisors view their responsibilities when supporting intern educators. Other studies have provided insight into the university supervisor role from student teachers' perspectives.

The Role of the University Supervisor: From Student Teachers' Perspectives

Some research has included student teachers' perspectives of university supervisors' roles and responsibilities. Since the early 21st century, scholars have examined intern teachers' expectations of their university supervisors during the clinical year. Talvitie et al. (2000) noted that student teachers expected the university supervisor to support their overall professional growth in education. The student teachers deferred to their university supervisor for advice when facing challenges during the practicum experience. Blanton et al. (2001) found that student teachers valued input from the supervisors who facilitated their learning during the practicum experience. As facilitators, the university supervisors adapted their support based on "the student teacher's developing practice" (p. 201). The university supervisors used open-ended questions to

engage intern educators in dialogue to promote reflection and ownership of solutions to improve teaching and learning practices. Caires and Almeida (2007) discovered that student teachers valued positive interactions (e.g., regular involvement and proximity with student interns) with university supervisors during the practicum experience. Student teachers considered positive interpersonal skills essential for university supervisors due to the time required for the practicum experience. Albasheer et al. (2008) found that student teachers benefited when university supervisors did the following: (a) modeled and trained student teachers to prepare thorough lesson plans, (b) combined theoretical perspectives into instructional practices, (c) provided immediate feedback and adequate directions to improve performance, and (d) discussed student teacher progress collectively and individually. According to Sağ (2008), student teachers expect university supervisors to mediate between the education program provider and the K–12 school. Intern teachers also wanted their university supervisors to introduce them to school administrators and leadership teams and familiarize them with the practices of their assigned K–12 school. The student teachers also expected university supervisors to (a) introduce multiple effective teaching practices; (b) conduct regular seminars to discuss their progress; (c) inform them of their progress weekly; and (d) evaluate their work and provide feedback on their progress, including positive, supportive commentary to promote professional growth (Sağ, 2008).

Some scholars have addressed student teachers' expectations of their relationships with university supervisors. Caires et al. (2012) found that student teachers benefitted when university supervisors supported them with the "ecological transition" (p. 173) of the practicum experience. This transition included (a) providing student teachers with emotional, logical, and technical support; (b) sharing the progress of their pedagogical, procedural, and conceptual skills; and (c)

creating opportunities for student teachers to explore and reflect on their perspectives, beliefs, and development of teaching practices. Asplin and Marks (2013) suggested that a positive relationship between the student teacher and supervisor increases the intern teachers' likelihood of using theories and practices learned from university coursework. Student teachers with positive relationships with their supervisors are likelier to view the supervisor as knowledgeable and be more receptive to advice and feedback from the university designee. In their research, Mau and Harkness (2020) emphasized the value of a positive relationship between the university supervisor and student teacher, finding that student teachers appreciated critical dialogue with their assigned university supervisor. Through dialogical conversions, the university supervisors aided novice teachers with transformative practices and vital reflection to improve their teaching practices and routines.

The Perspective of Preservice Field Supervision

Some research has addressed the aspects of field supervision in the teacher preparation process. For example, scholars have addressed the qualifications needed to serve as university supervisors and effective mentors and the issues supervisors face during the clinical year. Researchers have also addressed university supervisors' views on the future of the field supervision process. The AMTE (2020) presented the guidance and qualifications university supervisors should have to support new educators during the student teaching experience—most importantly, the university supervisor should have significant and successful experience with teaching mathematics. University supervisors may effectively prepare new mathematics educators with an extensive understanding of mathematics content and pedagogical practices. As mentors, field supervisors should understand and use the best mentoring practices to support teachers during the clinical experience. According to the AMTE, university supervisors should

also understand the K–12 context to assist student teachers with learning the roles of parents, administrators, and other stakeholders in the learning community.

Other scholars have contributed their perspectives on effective university supervisors. Cuenca (2010) posited that effective supervisors strive to understand the teacher candidate as a learner. University supervisors should possess a vast knowledge of "responsive pedagogy" (p. 265) and remain caring and compassionate for "thoughtful and tactful supervisory actions" (p. 265). Elfer (2012) suggested that qualified university supervisors have a working knowledge of the K–12 classroom and understand that the work of the supervisor and mentor teacher has similar characteristics. Candidate university supervisors could benefit from developing their knowledge about the education program provider's themes, beliefs, and teaching and learning practices. Waites and Waites (2012) suggested that candidates for the university supervisor role should be active listeners who acknowledge student teachers' concerns and validate their interest in the teacher candidates' success and well-being.

University supervisors handle various responsibilities during the student teaching experience. Scholars have addressed issues with supervision that could occur during the clinical year. In their research on supervision pedagogy for potential mathematics teachers, Blanton et al. (2001) presented the history of field supervision and indicated that university supervisors have a less interactive and more evaluative role during the clinical year. Blanton et al. suggested that supervisors assess teaching behaviors and patterns instead of interacting with student teachers for an extended time to challenge their pedagogical practices. University supervisors may also display authoritative mannerisms when interacting with student teachers and provide minimal professional support to promote their mentees' development (Blanton et al., 2001).

Studies from the 21st century addressed the supervision challenges during the clinical year. Elfer (2012) found that many university supervisors never receive formal training to prepare them for mentoring responsibilities. Therefore, supervisors deferred their personal experiences and knowledge learned as former classroom teachers. The lack of preparedness could cause supervisors to lack awareness of situational conflicts during the student teaching experience. Cuenca (2012) suggested that university supervisors often do not consistently engage student teachers in meaningful dialogue. Dialogue with mentees where the supervisor uses "sumative, intrapersonal, and phenomenological" (p. 29) questions enables teacher candidates to reflect on their pedagogical beliefs and practices. Schmeichel (2012) focused on the work of university supervisors during the student teaching experience and challenged the position of power, indicating that many university supervisors assert their power because they can. Power in field supervision may impede the ability to promote professional relationships "in ethical and productive ways" (p. 35). Dinkelman (2012) posited that university supervisors might struggle with the observation-reporting aspect of their role, especially when providing accounts of their interactions with student teachers. Also, Dinkelman noted that many university supervisors describe student teacher practices using positive, minimal, or reformist observation reports. Therefore, university supervisors may need support in critically describing their interactions with student teachers to effectively and sustainably impact teacher candidates' teaching practices (Dinkelman, 2012). Barahona (2019) focused on the complexity of university supervisors' work, finding that conflicting demands in responsibilities and complex tasks caused the supervisors to feel overwhelmed and burdened. There may be a need to refine and develop teacher candidate supervision during the clinical year.

The Role of Effective Mentors During the Clinical Year in the Development of Well-Prepared Beginning Mathematics Teachers

A positive relationship between the university supervisor and the student teacher is critical for a successful practicum experience. The ultimate goal of the university supervisor is to prepare teacher interns to become effective and efficient K–12 educators. According to the AMTE (2020), well-prepared beginning mathematics instructors should have in-depth mathematics content knowledge for the grades and age groups they teach. Well-prepared novice teachers should have a positive disposition toward teaching and learning mathematics and equitable and efficient strategies to meet all learners' needs. The AMTE noted that well-prepared beginning mathematics educators are cognizant of "learners' social, cultural, and linguistic resources… [and] how power relationships affect students' mathematical identities, access, and advancement in mathematics" (p. 7). AMTE's four standards indicate what new teachers should know and do as classroom practitioners (see Appendix A). The standards have corresponding indicators regarding well-prepared new mathematics teachers' knowledge, actions, and dispositions.

Like the AMTE, the National Council of Teachers of Mathematics (NCTM) presented what well-prepared teachers should know and do with eight mathematics teaching practices (see Appendix D). In addition to the eight practices, the NCTM provided a framework for preparing secondary educators for mathematics teaching and learning (see Appendix E). The AMTE and NCTM standards and practices have resulted in some questions regarding the university supervisor role in supporting teacher candidates. How do university supervisors incorporate AMTE standards and NCTM principles in their interactions with teacher candidates during the practicum experience? What are university supervisors' perspectives regarding these standards

and practices in preparing teacher interns to teach secondary mathematics? Which standards and practices do university supervisors believe are most impactful when mentoring novice mathematics educators? There is a need to answer these questions by exploring university supervisors' perspectives on these frameworks and their role in teacher preparation.

Operationalize Success in Teaching Mathematics According to Danielson's Framework and the InTASC standards

In addition to the AMTE and NCTM standards and practices, other frameworks have addressed operational success with instruction. This section presents Danielson's framework and the Interstate Teacher Assessment and Support Consortium (InTASC) standards and their best practices for teaching and learning. Danielson's framework is a comprehensive approach to practical teaching components and learning (Danielson Group, 2021). With a philosophical approach and a focus on a common language of education, Danielson's framework has four domains of efficient practices: (a) planning and preparation, (b) classroom environment, (c) instruction, and (d) professional responsibilities. Song (2006) showed that teachers performed with proficiency with Danielson's framework, indicating that the framework enables teachers to become more proficient with "intellectual and ethical development" (p. 175). Alvarez and Anderson-Ketchmark (2011) described Danielson's framework as the "go-to set of teaching standards" (p. 61). Although the research has shown the effectiveness of Danielson's framework for teacher preparation, interpretations of its domains vary. Roegman et al. (2016) argued that stakeholders, including university supervisors, tend to understand the framework's components differently. Different interpretations may significantly impact how university supervisors evaluate student teachers during the practicum experience.

As an outgrowth of their framework for teaching, the Danielson Group (2021) provided six clusters of effective mathematics practices: (a) clarity of instructional purpose and accuracy of content; (b) safe, respectful, supportive, and challenging learning environment; (c) classroom management; (d) student intellectual engagement; (e) successful learning by all students; and (f) professionalism. These clusters provide educators with pedagogical practices to maximize mathematics teaching while attending to students' various learning needs (Danielson Group, 2021).

The purpose of the InTASC standards is to raise the instructional level in the U.S. educational system and support novice teachers with professional development (Henson, 2009). InTASC has 10 instructional proficiency standards that indicate educators should "possess and use essential knowledge" (Henson, 2009, p. 34). The 10 InTASC standards are (a) learner development, (b) learner differences, (c) learning environments, (d) content knowledge, (e) application of content, (f) assessment, (g) planning for instruction, (h) instructional strategies, (i) professional learning and ethical practice, and (j) leadership and collaboration. These standards are the expectations for teachers' performance and disposition for high-quality instruction (Kuo, 2018). While researching InTASC critical dispositions, Lang et al. (2018) considered the InTASC standards "a useful construct definition" (p. 74) that could be holistically measured. In a study of teacher candidates' disposition development, Seay (2021) found the InTASC standards significantly impacted how college supervisors and cooperating teachers provided feedback to preservice educators when using disposition assessment tools. In addition, assessment tools aligned with InTASC standards enabled consistent feedback from university supervisors and mentor teachers, contributing to the "connection between college preparation and real-world expectations" (Seay, 2021, p. 52).

Danielson's framework for teaching and the InTASC standards are popular models for defining practical instruction, critical disposition, and performance for impactful student learning. University supervisors could use Danielson's framework and InTASC standards to guide their work during the practicum experience. Supervisors who use the InTASC standards and Danielson's framework as guides for mentoring for preservice teachers, mentor teachers, and university supervisors discuss "how to use the standards in the real-world classroom practice" (Kuo, 2018, p. 53). University supervisors may use InTASC and Danielson's framework to assist student teachers in setting goals and monitoring progress based on each frame's success indicators (Hicks & Bose, 2019). Supervisors may also use the rating aspects to "yield reliable scores…[and make] valid inferences" (Kettler & Reddy, 2019, p. 69) regarding preservice teachers' performance.

Limitations

The research includes preservice teachers' perspectives on university supervisors' roles and responsibilities. Recent studies have also presented the principles, standards, and frameworks supervisors use during the clinical year to support, evaluate, and mentor new educators during the student teaching experience. However, the literature on university supervisors has limitations. Few studies have included university supervisors' perspectives on supporting preservice educators seeking initial certification for secondary mathematics. Also, limited research has indicated how university supervisors for secondary mathematics have adjusted their mentoring practices due to the unforeseen COVID-19 pandemic.

This study focused on the experiences and perspectives not included in previous studies. The purpose of this study was to explore university supervisors' lived experiences of mentoring and supporting preservice secondary mathematics educators during student teaching to address

the limitations in prior studies. This study provided a rich, detailed description of the university supervisor role during the practicum experience and contributed to the literature on the best practices for supporting and mentoring new mathematics educators during the clinical year.

3 METHODOLOGY

Qualitative research occurs with data collection approaches, techniques, and theoretical assumptions (Bogdan & Biklen, 2016). In phenomenological inquiries, researchers carry out "a series of methods and procedures that satisfy the requirements in an organized, disciplined, and systematic study" (Moustakas, 1994, p. 103). The qualitative phenomenological design was a suitable approach for addressing this study's topic. Two research questions guided the study:

RQ1: What are the lived experiences of a university supervisor while supporting preservice teachers of secondary mathematics during the clinical year?

RQ2: What mentoring strategies do university supervisors use to support the development of well-prepared beginning mathematics teachers?

I developed the research questions from "an intense interest in a particular [issue]" (Moustakas, 1994, p. 104). The phenomenological design is an approach to investigating, examining, and analyzing qualitative data of lived experiences of a given event. Therefore, I used a phenomenological approach to explore university supervisors' experiences mentoring and supporting novice secondary mathematics instructors during the clinical year. The study contributed to the knowledge of university supervisors' role and the significance of their work during the clinical year.

Phenomenology as a Research Method

Of the various qualitative research designs, the purpose of phenomenology is "to generate the lived experiences of a certain population" (Peoples, 2021, p. 47). Scholars conducting phenomenological research use a systematic process to "move the study into action" (Moustakas, 1994, p. 104) with rigor and care. Moustakas (1994) outlined the seven steps of implementing phenomenological methods in a study. Step 1 is to discover "a topic and question rooted in

autobiographical meanings and values, as well as involving social meanings and significance" (p. 103). Step 2 is "a comprehensive review of the professional and research literature" (p. 103). For these two steps, I selected a topic of interest connected to my life story and experience with secondary mathematics education to contribute to the knowledge of mathematics teacher preparation, and I conducted a literature review (see Chapter 2).

Step 3 entails constructing "a set of criteria to locate appropriate co-researchers" (Moustakas, 1994, p. 103). Step 4 is providing "co-researchers with instructions on the nature and purpose of the investigation" (p. 103). The inclusion criteria in this study required the participants to (a) be university supervisors for secondary mathematics preservice teachers, (b) have experience or working knowledge of secondary schools, (c) have experience with a funded project at the postsecondary level, and (d) voluntarily participate in in-depth interviews to provide data on the phenomenon of interest. Upon receiving consent from the research participants, I informed them of the research topic, purpose, and scope. As the primary researcher, my goal was "developing an agreement that includes obtaining informed consent, ensuring confidentiality, and delineating the responsibilities of the primary researcher and research participant, consistent with ethical principles of research" (Moustakas, 1994, p. 103).

Steps 5 and 6 involve developing "a set of questions or topics to guide the interview process" (Moustakas, 1994, p. 103) and conducting and recording "a lengthy person-to-person interview that focuses on a bracketed topic and question and a follow-up interview may be needed" (p. 104). I interviewed four university supervisors who supported secondary mathematics preservice teachers at a public state institution during the clinical year. I used the participants' descriptions and responses to understand how they supported preservice teachers during the clinical year.

Step 7 is the process of investigating, organizing, and analyzing "the data to facilitate the development of individual textural and structural descriptions, a composite textural description, a composite structural description, and a synthesis of textural and structural meanings and essences" (Moustakas, 1994, p. 104). I analyzed the interview responses to identify themes and develop narratives of how the participants explained their work as university supervisors. I used Moustakas' seven-step process for conducting qualitative phenomenological research.

Research Preparation Using Phenomenological Methods

This phenomenological study focused on the lived experience of a given phenomenon "as it is structured through consciousness" (Henriksson & Friesen, 2012, p. 1). Thus, the study was a means of better understanding the essence of the participants' lived experiences. Phenomenological researchers identify topics and questions with "social meaning and a personal significance" (Moustakas, 1994, p. 104). Investigators should articulate the purpose of their studies by clarifying, discussing, and defining key terms in the research question. The research question should emerge from an intense interest in the phenomenon, and the researcher should express the question in "clear, concrete terms" (p. 104). As researchers develop reasonable inquiry questions, they justify their studies and acknowledge their connection and personal history with the experiences under investigation. Afterward, the researcher begins identifying participants for the study.

Participant Selection

To answer the research questions, I interviewed four university supervisors who supported secondary mathematics preservice teachers at a public state institution during the clinical year. Phenomenological research does not require "in-advance criteria" (Moustakas, 1994, p. 107) for participants' location and selection. However, I recruited university supervisors

with a funded National Science Foundation (NSF; 2017) project known as the Robert Noyce Teacher Scholarship Program for the science, technology, engineering, and mathematics (STEM) teacher workforce in high-needs schools. Because an inclusion criterion was participation in the Robert Noyce project, the following subsection provides a background on the NSF guidelines for the Robert Noyce Program in which the participants worked. This description provided context for the study and contributed to my bracketing.

Robert Noyce Teacher Scholarship Program

The purpose of the NSF Robert Noyce Program is to invite and fund, on a competitive basis, creative and innovative proposals from higher education institutions to recruit and prepare highly effective elementary and secondary STEM teachers for high-needs schools. The program's goal is to serve students by attracting individuals with strong mathematics and science backgrounds to teach in high-needs secondary schools. Per the NSF, high-need schools are local educational agencies that provide services to an elementary or secondary school in an area with a high percentage of individuals from families with below-poverty income, a high percentage of secondary school teachers not teaching in their trained content area, or high teacher turnover.

Higher education institutions receive Robert Noyce Projects to provide programmatic support to STEM professionals. These professionals, referred to as NSF teaching fellows (TFs), receive 1 year of support while enrolled in a master's degree program for teacher certification or licensing to teach a STEM discipline in elementary or secondary schools. In addition, TFs may receive up to 4 years of salary supplements to support their growth as educators. As preservice teachers in the NSF Robert Noyce Program, TFs receive support and mentorship from university supervisors, mentor teachers, teacher preparation program faculty, school-based mentors, and local school district leaders. In this project, the scope of support provided in the teacher

preparation program aligned with the university's mission to teach, research, and serve individuals in urban settings from various cultural, racial, and linguistic backgrounds. Higher education institution leaders collaborate with individuals in neighborhoods, schools, and businesses to advance knowledge and practice through innovation, equity, and creativity. This study focused on university supervisors' roles and experiences in an NSF Noyce project during the clinical year while mentoring STEM professionals entering the teaching profession in high-needs secondary mathematics classrooms.

Specifics of the Funded Noyce Project

The Noyce project in which the participants served as university supervisors had two goals: (a) to recruit and prepare STEM professionals willing to commit to and remain highly-effective teachers in high-needs secondary schools and (b) to engage STEM professionals in robust and innovative professional learning experiences for their development as teacher leaders. The university housed the Noyce project and two partnering school districts. The project has two cohorts of TFs with plans to graduate, place into teaching, and develop as teacher leaders. The TFs hold bachelor's degrees in mathematics, biology, chemistry, physics, computer science, environmental science, or engineering, and each TF cohort spends 5 years on the project. In Year 1, TFs complete the Master of Arts in Teaching (MAT) program and clinical experience. In Years 2 and 3, also known as the induction years, the TFs receive support for continuous growth in becoming exemplary teachers. TFs develop as teacher leaders and enter leadership positions in Years 4 and 5.

University Supervisors' Role in Noyce

In the Noyce project, university supervisors mentor TFs during the year-long clinical experience while they complete the MAT. The university supervisors engage in all the project's

aspects, including ongoing signature experiences. The signature experience is a bridge for TFs from coursework to clinical experiences that indicates the importance of cultural diversity in the TFs' professional development. MAT courses include the assumption that all learners bring various linguistic and cognitive strengths from their families and communities into the classroom. Educators should appreciate and use these strengths rather than ignore, dismiss, or devalue them. Thus, the university supervisors mentor and support TFs in the Noyce program with the expected outcome that Grades 6–12 students in the partnering districts will begin to see themselves as potential scientists, mathematicians, and engineers through robust recruitment of racially, culturally, and linguistically diverse STEM professionals.

The university supervisors in this study worked with TFs seeking initial teacher certification in a master's degree program to become mathematics or science teachers in the partnering school districts. Each university supervisor with the Robert Noyce project supported TFs in the first cohort, second cohort, or both. The mentoring occurred during the TFs' first year in the project as they completed the master's degree and clinical experience. As part of the program admission requirements, the TFs held undergraduate degrees in STEM-related fields and desired to switch from their previous occupations to secondary education teaching careers. Upon acceptance into the Noyce project, the preservice teachers enter the MAT program with a concentration in mathematics or science for secondary education at the partnering higher education institution. In the first year of the Noyce project, the TFs engage in experiences across coursework and clinical experiences that indicate the importance of cultural diversity in teachers' professional development.

Bracketing My Position as the Researcher

I bracketed my role as the researcher by acknowledging my experience with teacher preparation and secondary mathematics education. After working in corporate America for 2 years, I felt unfulfilled with my career choice and the lack of using my bachelor's degree. I started my career in secondary education as a substitute teacher in a local public school system. I would receive a call to work at any school in one district during a teacher's absence, an opportunity that enabled me to substitute teach various content areas at many elementary and secondary schools. During my first 2 months in the role, I accepted assignments at any school in the district when a teacher reported an absence of a day or more. One day, I received an assignment in a secondary mathematics classroom at a local high school. After completing this assignment, I realized I enjoyed teaching mathematics and wanted to pursue a career as a secondary mathematics teacher. I continued to substitute teach at this high school and only accepted teaching assignments in the mathematics department. After serving as a substitute teacher for 1 year, I decided to pursue my clear and renewable teaching certificate in secondary mathematics. I applied to and entered a state-approved education program, ready to begin my career in mathematics education.

I earned my master's degree and teaching credentials through an alternative certification program for secondary mathematics at a public higher education institution. Compared to traditional programs, the alternative teacher certification program enabled preservice teachers to complete their graduate-level coursework and student teaching requirements in 1 year. Although preservice teachers had up to 5 years to complete graduate coursework in their program of study, I finished all the required components in 1 year with the support of College of Education professors to accomplish this goal. During the classroom experience in graduate school, I learned

about theories of teaching and learning mathematics and various strategies to put them into practice. When I began the clinical experience, my assigned university supervisor worked with me to put the theories into practice in the classroom and supported my professional development as a novice educator. After listening to my university supervisor's advice and completing the practicum experience, I felt well-prepared to enter the classroom as a secondary mathematics educator.

Upon earning my master's degree and completing the initial teacher certification process, I taught secondary mathematics for 8 years, using the strategies I learned during my clinical experience. In addition, I reflected on my university supervisor's feedback to continue growing professionally. After teaching secondary mathematics for 8 years, I transitioned to professional development to mentor and support novice secondary mathematics teachers.

I have served as a secondary mathematics educator for over 18 years. As a classroom teacher, I effectively implemented instructional practices, fostering my students' content mastery. I attribute my success in the classroom to the pedagogical approaches I learned and the instructional support I received during my clinical experience. My experience as an educator gave me the opportunity to mentor novice teachers and assist them in becoming successful mathematics instructors. As I advise new mathematics educators, I see how the support they receive directly impacts their implementation of effective instructional practices in the classroom.

I learned about the Robert Noyce project while bracketing myself as the researcher, and as I learned more, I saw the similarities between its goals and missions and my journey as a mathematics educator. I considered my understanding of university supervisors' role in the Robert Noyce project while bracketing my experiences to prevent my biases from affecting the

data collection. As the researcher, I aimed to describe and interpret the participants' lived experiences as university supervisors supporting preservice secondary mathematics teachers during the clinical year.

Instruments

Phenomenological researchers typically collect data via lengthy, in-depth interviews regarding the phenomenon in question (Moustakas, 1994; Roulston, 2010). Therefore, I conducted three 1-hour, in-depth interviews with each participant. In the first set of interviews, I focused on the participants' autobiographical information, including their background, knowledge as teachers, and journeys to becoming university supervisors. The second set of interviews addressed the participants' role as university supervisors and how they supported preservice teachers during the clinical year. The third set of interviews were follow-up discussions for member checking, in which I extrapolated responses from the interview data and asked each participant for clarification as needed. The participants' lived experiences led me to reflect on my biases as the researcher and develop a new understanding of mentoring practices for secondary mathematics preservice teachers.

Methods

The research process commenced with interviews with four participants who served as clinical supervisors for secondary mathematics intern teachers at a local public university. Multiple in-depth interviews with each participant occurred with open-ended questions to "understand the participants' feelings, perceptions and understanding" (Roulston, 2010, p. 16) of how they mentored, prepared, and supported preservice educators during the clinical year. I used interpretative (hermeneutic) phenomenology to combine the analysis of lived experiences with their meanings (see Henriksson & Friesen, 2012). The interpretative (hermeneutic)

phenomenological design suggests that "expert knowledge on the part of the researcher are valuable guides to inquiry …[that] make the inquiry a meaningful undertaking" (Lopez & Willis, 2004, p. 729). According to the interpretative (hermeneutic) phenomenological approach, "The meanings that the researcher arrives at in interpretive research are a blend of the meanings articulated by both participant and researcher in the focus of the study" (p. 730). Interpretative (hermeneutic) phenomenological research enabled me to become a student of the participants. During the data collection and analysis, I used a hermeneutic circle to understand and interpret the research participants' lived experiences as university supervisors, redevelop my knowledge of the university supervisor's role during the clinical year, and learn innovative ways to support preservice teachers during the clinical experience.

Ethical Considerations

Phenomenological research should occur with "the ethical principles on research with human participants" (Moustakas, 1994, p. 109). Researchers should remain aware of their potential influence on the participants and the possibility they may struggle to remain objective during data collection and analysis (Hycner, 1985). Researchers should also recognize that the participants could provide inaccurate accounts of the phenomena in question, significantly impacting data validity. Therefore, researchers should learn how to appropriately collect and analyze phenomenological data with conscious awareness and sensitivity to their subjective experiences while researching the participants' lived experiences (Eberle, 2014).

Qualitative studies should occur with ethical standards for researching human participants. Each participant in this research received information about the study and provided informed consent before the interview. All the participants received pseudonyms for confidentiality and anonymity. I transcribed all the interview responses to ensure the accuracy of

the accounts of the participants' lived experiences. Therefore, this study aligned with Moustakas' ethical principles for phenomenological research.

4 THE LIVED EXPERIENCES OF UNIVERSITY SUPERVISORS

Descriptions of the Research Participants

This chapter presents the stories of four participants who served as university supervisors to preservice teachers during the clinical year. The inclusion of the participants' words presents their lived experiences as university supervisors. All participants discussed their backgrounds as educators, successes and challenges as new teachers, teaching careers, experiences as university supervisors, and roles in the Noyce project. Table 1 presents each participant's years of experience in teaching and higher education.

Table 1

The Description of the Research Participants

Participant	Years of teaching experience	Higher education experience
Angela	30	Adjunct Professor College Supervisor University Supervisor
Arlene	22	University Supervisor
Nina	36	University Supervisor
Tamara	22	Teaching Assistant University Supervisor

Angela

Becoming an Educator: Angela's Lived Experiences

Angela was from a small town where the community members regularly interacted and knew each other. Growing up, Angela frequently interacted with family members who were educators in the local school district and shared stories of how much they enjoyed their careers. Angela described how her family impacted her trajectory as an educator, saying, "I had several people in my family who were educators who were role models for me and set really good examples and were great teachers. And so, I considered [teaching] a career option."

Angela began the interview by describing her experience as an educator. She proudly reported serving in mathematics education for over 30 years. Angela said, “I’ve taught middle grades mathematics. Primarily seventh and eighth grades when I was teaching, and I taught one year of fifth grade. I taught all subjects, all in public schools.”

Angela described when she decided to become a teacher and her experiences as a math major as an undergraduate student. During her undergraduate experience, Angela felt undecided about a degree. However, the superintendent of a local school district significantly impacted her decision to pursue a career in education:

> The superintendent came and spoke to our senior class. And he was really the person that inspired me to become a teacher. He was out of New York, and he was a radical of a superintendent. He didn’t stay very long, but I really liked his style of leadership. I felt like he was really for the children. He advocated a lot for good teachers and good, you know, instructors, and he was here to recruit. And after he spoke a little bit about the education profession and, you know, what it had meant to him as a teacher, I was really inspired by his story. And so afterward, I actually went up and spoke to him and introduced myself, and he actually shared a contact with me, which was the coordinator for math, and so he asked me to reach out to him and connect with him, and I did.

After hearing the superintendent’s message, Angela decided to become an educator and participated in a sumer program for a local school district in her last year of college. She described her excitement about an instructor in the sumer program and explained how the sumer teaching experience confirmed that education was the right career choice:

> That’s really where I got my introduction and my zeal for teaching. Uh, and it was just a real knack for me, you know; it came easy to me. I enjoyed it. Uh, when I saw students’

> light bulbs go off, just based on how I connected with them, how I engaged them in the learning, it was— I felt like a natural. And so that was something that really motivated me because it was something that came easy for me, and I was able to really connect with my students in a meaningful way.

The sumer program opportunity motivated Angela to pursue a career in education to connect and collaborate with other mathematics educators. She attributed her success to the support she received from colleagues in this teaching experience:

> That whole process created this opportunity for me…to be like a team lead in math at the school where I taught. I had really good connections with the teachers that I worked with. And so that synergy of middle school, which is really supposed to be where you really collaborate with your fellow teachers and create this sort of family-oriented environment and structure for students…that's what we did at my school. And that's really what I think helped me to be successful as a teacher, because I had a lot of support because there were veteran teachers at the school, um, that supported me and helped me as a new teacher, you know, to really develop as a teacher, um, and kind of showed me what it was really, what was really important about the aspects of teaching and connected with my, not just my students, but the families that we served.

Angela discussed others who influenced her decision to become a teacher, including a local school superintendent who spoke at her college and family members:

> It was mainly him and other people in my family, you know, who were teachers, and they were influential, just based on the fact that they were passionate about what they did. You know? They talked a lot about their jobs, even at home, a lot about their students and their families.

Angela affectionally described the experience of having an aunt as a teacher:

> And so, with my aunt being a teacher—she was actually my teacher in school. So, I remember a lot of how she treated us as students, you know? Like, that was really important. How she made us feel important, how she made us feel smart, how she made us feel like, you know, we could learn anything, we could do anything, we could become anything. And then that really was who she was as a person, you know, like, even at home, in terms of how she interacted with her children. The fact that she connected with her students in the community, the parents in the community. So those were all things that I grew up around.

After teaching in the sumer program, Angela knew that serving as an educator was her destiny. She indicated that certain instructional practices during the sumer program contributed to her career choice:

> I knew that I wanted to be a lifelong educator once I had that sumer experience with the students, and not really having formal training, but the fact that I knew the content…probably without even really understanding and knowing. But I thought a lot about what children liked, as teenagers, you know, I thought about ways in which they learned and what would how I would be able to engage them in a very meaningful way. And so I just really was creative in how I engaged students in learning and how I planned instruction. And so, during that sumer experience, because there [were] not a lot of regimented processes or curriculum, I could be as creative as I wanted it to be. That was, I think, the turning point for me because I had that latitude to be creative. And then, with that creativity, students were learning. Students were captivated. Students were, like,

seemingly holding on to everything I shared with them or what they were experiencing. Um, so that was really the driver for me to choose education as a career.

The sumer program was the catalyst for Angela, who decided that education would be her lifelong career. After the sumer program, Angela remained at her undergraduate institution for an extra semester, taking additional education courses to learn more about teaching and learning theories and practices.

Angela's experience as a first-year teacher differed from the sumer program. Although she built relationships with her students and planned lessons, she felt overwhelmed. Angela discussed her first year as a full-time teacher, saying,

> It's been so long ago, but I think what I remember most about that first year…was probably, I remember, you know, teaching. I remember…um, being able to connect with my students, I remember planning instruction. But I remember just the overwhelming feeling of just all of the responsibilities that went into teaching. So, it was very different from that sumer experience because now it involves grading papers. It involved creating assessments. It involved making phone calls to parents. It involved after-school tutorials. So while I had friends who were in corporate America, and they were going out to happy hour and having drinks, I didn't feel like I could do that. I just remember feeling like my whole life revolved around teaching. So everything that I saw outside of the four walls of the schools I would always think about how I [could] use this in my instruction to better engage with students. If somebody didn't get something the day before, I was always, you know, thinking about at home. You know, like, what can I do tomorrow that can better engage, you know, my students in learning whatever it was. So that first year was a lot of trial and error. I wouldn't say that everything was perfect, but I will say that, again,

> with the support from other math teachers in the school and having a math teacher who was my mentor teacher [and] provided a lot of guidance and support, that really helped me to overcome a lot of my challenges. So I would say, like, specifically, the challenges around managing all of the responsibilities [were] more than I anticipated. But again, having that support system helped me to navigate it. And then, of course, I was always told that, you know, after 3 years, you can kind of you get like, you find your groove and you… Something magical happens where you really learn how to manage all of the responsibilities that you have as a teacher. And so I look[ed] forward to that day, during that first year of having, you know, that experience that I could hold on to that that helped me to manage things a little bit better.

From the challenges of teaching the first year, Angela learned the power of remaining positive, setting "high levels of accountability," and preparing daily for instruction. She learned to design activities to encourage student collaboration in teaching and learning mathematics.

After discussing her first-year teacher experiences, Angela described her impact on her students. She eagerly explained knowing she had impacted some of her students, particularly the ones with whom she maintained contact:

> I will tell you that the way that I can judge the impact is based on the fact that I still keep in touch with students today. After even my first-year students, after 32 years, I have students who, of course, have children, and, you know, they'll call me, and they might ask a recommendation for a school. They may ask me about, you know— they might have a son who's playing sports, and they'll ask me about coming to a game, or they'll ask me to vote for their child on some app, you know. Or I'll see them out in public and, you know, they're so happy to see me, and they're like, "Oh, my God, if it hadn't been

> for you, you know, I would not have been successful at X, Y, and Z. You really push. You know, you really pushed us." And um so, the judgment of my success with my students [has] really been seen, you know, later. And that's what I was always told. Like, you might not see this, the impact immediately, but down the road, you know…it will matter, you know, to those students.

Angela affirmed that teachers could tell the impact of their work by "seeing the fruits of the labor," such as students obeying what their teachers ask them to do and succeeding in the classroom and life.

As Angela concluded her first interview, she discussed what teachers should know and do. Angela believed that teachers should, first and foremost, understand the communities they serve:

> I think that teachers should, first of all, know the community that they serve. I think that's real important. I think it's important because when you can relate and connect to the students that you serve, that makes them feel valued. Because when you integrate maybe some of that into your instruction, you connect it to you as you're planning lessons. You plan it around what your students are interested in. That's something that I think that is important for teachers to know. I think it's important for teachers to know, not just who their students are, geographically, demographically, [but] knowing their families, knowing the culture of students that you serve, you know, even though students might be African American. I still knew that some of our social socialization was different. So understanding how students were socialized helped me to understand them in a way that did not make me judge them or their families. But to always, you know, inspire them, you know, and motivate them. So it's more than, you know, just knowing the content

> knowledge. Like, yeah, teachers need to know content. Teachers need to know how to plan. Teachers need to know pedagogy. But before they can use that pedagogy, they really do have to know who their students are.

In the first interview, Angela described her background and journey as a teacher. Angela had served in various positions throughout her educational journey. Her experiences as a classroom teacher, instructional coach, and middle school principal contributed to her understanding and development of teaching and learning in K–12 schools to meet the needs of the students, their families, and their communities.

Angela's Experience as a University Supervisor

In the second interview, Angela described her experiences in higher education and how she became a university supervisor. Angela worked as an adjunct professor and a university supervisor in multiple postsecondary settings. She described how she became interested in being a university supervisor:

> I came to that work based on the fact that I had experience as a K–12. teacher and I had been an administrator. And, um…the person who hired me thought that those, all of those experiences that I had, would serve as a great benefit in working with novice teachers. So that's basically how I came into the work. And I was actually introduced to it based on being a doctoral student, um…a full-time doctoral student, and um, wanting to just have an experience where I maintain a connection to the schools. And so I learned about university supervision just based on being inquisitive about the different types of graduate assistant programs that there were at the university. And so this one seemed to fit well in my experiences.

Angela accepted the position because she wanted to learn more about university supervision and other graduate assistant programs. She fondly recalled mentoring novice and veteran teachers as a mathematics instructor and coach and providing instructional support to teachers as administrators. Angela identified other factors impacting her decision to accept the university supervisor position:

> I've always seen myself as a coach, OK, even as a principal. So coming into the work from a brick-and-mortar building, a confined one…you know, one space with one with a group of teachers. To transition from that into supervising preservice teachers…was just, you know. I just kind of saw that as a full circle–type experience.

Angela described the professional development she received in preparation for serving as a university supervisor. Although she had taken professional development in mentoring and supervising teachers, she relied on her experience and learning opportunities as a secondary teacher, instructional coach, and administrator when she became a university supervisor. Angela described her professional preparation for university supervision:

> My own learning experiences [were] my professional development. Um, of course, I've had professional development throughout my professional career. I will say that the department that I worked with did provide professional development to the mentors or to the supervisors. So as it relates to professional development, on that level, I did receive professional development through the department on various things. And I can tell you what some of those things are if you're interested, but yes, I did receive professional development outside of my own lived experiences.
>
> I will say that we had specific observation tools that we were trained…to use. And with those tools, you know, students had assignments to do, and we had to use those

> tools to evaluate assignments that they had. Um, we use[d] those tools…when we would go out to observe them in the field. We would evaluate them on their teaching… The professional development that we had…helped us to understand the tools and the resources that we were using. And it was important for the facilitators of the training to ensure that all of the university supervisors had what you would call, for lack of a better word, just a common understanding, right? And that as much as possible, we would score in a similar way based on what we observed. And try to remove the bias from the scoring. So what we would do…to make sure that we were scoring in the same way, we would, like, watch videos of teachers teaching, and we would use those tools and evaluate the instruction. And then after we would do that, we would have some discussion among ourselves as university supervisors, um, to see if we were in a…for some reason, the proper term is escaping me right now… Interrater reliability. That's the term I'm looking for. So yeah, we wanted to make sure that the scoring was in the same range.

Angela's preparation for the university supervisor role contributed to her understanding of evaluating and assessing preservice teachers' progress with accuracy and equity. She reiterated that the evaluation tool used to support preservice teachers aligned with the Teacher Keys Effectiveness System, the instructional practices assessment for educators with clear, renewable teaching certificates.

Angela discussed her first experience as a university supervisor working with preservice teachers and her primary focus and role:

> For me, building relationships is really important. And so, um…whenever I meet anybody for the first time, I mean, I realized that I have a task to do. And that is to help them to be successful. But the one thing that I want[ed], or would want, and wanted the

> student that I was supervising to do, and that was to feel comfortable with me. And to feel comfortable…sharing, you know, their strengths and their areas of growth. I wanted them to feel comfortable in not knowing something and being able to, you know…not fearing asking or feeling like they had to know everything or to be perfect, right? Um, so I always go into situations like that, and I'm conscious and aware of that. I'm conscious and aware, and I had to always just remind myself that these are students and these students are learning. They are not teachers with 3 years of experience who know how to deal with discipline. They may not have what I would call the periphery of veteran teachers, meaning aware of multiple things going on at the same time and being able to address all of the things that are happening simultaneously. And so I think that's a real strength of a university supervisor.

As the university supervisor, Angela reminded herself that preservice teachers were students actively learning theories and practices to implement impactful and meaningful instruction. She explained that teachers should understand evaluation tools and scoring rubrics, and university supervisors should provide honest feedback to support preservice teachers' professional growth. Angela noted that she used her strong interpersonal skills when mentoring and supporting preservice teachers.

While discussing her experiences as a university supervisor, Angela described the frameworks or literature she used to guide her work. Angela shared that she relied on Danielson's frameworks for teaching:

> In the last…experience that I had working as a university supervisor, we used the Charlotte Danielson framework. I would have to go to it. And the reason why we selected the Charlotte Danielson framework is because it aligns, um…it aligns to the Teacher

> Keys. I would just say, like, using the Charlotte Danielson framework…provides, like, a guide for the teacher to know what the expectations are, right, when you're supporting them or when you're observing their teaching and their instruction. So it's not a secret. Like, you don't just show up, and just, you know, give them an evaluation, leave them with something, and then they don't have any understanding of it.

As the university supervisor, Angela reviewed Danielson's framework with the preservice teachers and provided examples of what it looked like in practice. Angela familiarized the preservice teachers with Danielson's framework the help them track their instructional growth and progress during the clinical year.

Angela's Experience With the Funded Robert Noyce Project

In the second interview, Angela described her experiences with the funded Noyce project team and how they impacted her work as a university supervisor. She fondly recalled serving in a leadership role for the funded Noyce project:

> So as a member of the Noyce team, I served on the leadership team of the Noyce project and was serving on the leadership team. And in the role that I served in, I had a lot of input, if you will, on the tools and the resources that we use to support our teachers. And being on the team, working with people who had experiences that were rich experiences really made us strong as a team. So I would say I was on a, what I would call a highly effective team. Just because of the strengths that we are brought to bear on the project.

Angela's team provided collaborative support, making her a stronger leader and more reflective about supporting preservice teachers during the clinical year. Angela expressed that she framed her work in the Noyce project with literature and research and elaborated on how the research impacted the project's goals:

> It was based on literature and research. The project itself was a project to increase the number of STEM teachers in STEM fields in high-need schools. And that in itself comes from the research because we know that a lot of teachers in STEM fields are White males. And so we were looking for minorities, and in particular, Black males. We were looking…we know that in high-need schools, you have teachers who are not certified to teach the subject areas that they teach. And so our goal was to recruit and retain the teachers in these high-need schools to fill those vacancies. Okay. So in that respect, everything that we did was is based in the literature.

In explaining how the funded Noyce project aligned with research and literature, Angela emphasized the importance of framing the project's work with the research.

While discussing her work in the funded Noyce project, she compared her previous work as a university supervisor to that in the funded Noyce project:

> I would say that it was similar and that…I brought myself into the work, you know, so it's just like, hey, you take yourself with you everywhere you go. So, the way that I perceived the work in the role prior to joining Noyce is the same way that I perceived it when I work as a Noyce…or worked with Noyce. And that way, meaning that, you know, my whole goal is to, yeah, I'm gonna use the tools and the resources that they that you give me. I'm going to evaluate the teachers based on the tools and resources that you give me, but I understand that these novice teachers are not widgets, right? They may not be perfect and get everything perfect. So I'm always having to say, like, what's the most important steps in the stages of their growth? Right? As novice learners? And so yeah, so, similarly, I took that into both experiences. Um…and the other thing that I would say was similar…is similar is, um…I did feel like I had a voice. Even when I worked in a

different capacity, just because that's who I am. Right? Again, that's who I am. So if, if I noticed that things, um…if I had a recommendation, I could feel free to make it right. I didn't feel restricted. Right, I didn't feel restricted.

In contrast to her previous experiences with university supervision, the funded Noyce project included a smaller cadre of teachers. Angela stated,

> But the difference between the collaboration with those people and then the collaboration in Noyce [is] I would see them at meetings that we would have once a month. But it wouldn't necessarily mean that I would talk to them outside of those monthly meetings. With Noyce, it was a smaller cadre of university supervisors and the leadership. And so, I thought we had more— It was more cohesive.

All the work in the funded Noyce project occurred with team collaboration. Therefore, Angela described the decision-making processes as more cohesive than what she had previously experienced.

Angela acknowledged that the funded Noyce project had enabled her to enrich her understanding of being a university supervisor:

> "Enrich" is the word that I would use. And you know, like it's like having…after having been a principal, you kind of think, you know, some stuff. Because you think that, you know, you kind of have it all together, and you think you might have experienced, you know, like, wow, I've kind of been through some pretty interesting situations. I don't know if they can get any…more difficult than this or different, but you know, you live, and you learn, like, hey, everything can change. All situations are different. Experiences are different. And so I think it's just— It enriched me, like, in ways that were unintended. I would say it was unintended consequences, so to speak. And in addition to it being

enriching, it shifted me. It shifted my thinking also. Just in terms of when things aren't going the way that they should. Like, as opposed to just keep trying to keep moving, keep moving, keep moving, keep moving, and moving at a pace that is not healthy. It caused me to, you know, have a shift in my own thinking. That, you know, I needed to pace myself right in the work. And with me pacing myself in the work, and not feeling like I have to just push, push, push, push, push, push, push. I recognize that sometimes going slow and stopping is healthy so that you could get your momentum back going in the right direction. And so that's something that I really learned because in the work that we do based on the fact that we work— We work with a lot of populations that are very unique in their own culture. And I say that because the majority of the students that we serve are minorities, or Black and brown children. And when you understand that, you know, their culture, their culture requires that you operate differently.

Angela learned how to aid teachers in making instructional shifts to support social justice frameworks in teaching and learning:

> And then helping teachers to understand that in order for us to have a real social justice kind of framework, because that's one of the frameworks that we did talk about with our teachers. Um…helping them to understand, like, what does that mean? Like, you'll be given all of these different mandates, but how does this connect and relate to the culture and the group of students that we're working with? Right? So if we had to make some shifts for our teachers, then…and I had to make a shift as an administrator, then helping teachers to understand that…would allow them to use those same sorts of practices with them in their own classrooms.

As Angela shared her experiences in the funded Noyce project, she reflected on the successes and challenges she encountered as a team member. She reminisced about a female teacher she supported who initially doubted her abilities to teach in a secondary setting:

> This particular teacher is Hispanic. And one of the things that…I did with all of my… teachers that I work[ed] with [was], again, building a relationship and just getting to know them on a personal level. So [the teacher] told me, you know, like, she would say things like, I'm not supposed to be here. Right? She had her doctorate. So in our program, the teachers actually get their teaching certification and they get their master's. So she already had her doctorate, and she was going back to get her teaching certification. And what she was basically referencing was that in her culture, women are not scholars. They are homemakers. And she was just determined that she was not going to go that route or be part of that statistic. So she chose to just keep going until she, you know, got her doctorate. And then, she had always wanted to become a teacher. And, um…she just happened to see an advertisement of our program, and she applied for it. And in her interview…she basically said, like, "This is a dream come true for me to be able to go back to school, get my teaching certification, and to be an example and a model for my people…in an underserved school, right, or in a school where the majority of them maybe are Hispanic, and then I can be that model for them." Different from what she had when she was growing up. And so, you know, we would have conversations, and she always had, like, just really thoughtful questions, you know, about teaching, about learning. But she would question herself, like, "I'm not sure if I'm doing this right. I don't know if this is the right thing to do." And then what we would do [is] I would go in and observe her instruction. And we would talk about her lesson and talk about what she did. And she

> would tell me what she thought about her lesson. And then from research— I would maybe pull some research, I would maybe share, you know, something with her, some strategy with her, some pedagogical practice with her, and she would actually go back and implement it.

Through her mentorship of preservice teachers, Angela significantly improved students' academic growth. The resources and best practices Angela taught the preservice teachers in the funded Noyce project had such an impact that she was nominated for Teacher of the Year in her first year of teaching.

While reflecting on her experience in the funded Noyce project, Angela described the challenges she faced while supporting the program participants. She recalled that several of the teacher fellows (TFs) in the program possessed mathematical content knowledge but struggled with the pedagogy of teaching mathematics:

> I'm thinking of one person in particular who faced some challenges teaching mathematics. And this is just my personal belief. Her background was in tutoring. So although she had…she may have had an undergraduate degree in mathematics, but it wasn't… This is true for most of the math teachers in our program. They did not come through a traditional teacher education program. And so that in itself can present challenges. And so…they know the content, right? Like, they can work math problems, but knowing how to work math problems and knowing pedagogically how to engage students so that the student is the one doing the learning, right? And how you craft that so that you can hear their voices in instruction. And it's kind of hard not to group them all together and being challenged in that way. You know, I can think of one person who came from a technical institution. And so he was very accustomed to lecture-based

> instruction. And so the challenge with that was that, in observing him teach, he experienced a lot of discipline issues because his students were not engaged.

Although Angela faced challenges with getting some TFs to shift their instruction to meet students' learning needs, she helped them gradually change their teaching practices and foster their growth through coaching, reciprocal dialogue, conversations, and reflective practices.

As the interview concluded, Angela shared what she found significant about the funded Noyce project. Angela discussed the project's outcomes:

> One of the things I think is significant about this Noyce project is making your teaching visible. And when I say that, I'm talking about teachers being given the opportunity to present at conferences. I mean, like, this is very early in their teaching career….right? But because of the support that…we provided as leaders and as supervisors,…coaches, the teachers feel confident enough to…go to conferences and share openly with other teachers, so teachers can learn from them. Um,…I think that…that's something that is just like, I don't know that I would have been ready to do something early in my career. Um,…but again, I didn't have the support that they've had, right. So they've been exposed to the opportunity, and they've taken advantage of; a lot of them have. They've gone to conferences, right, and they've gone to national conferences. So they understand, like, what it is. They understand what it's like. So we have a leader within the Noyce project, where both of the leaders are very active in their respective areas. So they've been presidents of professional organizations, right? And so, with the teachers having the exposure this early in their career, and the fact that in the 5 years of the program, we want all of our teachers to have some type of leadership role. The exposure that they get to have mathematicians can be visible outside of a classroom. Um…the fact that they see

> that learning should be visible to others, and the others can learn and grow from you …helps them to see the possibilities of what leadership roles look like in and outside of the classroom. So I think that our program is…very unique in that these teachers have these kinds of experiences that not all teachers have, right? So um…our program is unique in the fact that we have relationships with the principals with their principals, right? And so their principals reach out to us and ask us [if] we have any more teachers that we can send them.

Angela emphasized the project's value and the team's practices to support preservice teachers during the clinical year and acknowledged the need for similar projects to support and mentor preservice teachers. Angela believed the Noyce project provided successful trajectories for the TFs, as many received nominations for Teacher of the Month or Teacher of the Year at the school or district. Angela affirmed that the funded Noyce project also led to reduced teacher attrition and increased retention of teaching professionals in STEM-related fields.

Arlene

Becoming an Educator: Arlene's Lived Experiences

Arlene recalled her mother dreaming she would pursue a career in education. Her mother purchased her a chalkboard, hoping to realize the dream of having a child who would become an educator. Arlene shared her journey as an educator and described how her mother influenced her career decision:

> Okay, so I became a teacher. I'm just gonna tell you my mama made me become a teacher. …I'm just gonna be honest. When I graduated from college, I was programming, and then I, you know, I was getting laid off, and she always said she prayed for me to become a teacher.

In her first interview, Arlene discussed her experiences as an educator. She had been a mathematics educator for 22 years:

> So, when I first started teaching, I did sixth and eighth grade, and then I primarily moved to high school. In high school, it was Algebra 1, Geometry, Algebra 2, um, [I] did like a brief stint in Calculus to fill in for someone, um, and I guess that was most of the classes that I taught when I was actually teaching. Once I left teaching, I supported K–12 Mathematics. And my role as a math coach was high school, but in my role as district personnel, I supported K–12 Mathematics.

Arlene also shared when she decided to become a teacher. She acknowledged her mother's influence on her decision to pursue a career in education and provided more information about beginning her teaching career:

> I had a passion for kids anyway, but it was just that it wasn't going to be in that realm, but I went in as a sub. I just felt like that was my niche for teaching. So that happened like in 2000. And then I started the certification process. See, back then, you could circumvent stuff. I started, you know, the certification process, then I ended up getting certified in mathematics. So, I mean, I always work[ed] with children and did stuff for children, but it just wasn't in a teaching capacity.

Arlene had always served as a mentor for children, even before becoming a teacher.

Arlene stated that other family members influenced her decision to become a teacher. However, she emphasized that her mother's desire for an educator in the family was the most significant reason she became a teacher. Arlene's extended aunts also impacted her career choice:

> It was mainly my mother because even when I graduated from college, she always said she wanted me to be a teacher. And she always said she prayed that I became a teacher because she wanted a teacher in the family… I was like, OK, low pay, low wages, but OK, sure. But even when I started teaching, I did have a couple of extended aunts that were educators. But really, I was kind of on my own because I was the first…actually, I was the first college graduate out of all of the grandkids, my great grandmother's grandkids. So I guess I was first-generation college student. And so, really, I didn't have a lot of mentors to support teachers. I had great teachers in my life, but it was just really my mama saying that and praying for that and putting it into the atmosphere, and that's hence how I probably ended up becoming a teacher.

Arlene recalled an aunt encouraging her involvement in social activism while serving as a teacher:

> Well, when I started teaching, it was a standard. [My aunt] really influenced me more on the social activism–type part, getting me involved and doing things once I was teaching and in the classroom, getting me involved with, you know, doing NAACP, serving in different roles for that as well. So it really wasn't about teaching, but it was really trying to expand out to do more of giving back to the community beyond teaching,

After discussing the individuals who influenced her educational career choice, Arlene described her experience as a first-year teacher. Before working as a full-time teacher, she served as a long-term substitute. Arlene shared the following account of her first-year teacher experience:

> I remember starting out with sixth grade, then they transferred me to eighth grade. One of the things… [is that I am a] natural is building a rapport with the kids. And this

happened, like in 2000, the end of like, ’99 and 2000. I can’t even remember the year, but [I was] building a rapport with the students going in. And it was a low-income, challenging school. I actually got my job in the grocery store. People think it’s funny, but I was talking to one of our church members, and the principal was behind me. And I was telling them, you know, I had a math degree, I’m looking for a job, you know, be on the lookout. And he was like, “Come to my office Monday morning.” So that’s how I actually started. He didn’t even interview me. I was really just a warm body there, unfortunately. When I got there, [I was] listening, connecting with the kids, listening to kids, knowing the kids’ journey, and kind of thinking about, you know, I once was in that place with them. Because the house, the area that they stayed in, I [had] stayed in when I was an infant and a baby. So really connecting with the kids. I think some of the challenges [were] that I was a long-term sub, so I probably things that I tried— I tried based on my experience and, you know, as a student, and things of that nature. But I think if I probably would have had more, I mean, training, but more information, I probably would have been OK, being a better teacher in that short period of time. I did my research I did whatever I thought [would] be helpful to the kids at the time. But I think that one of the challenges is going in cold turkey and not having, you know, the background or having the, you know, the knowledge. I had the math but not…the educational pedagogical knowledge that was there. But I think I did OK, because the kids now, even if they’re in their 30s, I see them, and it was in a small town. So I see them now. Like, when I go back to visit my grandmother and stuff like that, I see the kids, and they still remember me.

Although Arlene started her educational career without a clear, renewable teaching certificate and minimal knowledge of mathematical pedagogical practices, she had a lasting impression on her students. Arlene saw the impact of her work when interacting with students she taught over 20 years ago. She elaborated on ways she impacted her students throughout her educational career:

> I think some of the things, even when I transferred up to high school— Being involved in kids, that had a lasting impact. Volunteering to coach for free. Like, I never danced in my life, but I was the dance coach, dance line coach, always, you know, just giving. I think that had a lasting impact, because giving back, I was the math team coach, like, I did sponsor proms. So I think the lasting impact, even though you have to go up beyond not just outside of the classroom, so I really make an impact and when kids see that you're involved and invested in them. So I think throughout my years of teaching that, um…that made…that was a lasting impact because, again, I still have a couple of my former students, and I've been in the classroom forever. I still have a couple of my former students that, you know… I went to the medical school graduation went to convince them to come to Georgia State and get their PhDs. They beat me with their PhDs. But you know, just having [those] connections and still having, you know, being there for kids, even when they're well into their 30s.

After pausing for a moment, the participant added:

> I guess some of the impacts…I made are…like, developing a whole student and going beyond the content. I think most of the impact is that when I taught, I tried to teach the whole child. I gave life lessons, life learnings, advice. Um, I think some of those lasting things that, um…you know, that probably they…carry it through. I never let them give

up. I don't care. We try. I was one of the teachers, and they told me I was crazy. But I want to teach. If it was an athlete [who] was failing, I went to the football field and got them and like, oh, no, he can't practice until you finish this. Um, so I was that type of teacher. …Yeah, the coach, she's like, "Hey, …OK, who didn't do their work, 'cause here she comes." So I was really one of those that tried to push it and instill that you need this in order to do something else. So yeah, I was one of those. I was that one, …that special person… That, yeah, if you didn't do a project, and you['re] out there doing football practice— …I think, actually, I walked out there and [was] like, "Stop." Like, "Hold up, Coach. I need so-and-so." Because he needed to come finish this in order to do [that]. So I think that was the last to impact that no matter what, even if you fail, you still want to try again and get it done.

After Arlene explained how she had impacted her students' lives, she described her teaching career's successes and challenges. She reflected on the achievements and challenges of being a teacher and shared what she had learned over the years:

So one of the things I learned…is that you always have to be involved with the student and think about content. I think that you have to… They have to see you as [having] been invested in their lives. And it's not just about teaching the content. So one of the biggest takeaways that I took away from that experience is making sure that I looked at kids as humans and not just a number, not just a test score, but really [being] involved and connected to the kids and students. And even, you know, sometimes even better connected to some of their families. Like, you know, if they're having a challenge, you listen and then, you know, you move on and help them…the best way you can. So really just been more of, again— Instead of being more of a teacher, a mentor, and a resource

> when it when you're when you can and be available. I think that's the most things that I learned. I think one of the challenges from that, though, is that we're humans, and we become so connected, [and] it consumes us. And sometimes, you know, not knowing how to keep it from consuming you or staying up at night worried about this particular student and things of that nature. So I think that was a success and challenge all rolled in one.

Arlene emphasized the importance of knowing the students, including their interests, families, and communities. She believed that understanding students as people preceded engaging them in learning mathematics content. Arlene had always seen herself as a lifelong learner. She sought ways to motivate and actively engage students in teaching and learning mathematics. Arlene described when she knew she would be a lifelong educator:

> I started out, and I ended up in a different county, and it was, I think, having a conversation with my principal at the time. It was a family, or…we were like family, it was like we were family that we didn't, it was a high school, but they treated it like a family situation. So really just having the conversation and listen[ing] to your principal say, you know,… "This is it. This is you. This is what you need to be doing. This is your destiny and journey." So just having that confirmation for someone who had already been in education for a long time really was an "aha, so let me go ahead and finish getting certified" because I was all good again, you know, because it was a lot. But I was like, "Let me go ahead and get certified. And this is going to be my journey." So just, I think, having that confirmation from my principal at that particular time helped me to say that, "Oh, I'm not gonna go back to programming. I'm gonna go ahead and continue with this."

Arlene recalled knowing she wanted to continue serving as an educator:

> It happened…like, my third year. It was early on in my third year because I ended up starting midyear… I went to a particular high school, and it was a mix thing, but it wasn't the support. But then, I kind of ended up at an African American school with high demographics of African Americans, teachers, administrators and, you know, really becoming part of the family there.

The first interview concluded with Arlene indicating what she thought teachers should know and do. Arlene emphasized that teachers should understand the importance of building relationships:

> One thing I think teachers should know is that it's all about relationships. I think they should be able to build relationships with their students, build relationships in the…whatever teaching environment…you're [in]. Content comes easy, but it's building that relationships with the students and with the stakeholders. I think that's one of the things that's the most important. I think teachers should know about that, and then they should be able to do that. That's 60% of your battle. If you don't have a great relationship with your students or what are some of the stakeholders, you won't even get them to drink a cup of water even though they're thirsty. So I think that's the most important because we could teach content, we can teach them how to teach, but we have to— Really, I think they need to know that they need to work on relationships. And that's the very biggest thing. I think that['s what]…they need to do.

Arlene believed teachers could resolve 60% of their challenges by establishing and building positive relationships with students, parents, and stakeholders. She also suggested how to resolve the remaining 40% of teacher challenges:

> I think the other 40% would be more of the content and delivery content, breaking that down. But I think that if you have that relationship… Because, like I said, most teachers come with some form of content. They have time to learn the content. They have time to look at the best practices for doing that. But if you can't— If they don't— If the students don't see that relationship and see that term of care from you, then it's all obsolete…and they're not going to receive the information from you.

The first interview with Arlene focused on her experiences as a K–12 mathematics educator. Arlene served as a teacher and instructional coach at the school and district levels, and her success as a mathematics instructor enabled her to work as a professional developer. In this role, Arlene traveled to high-poverty areas nationwide to positively impact teachers' and students' lives. Due to her vast experience, she viewed mathematics education from various perspectives and used the best practices and research-based strategies to promote effective teaching and learning.

Arlene's Experience as a University Supervisor

The second interview with Arlene focused on her experiences as a university supervisor. Arlene described her experience in higher education and how she became a university supervisor. Before moving into the role, Arlene had never taught at a college or university and had only worked with K–12 schools. She shared the following account of how she learned about and became interested in university supervision:

> I gotta think when I first started. It, well… It had to be like 17 or 18—I can't even remember the year. So one of the things I just saw…looking at tuition assistance at the point and then reaching out, speaking with, meeting one of the directors at the time, and she was talking about her needs. Working with different faculty…and they were talking

about, you know, “Here’s the opportunity to come in and be a supervisor,” since I have had opportunities from my past experiences as well. So I just applied with… I applied during the sumer, and then I came on as a university supervisor. So I think this was prior to the special project that I was working on. But…I just continued while I was finishing up my degree.

Arlene learned about the university supervision position via a recruitment email. She spoke to a professor about the job, and the professor convinced her to apply. Arlene elaborated on why she decided to apply for the job:

> Besides the tuition, it was the chance to work at a collegiate level as a TA [teaching assistant] because that was my first opportunity to work as…well, teach graduate…teacher assistants…and have that role. So really, l was looking at that experience as well. Because I never…I was always working full-time in public education, but then just having the chance to see how academia works as well.

Serving as a university supervisor enabled Arlene to expand her teaching experience beyond K–12 schools and experience preservice teacher mentorship and preparation at the collegiate level.

As the interview continued, Arlene described the professional development she received in preparation for the university supervisor role. Arlene considered her training more like an orientation than formal professional learning. She described the orientation session for university supervisors:

> The orientation was just, like, the expectation of what the university supervisors would have to do. But most of my experience came from working with districts. So really, like, supervising and mentoring and coaching… All of those skills came prior to me becoming a university supervisor. So when we went to orientation, the orientation just talk[ed]

about grading, talk[ed] about you know, the expectations of visitations, and just what the expectations were and some of the pedagogical statuses that the university believed in, but it really wasn't a professional development to say, "This is how you do XYZ."

Arlene shared that, during her first experience, the professors placed university supervisors in the content areas that matched their college degrees and background knowledge. Therefore, Arlene supported mathematics and science preservice teachers during the clinical year and had an assigned mentor to help her throughout the process.

Next, Arlene described her first time mentoring and supporting preservice teachers:

I think the teachers that I had for my very first year were slightly different because they worked. They were working. They were there full time, so they were getting the experience for a year versus just one semester. So one of the things that I'm thinking, trying to go back, one of the things that I really helped the teacher…preservice teachers with, because it was really what pedagogical strategy, sharing strategies, best practices with them, going in observations, providing feedback, and any questions that they had that dealt with just implementing lesson plans. I assisted with that. I helped, like, you know, provide the feedback on lesson plans. If there was a conflict between the preservice teacher and the mentor, school-based mentor teacher, I went out to deal with those conflicts. If there were some concerns, [I would] try to work through those concerns. For example, just like if the mentor teacher felt, like, the particular… [If], my first year…a particular teacher wasn't doing well, you know, [I] went out, coached, modeled, and did things to make sure that they [could] be successful. I'm trying to go back because I'm thinking that…it was like 5 years ago. I'm trying to think back so and really…because I did some professional development workshops with them, just trying to

> develop them…into educators. So we would have seminars for them because it was a different program, but we would have seminars and things like that to assist…them and make them successful in their first year of teaching.

Arlene supported preservice teachers using the state code of ethics for teachers and the university's expectations. During her first experience as a university supervisor, Arlene viewed her responsibilities as similar to her work as a secondary mathematics coach.

Arlene described her unique qualities for mentoring and supporting preservice teachers, including the ability to build rapport with preservice teachers. She indicated the importance of rapport-building:

> I think my unique quality is being able to build a rapport with them and identify and connect with the struggles that they're having. Because I guess I never saw myself far removed as a teacher. And so even though I have been in different levels, I still was like, "Okay, I'll go in and work with the classroom of students." So really thinking I [would] stay connected to the practice of teaching. And I think that is one of my unique qualities, so if there was a problem that they had or something they needed to talk through, whether it was with classroom management or facilitation, I was able to readily assist with that because I was still somewhat connected to the practice of teaching.

Next, Arlene discussed the literature or frameworks she used to guide her work. She shared that the literature about culturally relevant pedagogy significantly impacted how she mentored preservice teachers during the clinical year. Arlene focused heavily on culturally relevant pedagogy as part of the teacher preparation process:

> One of the ones that I really focused on was culturally relevant pedagogy, making sure that the students…. We're meeting the students from their cultural stance, so really

> teaching to your students and bringing in the cultural aspects of your other students. So I really push that for the classroom facilitation. There were some, and I can't even think of the name of the book now, but there were some articles and books that professors provided that we did support. And it wasn't class, classroom management, but it's really facilitation, making sure that, that teachers and the students have a joint responsibility for facilitating, and I will have the… I can't even think of the name of the articles that we utilize from that perspective, but really focus more on classroom facilitation.

Arlene used the literature from authors such as Ladson-Billings and Gay to help preservice teachers focus on classroom facilitation and promote equitable learning in multicultural environments.

Arlene's Experience With the Funded Robert Noyce Project

Arlene also described her experiences with the funded Noyce project and their impact on her work as a university supervisor. She shared how being a member of the funded Noyce team contributed to her conflict-resolution skills when supporting TFs:

> I think with any team you're going to have issues, but it influenced my work to help me be a better conflict resolver with some of the preservice teachers that were having issues with other team members, so nothing is perfect. And just to be honest, so to influence my work, really, I had to do a lot more conflict resolution. But that was with certain powers that be…that year. So I think that influenced me to be more of, you know, not [that it took] me from a lot of the coaching, but to really [say], "Okay, let's look at the end goal. Let's work here. Let's work to resolve these issues." So I did find myself, and I think there [were] some power struggles with certain people that were on the team. And I think that did influence me to do a lot of conflict resolution.

Arlene reported basing her work in the funded Noyce on the literature, her professional experience, and the project's structure and how they influenced her work:

> I think it was based in all three, and the reason being [is] because with the expectations of focus on the science and math teachers, you know, that helped to build some of the literature that surrounded with that come out with best practice[s] of how students learn. So really focused on prompts, you know, problem-based learning, open-ended questioning, and some of that literature was coming out in that as well as infusing cultural relevance in there. And then so, with my experience of being able to work with all three and put it into context, I think that it really it was all three of those that really made the made it fun and fascinating.

Comparing her previous experiences to her duties as a university supervisor in the funded Noyce project, Arlene identified similar expectations. However, the longevity of relationships differed. Arlene addressed the similarities and differences between the experiences:

> I think [it was] the same, just making sure they had the same expectation. And…meeting the goals of getting the teacher certified. …But the difference is, like, it's that relationship…the longevity of the relationships. Like I mentioned before, I still have two of the people that I supervise, they're still teaching, but we check…they check in every year. So I think, like at the beginning of the year, "Hey, how are you [doing]?" And, you know, "Have you finished it?" You know, so it was more of that, from that perspective, is that we, through relationship building, [were] better with the funded project, I think, with the ones that we just did. And I'm not gonna say bare minimum. I don't want to say that. But the ones where we really did not sustain the relationship, the constant professional development, the constant encounters; we just parted our ways. But then the ones in this

project— Like I said, I still hear from two of them, which is, so I think that that's the difference is that the Noyce, the project. I'm really, um,…. really assisted with having a lifelong learning, I'll say, I'm gonna say lifelong, because we don't know when, but having a support system extended outside of…the outside of the program. So like right now, you know, they reach out and say, "Hey, do you have XYZ?" And I'm like, "Yeah, give me a second. I'll send it to you." So I think that was the major difference.

When asked whether the funded Noyce project changed, expanded, or enriched her experience with university supervision, Arlene stated the program enriched her skills as a university supervisor:

It enriched me for a being a university supervisor. And it goes back again to, like, my purpose was— It's just not in the realm of getting teachers certified but being a resource for people, even when they get into the professional field. Because…we think about the first 5 years we lose teachers—I think it has decreased to the first 2 years now because of the way the climate is— But I think, um, it [taught] me to really make sure that, you know what, they can always reach out to me if they…have a question, …if they need assistance with something, if you need for me to reach out and call my contacts. So I think that, because of the way we develop that relationship, it enriched that for me to be more of, you know, a lifelong mentor.

Discussing her successful experiences working with the funded Noyce project, Arlene reflected on the TFs she mentored and shared an instance when she assisted a TF with completing a portfolio assessment:

I think one of the successful experiences that, um, they had to pass—and I can't even think of the name of the portfolio now because my brain has gone, but they got rid of it.

So that was the word they had to actually— It wasn't—it's not GACE, it was something with the ETS. And it's in here…I can't even think of the name of it. This is what happens at old age… So basically, the teachers, in addition to the game, they had to go ahead and do a portfolio style and pass that. So I think one of the major success[es] was that my, my preservice teachers, they all passed. And I think that was a major success. So I think one of the things that contributed to that was the honest feedback that was provided to them. I did not try to, you know, sugarcoat. You know, "This is what we need to do. Let's go look at this again," um, and just having that constant communication contribute[d] to that. So edTP…edTPA. It came out. I know it's gonna come somewhere, but just when that success, when you see that your persons do not have to retake or resubmit, like, that was the ultimate goal. So really having them to pass edTPA, and then once they pass at edTPA, then they're able…to be successful. 'Cause that was a lot of stress off of their back because that would…keep them from going into teaching. …So I think that was the… I saw that as my success goal and my success point at that time.

After discussing her successful experiences working with the funded Noyce project, Arlene discussed some of the challenges she faced while mentoring preservice teachers:

One of the young ladies did have challenges. The school reached out…to the guy…whatever the person, the title was at that time. So I think it was, it was a struggle with pedagogy, pedagogy and best practices for teaching mathematics at a middle-school level. One of the things that…she had experienced was teaching from a skill base, but really teaching for students to understand. Really teaching for students to conceptualize and contextualize mathematics. So my support with her included me coming out, teaching for her, telling her to notice, um, XYZ. So we sat down; we plan[ned] a lesson

together. I talked about things that I was going to do. I talked about how I would approach things to talk about different facilitation moves that I would do to get kids quiet. So really working on that. And then we went into working on using manipulatives to get the students started. So really coming in modeling for her, you know, planning and modeling for her how to teach from a standard base perspective, let's put it that way. So, first provided her with all the resources that I had…in my tool belt, like hands-on standards, things like that. I gave her my personal stuff, like, "Here, you need it more than I do." So trying to get her to change her perspective of what mathematics teaching looks like. So, really, just going from that perspective. And then once we get to that, once we got to that, then…really getting to, you know, show…going through that whole coaching, "Let's model. Let's talk about what are some things you noticed that I did? What are some things that you notice[d] that you might be able to do?" And I used to always have the conversation, "You can't be me. Because my personality is totally different from you. But you['ve] got to find your niche with your personality. But think about some of the things I noticed. …Don't start teaching until everybody's quiet, you know; they can't hear you." So small things like that. Find ways to do that. So really working with her. Yeah, really working with that particular person to develop the content as well as develop the delivery of the content.

As she concluded the second interview, Arlene shared what she considered significant about the funded Noyce project. She articulated having exceptional collaboration with local public school districts:

I think what was significant was…the collaboration with the districts as well as with the preservice teachers. A lot of times, they…the preservice teachers go in, but then they're

> just there… [We have] those meetings where we talk to the leadership about their performance. I think that is very significant because a lot of times, they need to hear…everybody's at the table, everybody understand what their expectations are. A lot of times when, like, before you just go in and introduce yourself, and you mainly just work with the mentor teacher and the preservice teacher, but with Noyce project from the district level, the building level as well as, you know, department level, everybody was involved. Everybody was part of the conversation. Every…so you had them going…you had the leadership going in [and] looking at it as well as the…the university supervisors, and it was more of a partnership and collaboration. I think that was significant because if there was an issue that we both saw [then] we had a plan to work on that either from [the] Georgia State side or from the school side as opposed to, well, "She['s] just a mentor; she['s] just a preservice teacher. We'll get through this year." So they…were assigned to counties, and they were going to be teaching in those counties. They were really invested in those preservice teachers.

As a university supervisor in the funded Noyce project, Arlene developed her knowledge of mentorship for preservice teachers during the clinical year. Working with the funded Noyce project team enabled Arlene to collaborate with and strengthen her relationships with university professors by assisting in methods and theory courses. In the funded Noyce project, she shared her math and science teaching experiences to enhance preservice teachers' understanding of effective teaching and learning practices.

Nina

Becoming an Educator: Nina's Lived Experiences

Nina grew up in a family that valued receiving a quality education. Her grandfather migrated to the United States at fifteen to escape the plague in Ireland. Upon his arrival, Nina's grandfather received no formal education. Because of the family's circumstances, Nina's father pursued a formal education to escape poverty and secure economic stability. Therefore, her parents strongly supported her efforts to attend school and excel academically. As an elementary student at a Catholic school, Nina loved learning, even dressing up as a nun teacher for Halloween, knowing she would become a teacher.

Nina began her interview by describing her experience in education. For thirty-six years, Nina worked as a classroom teacher for geography, economics, citizenship, and world history for the eighth, ninth, and tenth grades. Nina reflected on when she decided to consider a teaching career:

> I always wanted to be a nun teacher. …I always kind of thought I wanted to do that. And then when I was in high school, …I really loved going to school. I love learning. And when I was…might have still been in…New York, meaning, ah, elementary school in Florida, middle, and high, but I think I was maybe, I don't know, somewhere between eighth grade, ninth grade, maybe. I saw a movie called *To Sir with Love*. And I fell in love with it. And I wanted to be that person because [of] how much he changed the lives of the kids he taught. And little did I know that my situation would be exactly like his but just reverse.

Nina fondly recalled the movie *To Sir, With Love* and explained how the main character influenced her decision to become a teacher:

> He was a man in England teaching mostly all White students. And they were giving him a hard time because he was a new teacher. But he showed he loved and cared for them and they grew in [a] relationship. And so, I was a young teacher and experienced, White in an all–African American school. So it was my experience, exactly, just a little and female to male. He was male; I was female. And I love that movie. That song, "To Sir with Love." It's just a… It makes you have tears…goosebumps, goosebumps.

Nina displayed nostalgia as she reminisced how Sidney Poitier's character left a positive impression on students in the movie. She discussed the other people in her life who influenced her to become a teacher. Although her parents always supported her in getting an education, teaching was a career she wanted to pursue. She recalled her experiences when she started teaching:

> And my parents, you know, wanted me to get an education, so we're all for that. And, but, as my experience as a teacher, like I came in…without much induction. Back that they just didn't believe in induction so much. They didn't have any systematic means of supporting you. …So when I went to school, I did my student teaching. But for some reason—and this is so long, though—I was actually alternatively certified. I don't know why…'cause I did my student teaching. I came to…Kristie, I can't even remember. But what I guess what I'm saying is my experience as a teacher… Early on, I was alternatively certified even though I did student teaching, so I don't— so I can't go back and explain it. Um, maybe because— Oh, I know. I graduated with a degree in psychology to teach. But psychology, even back when I started teaching, was really an elective. And it's usually reserved for the teacher that's been in the school forever and there [were] really no openings in psychology. So I had to go back and add broad fields,

social studies, and then take the teaching certification tests for broad fields. Social studies and not psychology, actually, which includes psychology. But I was considered alternatively certified.

Nina described her first teaching position in a premier public school district that required every teacher to have a master's degree. Although Nina found the requirement to earn a master's degree appealing, she admitted to struggling at the start of her teaching career:

> My teaching experience was a struggle for a few reasons. There was no formal induction. I was going to school to add to my certification. And, quite frankly, I'm from New York, and I've never been in a situation where there was just one type of culture in…a schoolhouse. I mean, I grew up with all sorts of different people. And I was just unfamiliar with the South. How about that? About what this was looking like at a school that was 100% African American students. And according to that school, it had flipped or changed quickly. So I was getting adjusted to not having anybody with any different nationality or culture…you know?

Nina also described her successes and challenges:

> I would say my success was my willingness to work hard to be better. And their willingness to keep on, right, and, of course, my challenges. I was a teacher, going to school at night, [a] brand new teacher going to school at night. Without induction, and the end, you know, the way— I guess induction was hanging out in the teachers' lounge and [trying] to get a friend. But that is just very toxic. Because it's not productive friendship, it's— You know? I mean, you talk about people, you talk about students. It wasn't very… I would much rather [be] in my classroom and everything. And I was nervous. And I just— I guess I would reflect, and as a brand-new teacher, I did not want people to

know I didn't know. So I didn't ask, or…I told them I knew. "I got it. I got it. Don't worry, I can handle this," you know? So it makes it kind of made me hard to be helped. It was hard for people to give me help if I was trying to tell them I didn't need it. Because I didn't want to feel I was feeling vulnerable in all aspects. I didn't want to feel more vulnerable by telling people who were going to determine my employment status after a year that I needed help. The students knew I was new. So, the students do what students do when a teacher is new. And that is not going to change because it's like trying to tell kids not to be kids. Kids will be kids. No matter how experienced you are, kids are going to try to get something over a new teacher.

But what I learned after the fact is that you don't have to be a know-it-all, especially in abroad study. Like, I didn't have to 100% know all of world history, every country, every year, every whatever. I didn't have to [know] 100% on the same day.

Through the successes and challenges of the first year of teaching, Nina realized new educators should understand the balance between knowing and teaching the subject area content and the classroom's culture. New teachers must show concern for their students and meet students' specific teaching and learning needs. However, Nina said, her students did not care what she knew; they wanted to know she cared.

Reiterating that her parents valued and supported her decision to pursue a career in education, Nina identified the other people who influenced her decision to become a teacher. An assistant principal in her school district also supported her during her first year as a teacher. The assistant principal encouraged Nina to become a magnet teacher for the school district and promoted her. She said,

> There was an assistant principal who came along, and I just hooked on to her whether she had the time for me or not. I guess she liked me, and she saw that I worked hard and was prepared. And she, I guess— So I didn't really have a formal mentor now. So my decisions were either people saw that I worked hard and gave me promotions or I did it myself. So the assistant principal was the first person to promote me to become a magnet teacher. I did not even know [magnet]. I was tapped to do it.

The assistant principal recommended Nina to serve as the magnet teacher after the federal government indicated the school district was a violation of the Supreme Court ruling of *Brown v. Board of Education* (1954) due to insufficient school integration. To comply with the Supreme Court's ruling, the school where Nina taught ninth-grade social studies became a magnet school for majority students. Nina graciously accepted the recommendation and considered the magnet teacher position an opportunity to continue growing professionally and add credentials to her teaching certificate. To prepare for the role, she read literature on the magnet program's expectations and took twenty hours of public university coursework to earn the gifted certification. As the magnet teacher, Nina expected to have approximately thirty students in each class; however, when the magnet students arrived, she had no more than ten students in each class period. She quickly realized the magnet students attended a majority Black school in a separate school in the building. Although Nina found teaching smaller classes more manageable, she became concerned about the lack of Black students in the magnet program. She met with the assistant principal, who promoted her to the magnet teacher position. Nina suggested allotting minority students seats in magnet classes, but school district leaders denied her request, indicating that minority student participation in the magnet program was a violation of *Brown v Board of Education*.

While describing her teaching experiences, Nina elaborated on her role as the magnet teacher, which she held for more than 2 years. As the magnet teacher, Nina took her students on field trips, notably a visit to see the electric chair at a state prison. Nina enjoyed her position because of its flexibility and autonomy and impacted her students' lives through her hard work. Despite her efforts to provide students with multiple learning opportunities, Nina experienced ridicule and criticism from her colleagues. Other educators asked her how she got the magnet teacher position and questioned why the principal did not offer the job to the department chair. Nina knew the answer to these questions: The principal appointed her to the position. Despite the program's success, school leaders had concerns about low program enrollment. The school leaders adjusted her teaching schedule, so Nina taught magnet classes for one or two periods daily. However, low student enrollment presented difficulties in maintaining the magnet program. One day, the principal asked Nina to report to the front office. Unbeknownst to her, before meeting with the principal, school district leaders requested Nina to transfer to another school and serve as the gifted teacher. Nina was devastated when she heard that the school district suggested she leave her current assignment. She adamantly opposed the transfer because she wanted to continue teaching her magnet students, but the school principal told her that if she did not accept the gifted teacher position at the other school, school system leaders would never consider her for another promotion. Nina eventually obliged and moved to a different school in the district to serve as the gifted teacher.

Nina adjusted to a more demanding teaching workload when she arrived at the other school. She worked with larger class sizes, and her expectations as the gifted teacher differed from when she was the magnet teacher. Nevertheless, she excelled in her new role and provided her students with the best instruction possible. With determination and a strong desire to impact

her students' lives, Nina continued to grow professionally as an educator. She applied for and completed the National Board teacher certification process, began mentoring new teachers in the building, and became a teacher support specialist. She developed a passion for mentoring new teachers and began advocating for assigning student teachers mentors for adequate growth and development. Through her passion for mentorship and teacher development, Nina became one of three teachers selected to work with the district's alternative certification program and soon became the program's coordinator. Nina eventually became the district coordinator in charge of student teacher assignments. In this role, Nina understood the importance of partnerships with colleges and universities in ensuring student teachers receive adequate mentorship in authentic classroom environments to prepare for careers in education.

Nina also built relationships with school principals to ensure equitable and mutually beneficial student teaching assignments for schools and teacher candidates. She described establishing partnerships with universities, colleges, and the local school district:

> Over the years, I built up a relationship where I was placing…four hundred teachers a semester. And if eight hundred teachers a year…in all areas, and I would continuously go to HR, go, "Don't go to Chicago and pay that money to get forty signs. You have eight hundred teachers right here on this list. Start hiring…them off this list." So it took a long time, but I created partnerships. The school district had a partnership with universities. And the school district had a PL [who] had a partnership with every school. And literally, a principal would say, "Give me the usual," and I knew what they meant. I knew quote-unquote "the usual."

Nina continued to have relationships with and build partnerships with colleges and universities through her work with student teacher placements. During the clinical year, her

collaboration with universities and colleges to place preservice teachers with elementary and secondary school–based mentors contributed to her understanding of teacher preparation and the significance of positive relationships between universities and local school districts.

After discussing her experience as an educator, Nina described her impact on students. She fondly recalled field trips and shared how former students responded when they interacted with her:

> I am lucky enough to be able to tell you that the impact I have on students is that students who are grown, they make an effort to say hi to [me. I] know that [I] made a difference. I have plenty of those that each and every day. I've had people that I've taught that work now in the county that I taught when they were in school, and they would come up to me and they thank me for that, what I did for them, and they typically would apologize for their behavior. You know, but then I would apologize back, and I would say, "Well, you know, the apology goes both ways because I was a brand new teacher, so thank you for apologizing to me. But I owe you an apology because I'm a better teacher now than I was," and they laugh. I had one student call me who was my magnet student who's now a teacher. And she called me and she said, "Miss Nina, can you tell me the name of the prison we went to to see the electric chair because I want to take my students." And I said, "Oh, that is so sweet. I can tell you that it's no longer…it's now the lethal injection. I can give you the name of the institution, but you're not going to see the electric chair in this state anymore." "Oh, yes, that's right, Miss Nina." I've had that happen… I have had people…kids and their parents tell me how much they appreciated seeing Jimmy Carter. That would always be in their mind. We would [do this] when this was all magnet. And then I brought it to the other school but each year, over the same sumer, when they told

> me I was going to do this job, I said again, "I went into doing the things that were just natural to me. …What community resources can I use?" And one of them was, you know— Jimmy Carter was the former president, and he goes to Emory once a year, and he talks in an auditorium. And so I called Emory, and I asked to bring my students, and every year we got an invitation from Jimmy Carter. And then, Jimmy Carter noticed there were fourteen-year-old kids with twenty-two-year-olds, and he asked his secret service agents who were we and we said we were high school students. So each and every year, he insisted on talking to my kids. So he would let them answer— We would have them stand up and answer his questions directly. So that made an impact on the kids and the parents because the parents wanted to come, and they were so excited. And it really— Back then, [it] wasn't about… My kids didn't know if I was Democrat [or] Republican. I taught them that there are only X amount of presidents since the birth of the United States, and we happen to have one coming from the state of Georgia. It is a resource, you know? And they just love seeing the Secret Service agents with their headphones, their little radios, and what else? Um… I just think, can you give me, like— People came back and thanked me for what I've done. Like, how else would that work?

Nina appeared nostalgic as she recounted the field trips and teachable moments with her students. She enthusiastically explained how she incorporated various opportunities to provide her students with rich and impactful learning experiences.

Nina described when she realized she would be a lifelong educator and reiterated her fascination with Sidney Poitier's character in the movie *To Sir, With Love*. Her experience as a magnet teacher contributed to her desire to be a lifelong educator:

> Well, I told you, I knew what I wanted to pursue when I saw the movie *To Sir with Love*…but I knew when I became good at like, when, when I was the magnet teacher at a high school, I knew then I was good. I would have chill bumps…when I taught. It was never the money I made. It was the connections I [was] making and how well I taught something and…I knew the kids were getting it. And I knew again when I became National Board, and I didn't tell you this, but I made perfect scores on two entries. One entry, sorry. I made a perfect score and one entry, and I knew it when I turned it in. I said, "This is as good as it gets." And it was. Um, I taught the one I made a four on. So you have four entries, and the one classroom entry I made a four on was teaching in my citizenship class… Actually, it was about the two things I brought together. Actually, I did two entries, which were really good. And I knew I was…I knew that teaching, I had it. It was natural for me… I taught an entry on the Supreme Court decision with *Brown v. Board* and they had to read the decision of the Court… And then we watched a movie that represented…um. Thurgood Marshall made history because it was the first time in front of the Supreme Court that the Supreme Court allowed a psychological test, a sociological test to be brought in as evidence and used science because psychology and sociology [weren't] viewed as cards then. And he used the doll study.

As the first interview concluded, Nina described what she believed teachers should know and do. She asserted that teachers should connect learning to real-life phenomena and emphasized the significance of teachers making real-world connections for meaningful and impactful learning:

> Connect learning to real-life experiences, you know? And that is huge…because with that you draw real-life experience, [which] means you draw on the community. Real-life

> experiences, meaning parents or your partners. Real-life experiences is having the kids realize what you're learning makes sense in their life. So that's huge to me. Real-life experiences is letting them know that there's a freakin' electric chair in the State of Georgia. Real-life experience means [letting] them know that the state of Georgia has the most Supreme Court cases, [the] most cases up in front of the Supreme Court to decide whether, um the capital punishment is cruel and unusual and unequally given to minority. That's what real-life experience means to me. Real-life experience means anticipating the future for COVID. Real-life experiences all of that. And anticipating. Asking the kids during President Bill Clinton's time whether they think the first person to be different from the White male will be a female or a Black male or Black female, and all my kids at Southwest said a White female would break the code. And I, and then they all wrote it down and I took a vote, and I got, for the most part, all the kids thought it was gonna be Hillary, the White female. And I told him it was good to be a Black male. Woo hoo, I won. Because I used—Obama wasn't even in the scene—I used Colin Powell. Yeah, but from a woman point of view. I saw that a male would break it before a female.

In her first interview, Nina shared a wealth of knowledge about her teaching career. She acknowledged the value of highly qualified mentors in K–12 schools who could support new teachers beyond the first five years of employment. Mentors aid new teachers with learning the best practices and strategies to improve their instructional practices. However, Nina asserted that new educators should take the initiative to improve their teaching practices for professional development. Nina attributed her desire to excel as a teacher to her father's advice: "The only way up and out from your situation is education and to do the work no one else will do."

Nina's Experience as a University Supervisor

Nina discussed her experiences as a university supervisor in the second interview. The interview commenced with Nina describing her experiences in higher education and how she became a university supervisor. Nina mentored preservice teachers during the clinical year. As a K–12 school district coordinator, she partnered with faculty from various colleges and universities to place preservice teachers with mentors during their student teaching experience. Nina further explained how she became a university supervisor:

> I became a university supervisor because while I was working, I made connections with P–20 partners. After I retired, I was able to keep those connections. So, basically, the university supervisor is in the pipeline of what we call the teacher certification process. And while I worked for the district, I was involved in numerous ways for teacher certification with the Georgia TAPP, the MSTT program. And then I became a coordinator for all university partnerships throughout the district. So I have had teacher preparation experience: What it took, what the state requires, including mentoring, you know. I was organizing the mentorship. Whether I was a P–20 partner or working with Georgia TAPP, I was organizing mentorship, so I knew about it. I was trained to mentor, too.

After retiring from the local school district, Nina entered the university supervisor role to maintain her relationships with colleges and universities as a district coordinator and keep her mentoring skills current. Nina shared that a faculty member from one of the colleges she had partnered with asked her to serve in the university supervisor role. She elaborated on why she decided to accept the position:

> Well, because I was familiar, it was easy. It would keep me in. I would not be completely closing the door to education, leadership and education. It would not be closed as when I retired. I wanted to keep my certification active and my experiences and my knowledge active.

After explaining why she became a university supervisor, Nina described her professional learning to prepare for the job. She shared the following description of her professional development for the university supervision role:

> Yeah, I think… I don't— I wouldn't— So, again, I would say it exposed me to what was required of me as a mentor. But it didn't prepare me because I came in with this knowledge. So I knew of the Intern Keys, I knew of Danielson's, I knew of InTASC. I had to know that because of what I did for the district, because if I was certifying teachers for the district, just like the university, I had to do exactly what universities do. So I was aware of this. They just told me, basically, the training that I had was letting me know what was required of me for specific programs. But key, key assessments [are] required for whatever program you're in. If you're certifying the teacher in the State of Georgia, maybe, I would say I was given training. Maybe I was given training to review the Intern Keys, but by no means were they teaching me for the first time any of this.

Nina also described the professional learning she received in preparation for university supervision:

> The professional learning I got was, "These are the key assessments." I got professional learning to say, "This is our program. This is our structure. This is what we're going to require you to do. These are our assignments. And this is our platform," all of that. But

> the general nuts and bolts on teacher certification they did not spend time training us because I think they [knew] most of us…were doing [it] their way.

Nina explained how her professional development for the university supervision applied to the teacher education program and specific content areas:

> So, it was general when you talked about how to upload, how to do live feedback on the platform, what to look for when they were doing a community assignment, and things. But when we were talking about specific standards, yes, I was trained in the science and math standards.

The participant also recalled the first time she mentored a preservice teacher as a university supervisor. Nina shared an encounter with a preservice teacher during a classroom observation:

> I was in the classroom observing them, and then providing them feedback and giving them feedback. And I would absolutely say that what I constantly fight with is that teachers that are not yet certified have a hard time being told that they need to, that they're not hitting the standard, I think. So, I have to always be very careful about giving praises but really be very specific on, as to what that standard looks like. And there's so much there. There's somewhat of a disconnect, maybe, with what the district was looking for and what the schools are looking for. But you have to just kind of [lay] out your ideas [and] I tell them that I'm here to help them. I'm here to help them, and they need to be comfortable. They need to be comfortable feeling uncomfortable. And I have to explain that to them. And I tell them that I have certain standards, and I will ask, I will do, I will show them how to meet those standards, but I will not minimize my standards. I won't lower my standards, but I will show them how to. And that is a certifying experience, and

it's not an employment experience. And that this is their one shot to really get some feedback. That doesn't affect their employment. You know? I always just say— I just think that, you know, it's just so funny. There are people that are so willing to absorb what you're saying. And then [there are] so many people that are just saying, "I'm good." And, you know, "I'm not gonna listen to what you say." And it's just— You can see that those teachers will stay the same. Because they're not reflective.

During her first experience as a university supervisor, Nina set high expectations for the preservice teachers she mentored while adjusting to the reality that some would be more receptive to her feedback than others. Nina followed the InTASC standards and Danielson's framework for teaching to support preservice teachers during the clinical year. She explained how these guidelines impacted how she interacted with preservice teachers:

I think they might be worded differently, but they're consistently similar to what we expect as good teaching. So that's really good. And, um, I'm an expert in good teaching, so I can kind of break it down for them. Um, I think that as districts get more and more heat about test scores and achievement scores, they're starting to take away, like, the teachers are getting premade lesson plans. So it's harder to, like, if they don't do the lesson plan, it's really harder to find an area where you can help them grow because they're getting the lesson plan already given to them, which is so unfortunate, you know? And so when you say, "Where's the hook or…the connection to real life," they don't take time to change it, make it their own. So I think that when you think about district… It's ironic. There is good intent as to why a district would do a standard lesson plan. But they don't see that a lesson plan cannot be standardized because different children— Children are different in every class, in every school, in every region, in every district.

After discussing her first experience with university supervision, Nina described her unique qualities for mentoring preservice teachers and how her unique teaching experiences enabled her to mentor preservice teachers:

> Oh, just my experience, my experience in what…how to run a certification program, teacher certification program. Just my world of experience, and honestly, just really knowing it. I know the Georgia Keys so well. There's— It's beautifully written. And I know them more than— I truly understand them inside and out. I see them. They don't stand alone; they merge together. And what I try to do is I have my students not see that they have to hit one, two, three, four. But when they hit two, they hit four, six, you know. I want to show them that it goes like this. But they're not individual. They're not like this. They're like *this*.

She mentioned trustworthiness as her unique interpersonal skill as a mentor:

> And my interpersonal skills are that, you know, I think they trust me. I think I can build trust. I think they see that I have the knowledge, so they trust me. They don't think I'm just a bunch of smoke. Okay. You know, and they…pick up that I care.

After addressing her unique qualities as a university supervisor, Nina elaborated on the literature and frameworks she used to guide her work. She reiterated that she used the InTASC standards and Danielson's framework to inform her work:

> My framework has always been Danielson's, InTASC, and the Teacher Keys, and I was really disappointed because, early on, when the Teacher Keys were developed, they gave you the key, they gave you the standard, and then they wrote the reason. And then behind every standard, there was a bunch of research. And they took that away. They took that away. So what I would love doing is if they talked about differentiation, they would have

> the standard, and then they would talk about what it is and who said what, as a researcher and then at the very end. They had all these reference articles. And now they don't have that anymore, which is unfortunate. But I'm, really, I always refer to that. And then of course, I love National Board. National Board has a great thing on schools and community, so I always go back to those fantastic standards. And, of course, I am National Board. Not only did I pass it, but I went to Florida and graded all the National Board entries one sumer. So now not only did I pass it and do it, but I graded it and I understood what they were looking for.

Nina indicated that Danielson's framework, the InTASC standards, the Teacher Keys Effectiveness System, and the National Board Certification standards provided the best practices for teaching and learning. She regularly referenced these systems for guidance while supporting preservice teachers.

Nina's Experience With the Funded Robert Noyce Project

Nina described her work with the funded Noyce team and how it impacted her work as a university supervisor. Nina entered the funded Noyce project with experience working with preservice teachers as a professional learning coordinator in a local public school district. She met the requirements and received recognition as a National Board–certified teacher. Due to her professional experiences, Nina brought a wealth of pedagogical knowledge to the funded Noyce project. She sought mathematical resources to further support the TFs' professional development as educators. Nina fondly recalled the team focusing on collaboration to guide their work:

> As a member of the team, we collaborated a lot. We got together, we discussed, we collaborated, we shared a vision. We discuss[ed] where…the students were and where we wanted them to go, what was important. So there was a lot of buy-in and a lot of planning

> and, um, a lot of getting to know our students, where they were in terms of their schools and what they were struggling with. And it was very unique time because before too long, we were in COVID; we were with COVID. That was just— It made me realize how important the site base mentor is. Because during COVID, that was just very elusive. So I was everything to them. You know?

Nina discussed how social justice and culturally relevant pedagogy influenced the work of the funded Noyce project:

> Well, the idea is that we were talking about social justice in the team, in the project— culturally sensitive pedagogy. And so we were very much aware of that and helping the candidates understand how that could occur…while they were getting certified, while they were new in their building. And that really has changed my life, because when I'll go back to the schools this year, with another university, and I'll have to make sure I see, you know, when it talks about student feedback and about the environment, positive learning environment, you know. If I'm going into any classroom, I'm seeing women in roles of math and science, I'm seeing minorities in all roles, so I'm looking for that. Now I do think, though, I have to say that the districts that we were working with, with the Noyce project, were very good about incorporating relevant pedagogy to the children that they that we were teaching, and we were working with, and I thought we were not fighting… I didn't feel like we were fighting any battles with the schools we were with because I think they were doing a great job.

Nina said she based her work in the funded Noyce project on the literature, her experiences, and the program's structure and detailed how she used these resources to guide her work:

> I think it was all, all of them. That's why I think I did a good job fitting in…um, into the project. I felt like there one of the earlier projects that the students did was to know the community that they served, and to have a realization of what the students need and have and what they're exposed to what they're not exposed to. That was amazing. …We found out so much about the schools that they, that they taught at. A lot of it was like, food deserts. …I thought that there was a lot of like, yeah, just, like, after-school deserts in a lot of ways. And so that really helped us begin to understand how we would understand our mission and vision of the funded project with where the students were. And I thought that that was very eye-opening. I think that should be part of everyone's teacher certification process.

Nina acknowledged that the funded Noyce project enabled her to expand her views of mentorship and university supervision:

> I don't think it changed my views because I always, I always— Like I said, shared with you, my experiences have always been in a minority… The majority of the people I work with were in minority, in the minority, are minorities. So it never— It really didn't change my views, but it…expanded my view. And it, um, so if I noticed that there's not a specific question that talks about culturally sensitive pedagogy or access, equity, and justice, I will put it into my own…my own fingerprint into how I mentor other, in other schools, of course, like I actually— I actually did go to a meeting…at another school that I'm working with now, and they had journal entries, and one was about the environment, and it wasn't specific to what, what is available to the children to see minority and women doing these things. And I asked [them] to specifically put that in there. So yes, it

has changed my views. No, it hasn't changed my views; it has broaden[ed] in my views. It has allowed me to be more consistent and convinced, consistent with my practice.

Nina explained the difference between her experiences in the funded Noyce project and prior university supervisor roles:

> I think it was different. I think the funded Noyce project had a mission and a purpose that the students had a buy-in, and they were excited about it. And they delivered it. And I don't think that has been the case in other certification. Other times that I was mentoring. I would say that in the Noyce there was a strong enrollment of minority math and science, whereas in the other programs, it might have been, you know, half and half, or a third minority, uh…two-thirds majority. But in the Noyce, it was really strongly minorities. There might have been two, I don't even— I didn't even notice it. Like, I didn't count or anything, but it held to its purpose where they recruited math and science, minority-based teachers for this program, whereas I think…in other projects, not necessarily as strong. And one more thing. These teachers are given the confidence and the wherewithal and the skills to employ the mission of Noyce, meaning we are going to make a difference in the curriculum. We are going to interject this, although I felt like the curriculum was doing [that] in the places we were located. It was good partnerships, because they weren't with a partner where that would be an uphill battle, which would be— which would be a bad place to rest, right? You don't want a partner that's unwilling to do that.

Nina mentioned the success she experienced while working with TFs in the funded Noyce project, recalling that some funded Noyce participants completed the clinical experience virtually. She discussed aiding a TF with student questioning during virtual instruction:

I feel like when I went to help a few teachers, like… I'll tell you an online difference. There was, like…half of our experience was online, the other half wasn't. So the online experience I was using, you know, the Zooms, and I was listening to a very well. This teacher was doing a great job. But I noticed that she was not giving wait time when she would ask the question, and she was just speeding along. This was math. And I'm like, "Oh, my goodness." I'm, you know, needing the time. And so, um, so I had to share with her that and she wasn't quite getting it. Like, what do you mean, wait time and everything? And finally I said, I'm going to tell you a long… And she remembers this to the day, to this day. I said, "Do you remember *The Miracle on the Hudson* when the plane landed in the Hudson?" And she said, "Yes." Do you remember that, Kristie, when the pilot landed the plane in the Hudson? And if you've— If you've seen the movie, what they tried to do— The FAA tried to reprimand the pilot, like, "Why didn't you go to an airport?" Can you imagine that, right…after this successful land[ing]. So what they did was they, through simulation, they kept trying, they kept simulating, until they got…the right time where they said, "You had time." The pilot, the FAA said to the pilot, "You had time to turn the plane around and land in an airport versus landing in the water." And the pilot…said, …"But in your simulation…where you recreated that whole accident, you did not allow five seconds for me to think about what I was going to do. You didn't give me the— You didn't give me five seconds' wait time to think. You just automatically didn't incorporate that." And when they gave the five-second wait time, they realized that he absolutely did not have a chance to turn the plane around and land in the airport. The only way…[he] could have done anything was to land in the Hudson. And I gave her that example, and from that point on, she kept— She understood what

wait time was. And I thought I made a difference there because normally she was just a really good teacher. She did a good job. She's just a natural. I always thought she was a natural teacher with little room to…little room to [grasp] what am I trying to redirect.

Nina described helping a TF with classroom management for a group of sixth-grade students:

> One time I went to a young teacher's classroom, and it was so weird because it was her first time back in the… She was a certified teacher, but had never— She was in the program for two years or a year and a half and had never been in the classroom. So when she started the classroom, it was just so weird that she had been teaching so long online. And she was demure and small and she was given a just a tough group of sixth graders. And they were tough, you know, and I just was there and I helped her and I strategized. You know, we're using the seating chart where her problem people were, and they were like, on all fours, on all sides of the classroom. I'm like, …"If this is a military battle on all sides, you're surrounded by, by children that need your attention. So look at this seating plan and rearrange it." And I thought that that was helpful.

Nina also reflected on some of the challenges she faced as a university supervisor in the funded Noyce project. She shared an account of mentoring a mathematics TF who needed support with implementing group assignments with students:

> One math teacher was employing group work, which is important, right, with middle school. And, um, he was realizing that the students were sitting in groups, but they weren't working in groups. They were always asking him for the, you know, to check the math answer to help them with the questions and stuff. And…I sat there, and I used check marks to see how many times the kids would ask him to come to the group and to teach

and teach and teach versus them to work it out, as group members, to work with each other. He realized that he had to do better at releasing them, once he taught, releasing them to do the group work. And that was— It wasn't a super challenge, but he didn't realize how often he was…called to instruct each and every group, that they weren't working as a group. They weren't depending on each other. And they weren't trying, and they weren't like— What do you call it in math? It's, you know, you teach about, like, persistence and…solving problems. And then…he realized that he was able to see it for what it is and do a better job at…reminding the students that they're in a group to work together and to help each other out.

Nina recalled working with a TF reluctant to move around the classroom during instruction:

> I was working with a teacher who didn't get up out of her chair very much. She didn't walk around the classroom, and I was just like, "You cannot teach from behind your desk." You know? And she probably didn't realize that like she should have. So those were two, some of the challenges. Also, just the overall challenges were that during COVID, they just didn't have the on-site mentor.

Nina admitted that the challenges she faced while mentoring TFs in the funded Noyce project showed her the value of on-site mentors at the local school level. As Nina reflected on the challenges, she also described how the COVID pandemic affected the preservice teachers' ability to prepare for the GACE exam, the state-approved educator certification assessment:

> Oh, it was crazy because during COVID, the teachers didn't have to take the certification exam, and they were given extra time. And some of the challenges were the teachers weren't quite fully certified, passing the GACE. And we had to get them tutorial, you

know? So by bringing them into the program, waiving the GACE, and then having them realize 6 months to a year later they had to take the GACE— They waived it, but that didn't mean they did away with it. We had a lot of candidates in the program that were struggling to pass the GACE.

Nina expressed that the pandemic caused some TFs to lose their confidence. She shared how difficulties passing the GACE impacted a TF in the funded Noyce project:

I think…they lost their confidence. The one girl that I thought was a great math teacher— She was an amazing math teacher. Everything was so natural to her. She just had a hard time passing the GACE… And she had just wore out her confidence. And then she wound up leaving, which was very sad because she was excellent. And I think English— I only found out that English was not…I think she grew up outside the United States, …but came back, like, as a teen or whatever. So you would say that she had dual language, and maybe that was the reason. She was a great, great teacher. And she just was so exhausted trying to pass this GACE that she wound up going, actually asking me for a reference to go to law school.

Nina highlighted how the COVID pandemic impacted her mentorship of the preservice teachers in the project:

I think the fact that we were not allowed in the schools as often as we should have been, that affected it, our mentorship. …Teachers being out with COVID. I mean, the schools were just overwhelming…teachers during the COVID. Like, the kids had to stay in the classroom during lunch. They all couldn't go into the cafeteria, so there was no break from the kids. There [were] teachers quitting or teachers being sick and then [the school] being understaffed and having more than 30 kids in a classroom frequently. So it's very

> strenuous, very strenuous on the teachers. …It made it hard to mentor because they wanted us to be a means of letting go and releasing versus being taught anything. No, you know what I mean? They wanted to meet to share experiences and struggles. They did not want to meet to learn anything more, because they were just…[they] had enough. They were just overwhelmed. They were overwhelmed. So we, we reworked it, where they were more in charge of their learning. And we sat back and we facilitated, and they took the reins on what they wanted to learn.

Nina noted that the COVID pandemic caused the TFs who remained in the funded Noyce project to take more ownership and responsibility for their professional development. Nina elaborated on how the TFs' behaviors impacted her work:

> It was amazing. We didn't get as much pushback, and they really delved into it, and they took ownership. And they enjoyed the project a little more. …We we had things we wanted them to do. And it was too much. It was overwhelming. Because, guess what, we were in nonpreceden[ted] times. No one knew how to deal, no one. …COVID was very— Yeah, that was tough.

Nina acknowledged that the TFs helped her adjust to the unanticipated events of the COVID pandemic.

Nina concluded the interview by sharing what she considered significant about her work as a university supervisor in the funded Noyce project. She said the funded Noyce project teams understood each other and worked well together, regularly collaborating to deepen their understanding of social justice and culturally relevant pedagogy. The TFs enhanced their knowledge of multicultural experiences by attending field trips to places such as the Civil Rights Museum and the Edmund Pettus Bridge. The team members also required the TFs to present at

conferences to make their teaching visible and enrich the knowledge of relevant practices in the education community. Nina stated that the funded Noyce project was a unique experience that enabled her to enhance her mentorship abilities and collaborate with teams vested in fulfilling the project's mission to place and retain STEM professionals to teach in high-need schools.

Tamara

Becoming an Educator: Tamara's Lived Experience

Tamara's family emphasized the importance of a good education. Tamara stated she always had an interest in learning new information and excelling in school, discovering a passion for mathematics in middle school. Her sixth-grade mathematics teacher saw her aptitude and challenged her to complete more complex and challenging problems. Tamara stated that her love for math increased in high school. She continued to excel academically due to her aptitude for mathematics. After high school, Tamara attended college and graduated with a Bachelor of Science in Mathematics. Although Tamara initially thought she would become an engineer, her career trajectory changed, and she became a mathematics educator.

In the first interview, Tamara described her education experience, saying she had worked in education for twenty-two years and had recently earned her doctoral degree. Tamara described the grade levels she taught:

> I taught sixth through twelfth grade. I've taught at the junior college level. I taught basic math, college algebra, and statistics. At the high school level, I've taught every math class: Algebra One, Algebra Two, Geometry, Trigonometry, PreCalculus, Calculus, and Statistics.

Tamara provided more details about her teaching experiences and her decision to become a teacher:

> I decided to become a teacher when I was thirty. I worked and graduated from college and majored in math, and I thought I wanted to be an engineer. I wanted to do some technical things. And then one day, I was just sitting at my job and decided, like, "I think I'm going to try teaching for like five years and see how it goes. And then I'll go back to engineering, or math, or technology, or whatever if I don't like it." So, I went back and talked to one of my friends who was a teacher, and she said, "You just need to fill out an application for the job." I said, "OK, but I'm not certified." She said, "Just fill out the application for it," you know, for the next school year, and I said, "OK." It was funny, because it was October of that particular school year, and I'm filling out the application for that school year. So I filled out the application two weeks later, and one of the principals from Oak Grove Middle School or high school called and asked me if I was interested in teaching eighth-grade science and geometry. I said, sure, but I need to give it two weeks' notice. He said, "Well, I can't wait two weeks. I need you to next week." So I ended up giving my employer like a one-week notice, and then I started teaching in the classroom a week later.

After discussing how she became a teacher, Tamara described the people who influenced her to pursue a career in education. She fondly recalled how her middle school teacher and neighborhood members impacted her decision:

> My influence was my sixth-grade math teacher. He would always challenge me, all the time, to do harder problems because I [would] finish my problem faster. There were three of us in that class who got the work done real fast. He always [gave] us challenging problems. And every challenge that he gave, we all did well. He was the person who influenced me as far as liking math. He's the one that really would challenge me to like

math. When I was in eighth grade, I tried to get into the Advanced Algebra 1 class, but they wouldn't let me because they said I would have skipped the seventh-grade math course. I did well in sixth grade and seventh grade. I wanted to take…be on advanced track, but they wouldn't let me when I got to the eighth grade, I wanted to take Algebra 1, but they wouldn't let me. They told me I would not be able to get the math that was required. If I had taken advanced, I wouldn't be on advanced track in seventh grade. So I ended up staying in eighth-grade math. And when I got to high school, I took ninth-grade math, I think it was Algebra 1, and I did really well in that, too. I think I saw my report card [a] couple weeks ago. I think my grades were one hundred, ninety-nine, ninety-eight, or something like that in algebra. Therefore, my teacher told me, maybe I need to double up because I was very fond of math. So, I ended up taking Honors Algebra Two and Geometry my tenth-grade year. Honors Algebra Two was a challenge but I did well in Honors Algebra 2 and Geometry. Then my eleventh-grade year, I took Precalculus. And I was going to take 12th-grade Calculus, but I decided not to take a math [course]. But my influence would be my middle school math teacher. Also, when I was growing up in the neighborhood, I tutored my mom's friend's son. My mom's friend said, "You're such a good tutor. You should become a teacher. And I was like, "Girl, I'm not teaching anyone's kids. So anyway, um I just started tutoring a whole lot. And then when I went to college, my major was engineering. But I didn't really know if I wanted to be an engineer. And I've always found myself either helping somebody with math, or I was in the Disability Support Services, helping the disabled students get math. They would always tell me… I tutored a blind student one time. He said, "You are really good. You need to become a math teacher." And so I was like, "OK, OK, these people keep saying

I'm a good tutor and teacher. But I don't want to teach anybody's children." After I graduated, I realized… I was sitting at work and I kept hearing those voices. So I told myself, "Let me just go ahead and teach math 'cause people do need help." So, yeah. It was really my sixth-grade teacher. It was my neighbor. People in my neighborhood… They liked how I tutored. So with me, finding ways to help people. Even when I was in college with math. So, yeah. My peers, I would say.

Tamara discussed her first teaching experience and the challenges she faced, and how she overcame them:

My first teaching position. When I started teaching, math and science was not a good one at first. Because my concept of math was, "The kids come in, you teach a lesson. As you teach, the kids sit quietly, listen, and practice. And then it's time to go home." That's what I thought teaching was until I got into the classroom. I realized that these kids are not really listening to you, or they are trying to challenge you. At the time, I was in a majority-White school. I didn't know I would be challenged like that, but I was challenged like that. And so, after that first week, I went to the department chair's classroom after school. I literally sat there and cried and told her that I couldn't do this. I told the department chair they would have to get somebody else because I'm not doing this. I thought about calling my supervisor so that he could give me my job back. So she told me not to worry. She said, "It's gonna be OK. We got to give it time." She said, "I'm gonna show you what you need to do." I didn't know anything about a do-now, a bell ringer, or anything because I was emergency certified. And so emergency certified in the state of Alabama gives somebody who has a math degree or a science degree 1 year to teach without certification. After that year, they will have to go and get certification the

next year. So that's what I was doing. I didn't know anything about teaching. I didn't know anything about a bell ringing, a do-now, or a warm-up activity. Nothing. None of that. I'm going to say that the math department chair had to teach me all of that in that year. She taught me how to actually teach. I learned more from her than I probably learned in the program that I was in. So, [it was] getting that experience from her. She said, "I'm gonna teach you this as a warm-up. This is what you do. You give this the first 5 minutes of class. Go ahead and do your attendance while they are doing this. Then you go ahead and develop a lesson plan: how you're going to teach the lesson, what you're going to use to teach the lesson, and how are you going to test them." You know, do assess them, all of that. The department chair taught me all of that my first year.

Tamara also reflected on her first-year teaching experience. She provided additional details of how the mathematics department chair aided her in overcoming the challenges she faced as a first-year teacher:

> She would tell me which resources I need to pull from the closet. She would tell me things that I needed to know, how to teach with technology at that time. But it was mainly looking at resources, reading articles. She told me what to read. And she was probably doing some NCTM stuff, too, you know. I just didn't know anything about NCTM because of the fact that I wasn't going through an education program. So she had to give me resources to help me set up a classroom, all of that. So it was me, you know, having those private sessions with her to really help me navigate through that first year of teaching. Learning the concepts I needed to teach. And then she sent me to… Because she was the math department chair…I [would] have to go to the science department chair and ask, "How do I teach science like this?" I asked, "What do you do? Like, how do you

> give a test? Is it memorization? What is it?" So because science is a whole different area than math—I knew my math, but my science I had to study. I had to learn what I shouldn't be teaching, how I should be teaching, and all of that. The physical science part was a little easy because there's a lot of math in the physical science part. But the eighth-grade integrated science was a struggle, because they learn more of terminology than anything. So it's integrated with everything. You may teach a little zoology, botany, all of that. So, I was like, "How do I teach this? You know, do we just do it for memorization, or what we do?" So, mainly, spending time with those department chairs really helped me to navigate throughout the school year.

Tamara learned the teaching structure with the support she received during her first teaching experience. With the department chair's assistance, she learned how to implement a standards-based lesson, set up the classroom to improve management, and write assessments to monitor her students' progress with the standards she taught them. Tamara transitioned from a rural school[1] to an inner-city public school[2]. She reflected on the challenges she faced during the transition:

> I [was] going to go into an inner-city school. This was totally different. I couldn't believe kids acted the way they acted. So, I when I got there I was like, "Oh, my God. What is going on?" And so, I think I had to learn how to be tough. You know, you say what you mean. And you can't…even look back to see what the expressions were because expressions may not be great. But you say what you mean because if they know you feared them, then they're gonna take advantage of [you]. So that's when I… That's when

[1] Rural school refers to a public secondary school located outside the city limits or a major metropolitan area.
[2] An inner-city school refers to a public secondary located in a major area and with a large representation of students who identify as minorities.

Mr. B was the principal. He hired me to be a teacher at that, that inner-city school. He said, “Look, you might have to be a little tough because it’s a little rough, you know.”

Tamara reflected on her experience teaching at an inner-city school, including its successes and challenges:

> Being in an inner-city school, you[’ve] got all kinds of issues going on. So what I did— I love math so much, I would find all different strategies and ways to teach. I would sit with my math department chair to ask her, “What methods did you use?” I would visit other people’s classes. Whatever I could do to really get my kids to learn math was my goal. And I remember that she allowed me to be like her assistant department chair. And this is my second or third, well, my second year teaching. So she knew that I loved different strategies and using different things in class, and she nurtured that. Like I said, she would let me go to her meetings, and she said, “Hey, Tamara, just bring back what they taught you. Just bring back to a department meeting.” And I did that all the time. I think she was tired. She had been teaching for at least twenty years. So, she saw this Black energetic girl who wanted to come in, look at different ways to teach, go to meetings, and share strategies. She didn’t care because they weren’t going to do the strategies anyway. It was three older people there that [had] been teaching for twenty years. It’s hard to get them to change what they’re doing because they feel like what they do…works, but they love my energy. And so, I would always, you know, always go into those meetings. And then a lot of success came from my students, too. Like, I remember, and this is going to be interesting. Because I remember I used to use this method called “tic tac but no toe.” And I remember going to a professional learning session, and this girl shared it, and it was fun. It was something interesting. So, I went back and I took it back

> to my class. And it was so funny because it— one of the students, he remembers because every now and then, I'll talk to him. But he remembered that "tic tac but no toe" method. Oh, man, he used that. When I taught him, he was in the 11th grade. He used that strategy all throughout his college. He was like, "Tamara, every time I factor something, I remember the 'tic tac but no toe' method you taught." He said, "I used that the whole time. I even taught people in the college, 'This is how to do it.'" And so, that was a success.

Tamara indicated that she began to enjoy her teaching career in an inner-city public school setting. She learned the significance of knowing her students and the skills needed for meaningful, impactful learning. Tamara stated that understanding the prerequisite skills of math concepts enables teachers to fill the gaps students may have regarding mathematical concepts. She believed that the lack of mastery of prerequisite skills may affect how students feel about learning mathematical concepts. Tamara built her students' confidence by encouraging them and praising their effort:

> I had to encourage them because they felt like they couldn't do it, you know? And a lot of times, and that's a lot of times, minority students don't feel like they can really do calculus. And then what I did was every time they got something right, or they're thinking right, we praise that. Like, "Yeah, yeah!!! We got it! We got it!" We were doing things like that so they wouldn't think that they couldn't do it. And it just wasn't my calculus students; it was my other students as well.

Tamara valued building relationships with and learning about her students and their interests. She considered relationship-building with students a significant part of teaching and learning mathematics. Tamara described her impact on students:

> I think it is important, like, when you first start your class for the year that you really get to know your students. I think that's very important. Because if they know you are kind of concerned about how they learn or about them in general, I think they'll do better for you. I've always tried to establish a relationship with students and get to know them. I mean, we'll do activities, I'll ask questions, and I talk to my students all the time about their life. Some of them share[d] their problems; some shared things that they're going through. I think it's very important to really get to know your students because I feel like you can get them to do what they need to do to learn math or to pass a class or whatever. So, I think my impact on my students was getting to know them and supporting them.

Tamara learned she had the most significant impact on her students' learning and mathematics mastery when she made mathematics relatable and created activities that connected to students' experiences. She learned how to collaborate with peers to develop rich, meaningful lessons and use research-based strategies to meet students' learning needs.

Tamara recalled deciding to be a lifelong educator during her second year at an inner-city school. She solidified her decision when she realized how she could support other mathematics teachers:

> I started working in inner-city schools, and I started seeing where a lot of kids needed help. I started seeing how I could support teachers in my department. I was always trying to find all the teachers who taught algebra. We worked together to come up with lesson plans. We were not working individually. That's hard. We all started working together to make it work. So, I started having a lot of good success at the inner-city school, and I realized this is what I'm supposed to be doing. This is what I was called to do, because I always felt like teaching was a calling and I didn't know how long I was going to be

> called to teach. I looked at education as a calling, and every, any time people would ask me, "Why do you teach? These kids are bad." I said, "Yeah, but I look at it as a calling. When God calls me away, then I'm done." But I always thought it was my duty to do this. It's just to teach in school.

Tamara enjoyed working with students in her church and community. As an educator, she found it easy to remain in a field where she could continue working with pupils to impact their lives positively.

Tamara concluded the first interview by suggesting what teachers should know and do. She emphasized the significance of teachers establishing positive relationships and getting to know their students:

> They need to get to know their students and have a relationship with them. That's something I learned. It was a person that shared that with me. He shared that, and that's what made me love those kids. Because we spent time learning how to get to know our students; it's supporting them. If you're having trouble with a student, go support them. If you know they're playing a sport, support them. Go to the game, and then say something about the game that you saw. Pay attention to them.

Through her interactions with students, Tamara learned the value of supporting pupils with mathematics content and taking an interest in their activities outside the classroom. The more she learned about her students' interests, the more she could connect mathematical content to their daily lives during classroom instruction.

In the first interview, Tamara described her teaching experience in secondary schools. She worked as a classroom teacher and a mathematics department chairperson for several school districts. Over her twenty-two years of teaching, Tamara learned the value of building

relationships with student and their families. She acknowledged that meaningful mathematical learning included teachers making connections to the students' daily lives with pedagogical practices and learning experiences relatable to real-life events and students' cultures and communities.

Tamara's Experiences as a University Supervisor

The second interview with Tamara focused on her experience as a university supervisor. Tamara described her experience with higher education and how she became a university supervisor. She previously worked as an adjunct professor for introductory-level mathematics courses. Tamara explained how she started working in higher education:

> I started teaching all their basic-level classes before. We called them preliminary classes or prerequisite classes before they got into the major. And so I taught that for, maybe, two or three semesters, and then I transferred back to the campus at Georgia Perimeter because there was a guy that had been diagnosed to cancer and he was not gonna live, so I ended up taking over his classes. And so, anyway, that's how I started teaching in higher education.

Tamara's first experience as a university supervisor was the funded Noyce project. In the Noyce project, she worked as a university supervisor while pursuing her doctoral degree at the same higher education institution. Before starting in the university supervisor role, Tamara worked as a teacher's assistant with other university faculty as the TFs completed their required coursework in the teacher preparation program. Tamara learned about the university supervisor position for the funded Noyce project after returning to school to complete the doctoral program:

> When I came back to the program, I didn't know what I wanted to research. And she told me to look at this program that she started, which was the funded Robert Noyce. She told

> me to look at the project. So I looked at it, and I told her I was interested, and she said OK. So from there, after I taught that one semester, she asked me was I interested in being the university supervisor to help the second cohort that was coming into the program. So, I actually was a TA and a university supervisor. I was a TA the sumer that these new students came into the program. And then I became a university [supervisor] and a TA the fall semester. So, for some of them, I was their university supervisor, and then I was a teacher assistant in two of the classes. They started— I mean, they took sumer courses and started student teaching in the fall. And then the next semester, I was pretty much their university supervisor and not a TA anymore. So that's kind of, like, how I got it to be involved in university supervision.

Tamara sought the university supervisor position after her advisor asked if she would like to work with the project team members and participants.

The participant described the additional factors in her decision to become a university supervisor. Tamara also decided to serve as a university supervisor due to her previous experiences with supporting teachers:

> I've always wanted to help teachers from me teaching a while. I was always a department head or lead teacher, or some mathematics specialist that I was assigned by my principals to actually help either new teachers who were coming into the field or new teachers who were hired at the school. So I was constantly being asked to help them. And so, I was like, well, if I've done this, then the university supervision or coach would be kind of [up] my alley because I know how to work with people and work with teachers on the lesson plans. Because I was a coteacher to one of the new teachers who came in who was not certified at one of the schools I worked at. And so, I would pretty much tell her— We

would sit down and plan the lessons together. And we— sometimes we taught together. If I was off a period and I had to go in there and her coach, I would. I would teach a lesson. She would teach a lesson; sometimes we would teach the lesson together. So I was already doing some type of coaching at these different schools. So, it was easy to make that transition into, you know, being a university supervisor.

Tamara discussed the professional learning she received or participated in to prepare to mentor preservice teachers. She did not have any formal coaching on mentoring preservice teachers, instead learning how to mentor on her own:

Did I have some coaching myself on mentoring? Um…and I'm trying to see if I can relate that to… I [didn't] really have any kind of coaching. Nobody took me through a program. What I learned was pretty much on my own. I would always listen to, you know, different… I always felt that I was… I never thought I was a leader. I just thought I was really good with helping others to be their best or do their best. So, I would always listen to things, like, anything that relates to being a leader in school. So, I'm always reading. I have this math coach book, so before I even started coaching, I would read on how to work with people effectively. When I first became a department chair, I would…and, actually, that was hard to because my second year or my third year of teaching, I was my department chair assistant. I would go to all the meetings, because my department chair didn't want to go to the meetings. She had been teaching for twenty-something years. She was trying to retire. So I would go. I would go to all her meetings, and then I will come back and always present it back to the department. And so, the younger ones that were teachers, they would pretty much adapt to what I was saying. I had always had a problem with the older ones that had been teaching longer than I had,

because this is my third year teaching and these people [had] been teaching for twenty or more years. So they felt like— They didn't really want to change anything. So I knew that…going in, it would be mostly me helping the younger ones that started teaching or hadn't been teaching as long as I have, or maybe five years or less. But I could give some, I could help them in some kind of way. So, once I started doing things like that, it kind of led me to see that I was good at helping people. So then I started to think about how I [could] help people and how I [could] work wit people more effectively. So that's when I got into my John Maxwell books about being a leader inside that… There was a three-hundred-sixty-degree leadership book that I read. I didn't read all of it, but I read most of it. So, it teaches you how to be a leader when you are in the classroom, so I thought that being a leader in the classroom would be where I [would] start. If I wanted to help people with math or help teachers with math. So, that's kind of like where I started. But I've always educated myself.

Tamara also found additional resources to develop her leadership and interpersonal skills: I became a math department chair, and then we start[ed] having more teachers to come in who had not taught. And at that time— I think this was my fifth or sixth year teaching. They hadn't taught, and so I was constantly helping them find strategies. We would find strategies. We were doing all kinds of things to really help. So when I started doing all of that help, I started looking at how to make myself better. I would read Joel Osteen's book, how to become a better person, how to make yourself…have influence. That's another book from John Maxwell. You know, how you get people into… I guess it's just the power of influence. How you get people to see what you're saying, to understand

what you are doing, to listen, and to how you break things down. It was always me learning on my own on how to be a leader.

Tamara turned to scholars such as Osteen and Maxwell to become a better leader and influential mentor for teachers.

Next, Tamara described her unique qualities for mentoring teachers. She stated that she used her communication skills to promote reflection and help teachers use research-based strategies to foster students' conceptual understanding. Tamara shared specific examples of how she communicated with teachers to support their pedagogical practices:

> I would say the way that I communicate to them, I never make someone feel bad. Even if they use a strategy that I disagree with. If I disagree, I may say, "I see how you did this. Have you thought about a different way of explaining this? I ask because there are several other ways." And sometimes they'll say "No" once you explain another way, or they'll ask, "What is another way to explain this?" I'll say, "Well, the kids learn from prior knowledge." I always made it my business to go back to see how the students were learning back in earlier grades, so I'll say, "If you go back and you think about how they learned how they multiply numbers, they use this method called the array method." And I said, "When they used the array method, they split the numbers into place values, which gives them a better— or they can multiply ten times ten. And everyone knows that's one hundred. So they know how to multiply those kind of numbers. But when it comes to thirteen times fifty, then they try to do it alone when they mess it up." I say, "So, the way that they multiply these numbers and put them into place values and put them in a chart and multiply is [the] same kind of way you can do this, when they are multiplying either binomials or even if they're factoring trinomials. They can do it the same way." And, so,

> it's the way I talk to them. And I explain to them; I never make them feel bad about anything. And I'll tell them, you know, "I used to do this, too. I used to have all these methods." So, that's why I learned all these tricks and trades from attending math department chair meetings back when I first started teaching and attending conferences because they would teach us all these different methods. And I would try to figure out, "Why [does this] work like this? Why does it work like this?" So, I always say, from my experience, "Yeah, I did that, too."

As part of her communication strategy, Tamara asked questions to encourage preservice teachers to reflect on and adjust their practices to connect to students' prior knowledge and learning needs.

Tamara's Experience With the Funded Robert Noyce Project

Tamara discussed her experience as a member of the funded Noyce project. She had begun working as a university supervisor with the second TF cohort in the project and spent the first few weeks learning about the project and her roles and responsibilities as the university supervisor. In addition, she learned about TFs in the program and developed her understanding of the opening school experience:

> I guess spending a lot of time talking about the students that we had, and what are they, their strengths and weaknesses. I guess…I don't know… It taught me more about what I didn't know…like, working with them and working with the curriculum and working with the curriculum in the practicum. I learned how important it was to really know [the] environment your school is in. I learned that in the opening… They called it the opening school experience. And it allows the students to research where they will be teaching, and do a really a thorough research, you know, looking for, you know, how many…if this is

> [a] mainly Mexican, or African American, or whatever environment. What's surrounding… What are the communities that [we are] are serving? Who are the people in these communities? What is going on in the community? I guess I can say that I learned how important that really was when [I was] teaching students. I felt like it was, for me, it was more of a learning opportunity…to learn more about the things I did not know, and, at the time, understand why they have open school experience. If you grow up differently from the community that you are teaching in, then you do need to know something about the community, because you would think…and I think that was one of probably my biggest problems. When I was teaching in the inner-city school, when I first started teaching my second year— I can understand why we have students that like this and what was going on with education. And I think if I had to study my community, in knowing, you know, the people that I was serving, it [would] make me understand and, you know, understand my position a little bit better. So I felt like it was more of a learning opportunity, you know, with the team. I learned a lot from just being in that environment.

During her tenure as a university supervisor, Tamara researched NCTM's positions and theories of effective teaching practices for her doctoral degree. As a result, Tamara familiarized herself with the NCTM's theories and practices for effective teaching and learning. She used this knowledge to support the TFs during the clinical experience. As the interview continued, Tamara explained how her work with the funded Noyce team further contributed to her understanding of standard mathematical practices:

> I think I had a better idea of how the standards came into play and how the state adopted them. I had my whole understanding, and all of that became clear. My understanding of

why these standards are here. And they're really looking at standards and understanding what they meant. Even with the standards for mathematical practices, understanding those a little bit better, why we need those in the coursework. It really helped me when I was helping the students in that program plan their lesson. Or if I observed a video or something that they taught, I was able to see if they brought out any standards of mathematical practice. Or even just looking at a part of the lesson that they taught, I would ask where they could have brought this out. It just made me a little more aware of how important knowing what the standards are in their teaching is, even I don't even know. When I finished the program with them that first year, when I went back into the classroom, I was able to look at myself and look at my own teacher and say, "Hey, Tamara, are you using the Standards for Mathematical Practice?" So I felt like it was more of a learning experience that I was getting from the people in, from the team. I was able to look from outside. I was looking at these students and the way they were teaching and the way they were doing things and trying to see how they could do something better.

Tamara recalled the first time she mentored a TF in the funded Noyce project. For mentoring during the clinical experience, she observed TFs facilitating online instructions due to the COVID pandemic. She described how the virtual observations impacted her mentoring of the TFs:

> That was interesting. The first, I guess, the first time…I'm trying to see did we do— We didn't do supervision online we…we did it by… They had to upload a video. So I had to watch every, every video before we even [made] any live… Like before, we would get the Zoom or the Microsoft Teams. We had a code to go into the classroom. So it wasn't… It was not like interaction with them, like, me actually seeing them. I saw them.

> My first encounter with the students was when they had set up the times that we would observe their classroom, so… And it was a different experience, because I was…we were totally online…on a video. And so…are you saying what was my, my experience seeing them on the video? Because that's when I first saw them teaching as far as [my] being in the university supervisor role. I'm trying to figure out, like, what my experience would be. …Pretty much, they send me their teaching video where they upload in a Torch. I would go into the Torch program, and I started watching the video. And I was just take notes on what I saw or what I observed. And then once I took notes on what I observed, I [would] go back, kind of, like, over the notes. And if I had a question about anything, I would rewind it and then I would say, "What was he thinking here? What was he saying here?" Trying to understand it, you know, from the teacher perspective. Then I was able to… After I took notes, I was able to give suggestions…on the side, such as [he] needed to be more clear here. If I didn't understand it, then I knew the students didn't probably understand it, either. And I was not trying to… I was mostly trying to be the student, in a sense…listening to the instructions, listening to what they were teaching. I was trying to see if I understood as a student, not even being a supervisor, or even as…being an observer. I was trying to go through the lesson first and see if I'm hearing it right.

After observing the TFs' online instruction, Tamara provided meaningful, impactful feedback. She required the TFs to review the recordings of their classroom instructions to reflect on what they did well during the lessons and what areas of the instructions needed improvement.

Tamara mentioned the similarities and differences between observing instruction virtually and physically. She looked for the components of standards-based lessons during classroom observations in both settings, such as how TFs engaged students in meaningful

learning, allotted wait time for student responses to teacher questions, and assessed student learning. Tamara noted that the TFs' dispositions varied during virtual and face-to-face observations. Therefore, she sought to aid TFs with being more comfortable and authentic during classroom instruction:

> For some of them, it was a little nervous. You know, they were a little nervous when I would come in there. I did see some of that but the majority…of them because I had, like, I mean, so, I had seven of them. But I did see some nervousness. When, physically…if I'm in the room, I felt like they were trying to be exact and perfect and things like that. So, you know, when I converse with them about the things that I saw, whatever, you know, like, I always tell them, like…be yourself, you know. If somebody's acting up [in] class on the video, address it, you know. I'm looking at all of it. It is not just how you manage classroom discipline, it is how you give assignments—you know, is your wait time too long. So…it was different.
>
> The nervousness— Sometimes you forget you're being recorded, but when you, when someone's in the classroom, I feel like they were more trying to make sure that they were communicating…things correctly or doing things right and all this kind of stuff. And I just told them, I said, "I need to see you…doing…" Not necessarily, you know…you know how it is when somebody comes in the classroom, and I'd be like, "Oh, you know, you're trying to say stuff, right? OK, y'all need to make sure you do this, and y'all need to make sure you…oh, don't forget to do, you know…you're trying to make sure you're covering standards. Make sure you have a warm-up and make sure you…" It was like that in some of them…[I] would [not] say all of them…but the ones that I feel that needed more support. They [would] act [nervous]. They had it together when I

> [came] in, but even with me just sitting there, I just noticed that one guy, he talked all the time.

Tamara did not always have the opportunity to meet some of the TFs in person before she observed them virtually, sometimes learning about their instructional practices before meeting them in person.

Tamara described some of her successful and challenging experiences working with TFs in the funded Noyce project. She recalled mentoring a TF who needed support with balancing her personal life, responsibilities, and program expectations:

> And I said, "Oh, geez, that's how I'm gonna handle this?" So I was like, "Look, first of all, I need you to breathe." Because she was stressed out, she was… She was doing and she was working another job and trying to do this program and trying to do her work. I said, you know, going to do all of that… "Because this is a fast-paced program, I'm gonna need for you to just, you know, stop." And because, I think she was doing hair—…hair was [her] second job because when she braids hair, she gets money. And I said, "You're gonna have to…figure something out."
>
> So she eventually came around, but it was me… [One] time I found out she didn't turn something or didn't do something else. I'm like, call[ing] her, say[ing], "Look, I need you. So I'm probably gonna get on your nerves, but I'm trying to help you out. So I need for you to do it." So she came through because it was… It was a threat, you know, that she was gonna get kicked out if she didn't do it. So I think just listening to her and, whoo, Lord, it was a lot…listening to her, help[ing] her get through some things or think through some things that she needed to change. And she was always good with our classroom. So, finally, she completes the program. And she pretty much [said], "Thank

you so much for supporting [me].” She said, “I know, I was crying and going through all this.” She did graduate.

Tamara also mentioned successfully supporting TFs needing more support with teaching strategies for secondary mathematics:

> They were like, um, yeah, we need more math, you know. I’m thinking like, OK, y’all haven’t even complained about anything. But anyway, so I went ahead and kind of… I was the spokesperson for, you know, all of them. I said, “We need to have some professional math development.” And so, it was mostly when we go into these professional learning [sessions], we’re talking about science. And so, they were getting a little upset. So I had to be the mediator and say, “Hey, we need to have [our] own.” I said, “Can they can we split this? Can we have our own professional learning? Or when we do professional learning together, can we have, like, a math part in it and a science? Because right now all we see is science, and that’s a little annoying.” And so, we ended up changing it second semester.

After recalling some of her successes, Tamara described her challenges as a university supervisor in the funded Noyce project. She recounted supporting a preservice teacher who needed additional support with mathematical pedagogy:

> I am thinking [of] one of my students, the one that was having struggles. The one that was outspoken. She wanted pedagogical knowledge. She didn’t need content knowledge. She understood the content. She needed to know how to teach this, and she would make it known every time: “I need strategies on how to teach this.” And so, we would sit down at times, and, you know, talk about what she’s teaching. And if I could give her any type of suggestions or strategies, then I would tell her, you know, it could have been, “Maybe

don't present it this way. Present it in another way. Make sure you're showing some type of…" Because she was…geometry… That was not her strong subject.

Despite the challenges, Tamara expressed how much she enjoyed and appreciated the opportunity to support preservice teachers in the funded Noyce project.

Tamara stated that the funded Noyce project enabled her to expand and enrich her views of university supervision:

> I learned a whole lot just about teaching in general that I didn't know. I had never seen, like, the eight teaching practices. So I was learning that. I'm like, "Where did they come from?" It kind of made me go back and really want to look at all NCTM stuff when I was actually, you know, supervising them. I would go and look on purpose. And I didn't have to do this. This was not part of the program. But I was more of the support for them. So if I see one of the students having issues with differentiated instruction, well, guess what I'm gonna do? I'm gonna go to NCTM. I'm gonna look up anything they have on differentiated instruction, and I'm gonna send— I'm gonna read it first, and I'm going to send that article to them. So, even when I'm having a meeting, I can say, "Hey, you know, Pam, you had problems with, you know, you've been trying to find some differentiating instruction ways. So did you read the article? And let's talk about [it]."

Tamara reported turning to the NCTM literature for the best practices preservice teachers could use to support learning mathematics, implement research-based strategies, and model mathematical concepts using multiple representations. She discussed other frameworks she used to guide her university supervision responsibilities:

> The only framework I know we use is Danielson. But that was mainly to observe and evaluate them. That's all that Danielson to me was. I don't feel like Danielson's was

something that I use to help me supervise them or anything like that. It was more of a check-off: did they do this, [did] they do that. But I really use the NCTM principles to guide me. It wasn't just NCTM. It was the people that wrote, some of the authors that were coming out of NCTM, like Smith and Smith. They talked about lesson planning. So, even though it was a NCTM publication, but it was a different author, talking about how they…plan their lesson, how they teach their lesson. So anything that I saw that, you know, that I saw in the NCTM website that had a different author, I [would] go to them and look to see if they [had] any books, you know, where they…could help my students or my mentees or whatever you want to call them, or the teacher interns…with they were doing in the classroom.

The literature, her teaching experiences, and the Noyce project structure significantly influenced how Tamara mentored and supported the TFs in the funded Noyce program. She said,

Okay, so my experience… I'll start with [my] experience as an educator again. I already had some type of coaching experience coming into this, you know, coming into this program. So I knew how to communicate with my people, because I've always done that well, with when me being a department chair. I knew how to help them. And even with me…being the math department chair, if any of them had any issues with anything, teaching a concept, using technology or whatever, I was always there to help them work [and] guide them. If I find better ways to teach stuff, I send it to everybody in my department. So I was always, I mean, always doing that, no matter what school I was working [in]. So, I knew I was a pretty good, you know, good helper and a good listener as well. Any problems they have with students, we try to figure out how to handle that,

you know, what we would do with that. So communicator, helper, listener—already had those skills coming into the program.

The structure of the Noyce project gave me some guidance as, you know, being the university supervisor. I enjoyed when we figured out what type of professional learning we would provide for the math students. I did enjoy that because, like I said, I was learning as well as teaching them. So when we got to present on, for example, technology. And so we will have to figure out like what we were going to present as technology like effective technology use in the classroom. So I enjoyed [it]; it was just us working on what we presented. We [would] just get it approved or what we need[ed] to change. But we were always, you know, for those eight—I think we had eight sessions. I can't remember, but I think it was eight sessions—we will have to get together. I did like that structure because I felt my students that were in the program really liked that because they were able to, you know, voice their opinions, voice what they were going through.

Tamara reiterated that she relied on the NCTM literature because it aligned with the standards and pedagogical practices for teaching and learning mathematics.

As the interview concluded, Tamara shared what she found significant about the funded Noyce project. She highlighted that one of the project's essential components was participants entering the program from other STEM professions. She considered the participants' backgrounds significant to their work as TFs:

These are students who are coming from professional careers. And some of the things that stood out: some were engineers, some were in the computer industry, some were form other industries. Those skills stood out, but I just felt like some of them didn't know how to bring those skills into the…classroom. So, I would say…that their skill stood out.

> Like, one particularly; he was a project manager over different programs. And so his skills stood out. He was able to use those. I did see him using those; that's a skill set. And, like, when he taught seventh graders, you know, in the class, and he would bring in, like, "I am the CEO of Home Depot," you know, he would bring in word problems that relate[d] to what he did in the real world.

Tamara described feeling excited and intrigued to observe the TFs bring and incorporate their knowledge from their other careers into their mathematics lessons to help students connect content knowledge to real-world experiences.

By working with the funded Noyce project, Tamara increased her knowledge of mentoring and supporting preservice teachers during the clinical year. She indicated the need for more programs like the funded Noyce project to recruit, prepare, and retain minority teachers in high-needs schools. Tamara considered the funded Noyce project successful because of the leadership team's collaborative efforts. The leadership team ensured the university supervisors and TFs had adequate support to meet the project's goals and the needs of the local school districts and communities in the project.

Summary

According to hermeneutic phenomenological research theories, comprehension and understanding are the foundations for interpretation. The stories of Angela, Arlene, Nina, and Tamara, as presented in Chapter Four, provide accounts of their experiences as university supervisors. It was essential to understand the participants' perspectives of their roles as a start to interpreting their lived experiences as university supervisors during the clinical year. By interpreting and analyzing the research participants' experiences, I have expanded my

understanding of their work as university supervisors and further developed how they mentor and support secondary preservice mathematics teachers during the clinical experience.

5 DATA ANALYSIS

The purpose of this study was to describe and interpret the lived experiences of four university supervisors who mentored and supported secondary mathematics preservice teachers during the clinical year. The analysis of the research participants' lived experiences as university supervisors produced themes that aligned with the following research questions:

RQ1: What are the lived experiences of a university supervisor while supporting preservice teachers of secondary mathematics during the clinical year?

RQ2: What mentoring strategies do university supervisors use to support the development of well-prepared beginning mathematics teachers?

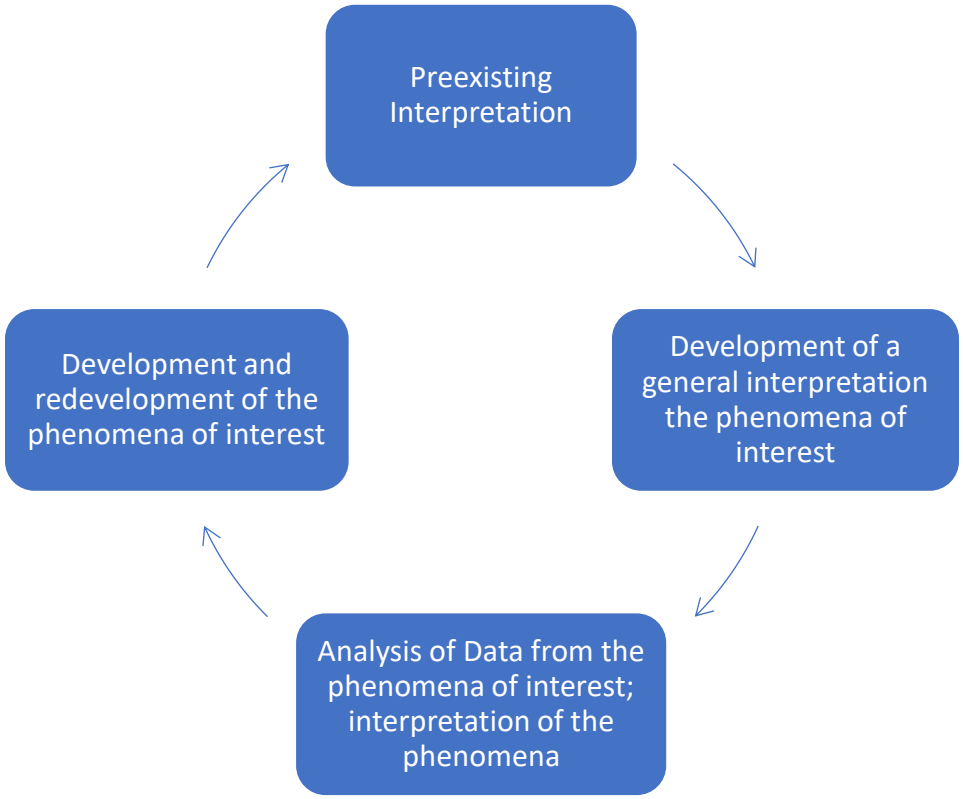
The data analysis was a means to describe and interpret each participant's lived experiences as a university supervisor during the clinical year. I conducted three one-hour interviews with each participant. The first interview focused on each participant's trajectory to becoming an educator. The second interview was specific to the participants' lived experiences as university supervisors while mentoring preservice secondary mathematics teachers during the clinical year. The second interview occurred in two phases: Phase One focused on the participants' experiences as university supervisors outside the funded Noyce project, and Phase Two pertained to the participants' roles in the funded Noyce project. After each interview, I transcribed the recorded responses, providing a copy to the participants to review for validity. The third interview was for member checking, as I posed follow-up questions based on the participants' responses to the first two interviews. The participants clarified their responses as needed.

Coding and Data Analysis Using the Hermeneutic Approach

In a phenomenological hermeneutical study, the researcher seeks to understand and interpret the lived experiences of a given phenomenon or event (Dibley, 2022; Ezzy, 2002; Peoples, 2021). Data analysis using a hermeneutic approach requires understanding the phenomenon as a whole, then as parts, and redeveloping the understanding of the event as a whole (Dibley, 2022; Ezzy, 2002). Phenomenological researchers may use a hermeneutics circle throughout the data analysis process to develop an understanding of the phenomenon in parts and as a whole. See Figure 1.

Figure 1

Hermeneutics Circle



I was the investigator seeking to interpret and understand university supervisors' lived experiences. Therefore, I used the hermeneutic circle to analyze each participant's responses to the interview questions in parts and as a whole throughout the data analysis process.

The data analysis commenced with reviewing the transcribed interview responses, with line-by-line coding used to identify meaningful statements from each participant's experience. There is no correct way to begin initial coding; the researcher has the autonomy to select a coding process that best fits the scope of the research (Dibley, 2022). The purpose of this data analysis phase was to make sense of each participant's becoming as an educator. I sought to understand each participant's teaching experience as a segue into their university supervisor roles. After analyzing each participant's interview responses separately, I reflected on and developed a collective understanding of their teaching experiences as a whole.

Analysis of the second interview transcripts included line-by-line coding to find meaningful statements from each participant's experience. This data analysis phase involved making sense of each participant's experience as a university supervisor. Transcript analysis occurred in two parts: the participants' roles as university supervisors outside and in the funded Noyce project. After analyzing each transcript, I reflected on the participants' responses as a whole to create a preliminary understanding of their experiences as university supervisors during the clinical year.

In the beginning phase of data analysis, the researcher develops a superficial interpretation of the phenomenon of interest (Dibley, 2022). Each participant in this study received copies of their first and second interview transcripts to review before taking part in the third interview for member checking. During the final interview, the participants verified the accuracy of their responses from the interview transcripts and answered follow-up questions to

clarify their experiences becoming educators and university supervisors. After the third interview, I reread the transcripts and revised my interpretation of each participant's experiences based on member checking. Afterward, line-by-line coding occurred to identify meaningful statements from the participants' responses. Tables were the means of organizing the participants' responses and corresponding codes. I wrote interpretative sumaries to understand each participant's experience in parts before interpreting and sumarizing all the participants' experiences as a whole.

The Research Participants' Becoming as Educators

Effective university supervisors should have successful and sustainable teaching experiences before mentoring preservice teachers during the clinical year (AMTE, 2021; Cuenca, 2010). I began understanding the participants' experiences by learning about their becoming as educators from the first interview transcripts. The following tables include significant excerpts from each participant's responses and an interpretive Summary of each participant's trajectory as an educator and what the participants suggested teachers should know and do during the clinical year.

Table 2

Angela's Becoming as an Educator

Category	Response
Influences to become an educator	I had several people in my family who were educators who are role models for me.
	The superintendent came and spoke to our senior class. And he was really the person that inspired me to become a teacher.
Decision to become a lifelong educator	I knew that I wanted to be a lifelong educator once I had that sumer experience with the students.
Successes and challenges as a first-year teacher	I remember being able to connect with my students.
	I also remember just the overwhelming feeling of just all of the responsibilities that went into teaching.

Category	Response
	I learned that early in my career, like, you really have to be prepared because if you're not, they know it. And they will capitalize on it.
	I think another thing was probably, in addition to making sure that my students were accountable for their learning, was being able to design instruction where they collaborate more together.
Positions held in K–12 schools	Classroom teacher, instructional coach, and middle school administrator
Impact on students	I will tell you that the way that I can judge the impact is based on the fact that I still keep in touch with students today.
	I think that's really one of the really good payoffs of being a good teacher is to see the fruits of your labor and the fact that your students are successful in life.
What teachers should know and be able to do.	I think that teachers should, first of all, know the community that they serve.

An Interpretive Summary of Angela's Becoming as an Educator

Angela became interested in teaching due to family members who were educators. While studying at a private historically Black women's liberal arts college, Angela reaffirmed her decision to become an educator after hearing a local school district superintendent speak about the profession. Angela obtained her first teaching experience in a sumer program, where she found her zeal for education. She attributed her success in the program to collaborating with other mathematics teachers and decided to become a lifelong educator after the program. In her first year as a classroom teacher, Angela naturally connected with and taught in ways that resonated with her pupils.

Despite successfully connecting with her students, Angela felt overwhelmed by her teaching responsibilities and learned to adjust to her role through trial and error. During the first year as a classroom teacher, she worked closely with an assigned mentor teacher who helped her overcome challenges and obstacles. Angela learned the power of being positive, maintaining high accountability, and preparing to deliver meaningful instruction. The participant worked as a

classroom teacher, instructional coach, and middle school administrator throughout her educational career. She believed teachers could see their impact on students in the fruits of their labor, such as students obeying and succeeding in class and life. Based on her experience in education, Angela asserted that teachers should know the students and communities they serve and plan lessons around students' interests.

Table 3

Arlene's Becoming as an Educator

Category	Response
Influences to become an educator	I'm just going to tell you, my mother made me become a teacher.
	It was mainly my mother because even when I graduated from college, she always said she wanted me to be a teacher. And she always said she prayed that I became a teacher because she wanted a teacher in the family… I was like, OK, low pay, low wages, but OK, sure. But even when I started teaching, I did have a couple of extended aunts that were educators.
	[My aunt] really influenced me more on the social activism–type part, getting me involved and doing things once I was teaching and in the classroom, getting me involved with, you know, doing NAACP, serving in different roles for that as well.
Decision to become a lifelong educator	It was a family, or…we were like family, it was like we were family that we didn't, it was a high school, but they treated it like a family situation. So really just having the conversation and listen[ing] to your principal say, you know,… "This is it. This is you. This is what you need to be doing. This is your destiny and journey." So just having that confirmation for someone who had already been in education for a long time really was an "aha."
Successes and challenges as a first-year teacher	One of the things that, I think, and that was natural is that I've been building a rapport with the kids, listening to kids, knowing the kids' journey.
	I think some of the challenges [were] that I was a long-term sub, so I probably things that I tried— I tried based on my experience and, you know, as a student, and things of that nature. But I think if I probably would have had more, I mean, training, but more information, I probably would have been okay, being a better teacher in that short period of time.

Category	Response
	But I think that one of the challenges is going in cold turkey and not having, you know, the background or having the, you know, the knowledge. I had the math but not…the educational pedagogical knowledge that was there.
	One of the things I learned…is that you always have to be involved with the student and think about content. I think that you have to… They have to see you as [having] been invested in their lives. And it's not just about teaching the content. So one of the biggest takeaways that I took away from that experience is making sure that I looked at kids as humans and not just a number, not just a test score, but really [being] involved and connected to the kids and students.
Positions held in K–12 schools	Classroom Teacher, Instructional Coach
Impact on students	Being involved in kids, that had a lasting impact. Volunteering to coach for free. Like, I never danced in my life, but I was the dance coach, dance line coach, always, you know, just giving. I think that had a lasting impact, because giving back, I was the math team coach, like, I did sponsor proms. So I think the lasting impact, even though you have to go up beyond not just outside of the classroom, so I really make an impact and when kids see that you're involved and invested in them.
What teachers should know and be able to do.	One thing I think teachers should know is that it's all about relationships. I think they should be able to build relationships with their students, build relationships in the…whatever teaching environment…you're [in]. Content comes easy, but it's building that relationships with the students and with the stakeholders. I think that's one of the things that's the most important.

An Interpretive Summary of Arlene's Becoming as an Educator

Arlene became a teacher due to her passion for working with children. Her mother and aunt also influenced her decision to pursue a career in education, and her aunt encouraged her to use her career in education to pursue social activism. Arlene's first teaching assignment was as a long-term substitute teacher in a local public school district. However, she entered the field with minimal training and knowledge of mathematical pedagogy. She found the lack of formal training challenging and often tried to teach courses based on students' interests and her own

student experiences. Although she started her career without a clear renewable teaching certificate, Arlene found research-based strategies to make learning meaningful for her students. She attributed her success as a first-year teacher to a willingness to research ways to help her students learn mathematics.

Throughout her teaching career, Arlene learned the importance of becoming involved in her students' lives. She realized that students are people with more to their lives than assessment results and tests. Arlene learned to be part of her students' lives but not to the point of overconsumption. After completing her initial teacher certification, Arlene continued to serve as a secondary mathematics instructor and developed her pedagogical skills to meet students' learning needs. During her third year as a classroom teacher, Arlene realized teaching was her destiny and decided to become a lifelong educator. She continued researching ways to motivate and engage her students in learning mathematics.

Arlene served as a classroom teacher and instructional coach throughout her tenure as an educator. She believed teachers impact their students' lives by contributing to their development as whole students, moving beyond the content by becoming involved in their lives, and knowing their interests. Arlene affirmed that teachers should possess strong content knowledge and deliver the content to meet students' learning needs. Although Arlene valued content knowledge, she emphasized the importance of effective teaching and learning over content knowledge and standardized test preparation. Teachers should build meaningful relationships in the learning environment and understand the value of relationships with students and stakeholders in the learning community.

Table 4

Nina's Becoming as an Educator

Category	Response
Influences to become an educator	I always wanted to be a nun teacher. …I always kind of thought I wanted to do that.
	I saw a movie called To Sir with Love. And I fell in love with it. And I wanted to be that person because [of] how much he changed the lives of the kids he taught.
	And my parents, you know, wanted me to get an education, so we're all for that.
Decision to become a lifelong educator	Well, I told you, I knew what I wanted to pursue when I saw the movie *To Sir with Love*…but I knew when I became good at like, when, when I was the magnet teacher at a high school, I knew then I was good. I would have chill bumps…when I taught. It was never the money I made. It was the connections I [was] making and how well I taught something and…I knew the kids were getting it.
Successes and challenges as a first-year teacher	I would say my success was my willingness to work hard to be better. And their willingness to keep on, right, and, of course, my challenges. I was a teacher, going to school at night, [a] brand new teacher going to school at night. Without induction, and the end, you know, the way— I guess induction was hanging out in the teachers' lounge and [trying] to get a friend. But that is just very toxic. Because it's not productive friendship.
	But what I learned after the fact is that you don't have to be a know-it-all, especially in abroad study. Like, I didn't have to 100% know all of world history, every country, every year, every whatever. I didn't have to [know] 100% on the same day.
Positions held in K–12 schools	Classroom Teacher, Teacher Academy for Preparation and Pedagogy (TAPP) Coach, Professional Learning Coordinator
Impact on students	I am lucky enough to be able to tell you that the impact I have on students is that students who are grown, they make an effort to say hi to [me. I] know that [I] made a difference.
What teachers should know and be able to do.	Connect learning to real-life experiences, you know? And that is huge…because with that you draw real-life experience, [which] means you draw on the community. Real-life experiences, meaning parents or your partners. Real-life experiences is having the kids realize what you're learning makes sense in their life. So that's huge to me.

An Interpretive Summary of Nina's Becoming as an Educator

Nina realized she wanted to be a teacher as a high school student, and her parents supported her decision. She also gained a desire to teach from the movie *To Sir, with Love*. Nina admired Sidney Poitier's role in the film and wanted to impact students similarly. Nina entered her first teaching experience without formal induction or mentorship from the school district. She joined the teaching profession with a clear renewable teaching certificate and took additional courses to add to her teaching certificate. As a first-year teacher, Nina struggled to adjust to a classroom of students who all identified as Black. She also found it challenging to ask colleagues for help, fearing to expose her vulnerability. However, Nina took it upon herself to seek assistance from an assistant principal who provided advice and suggestions, enabling her to develop professionally and learn practical ways to create meaningful learning experiences.

In her first year of teaching, Nina learned the value of knowing her students and creating opportunities to connect student learning to real-life experiences. Nina indicated that students do not care how much content knowledge teachers have until they know they care. She attributed her success to her willingness to work hard and find resources to become a better teacher. In addition to the movie *To Sir with Love*, serving as a magnet teacher and becoming a nationally certified teacher impacted Nina's decision to become a lifelong educator. Nina worked as a classroom teacher, a mentor teacher for preservice teachers, and a professional learning coordinator throughout her educational career. She believed teachers impact their students' lives by engaging them in field trips and creating teachable moments to connect learning to real life to make learning meaningful.

Table 5

Tamara's Becoming as an Educator

Category	Response
Influences to become an educator	My influence was my sixth-grade math teacher. He would always challenge me, all the time, to do harder problems because I [would] finish my problem faster.
	my influence would be my middle school math teacher.
	It was really my sixth-grade teacher. It was my neighbor. People in my neighborhood… They liked how I tutored.
Decision to become a lifelong educator	I started working in inner-city schools, and I started seeing where a lot of kids needed help. I started seeing how I could support teachers in my department. I was always trying to find all the teachers who taught algebra. We worked together to come up with lesson plans.
Successes and challenges as a first-year teacher	When I started teaching, math and science was not a good one at first. Because my concept of math was, "The kids come in, you teach a lesson. As you teach, the kids sit quietly, listen, and practice. And then it's time to go home." That's what I thought teaching was until I got into the classroom. I realized that these kids are not really listening to you, or they are trying to challenge you.
	And so, after that first week, I went to the department chair's classroom after school. …I didn't know anything about teaching. I didn't know anything about a bell ringing, a do-now, or a warm-up activity. Nothing. None of that. I'm going to say that the math department chair had to teach me all of that in that year. She taught me how to actually teach. I learned more from her than I probably learned in the program that I was in.
	Well, I guess a success would be me, um, me understanding the whole the way you teach and then the structure of teaching to [a] standard basis, you know, of education. You know, I did not know that at the beginning. But at the end of that year, I knew how to…set up a classroom, and it's just learning from the department chairs, to be honest.
	I think it is important, like, when you first start your class for the year that you really get to know your students. I think that's very important.
Positions held in K–12 schools	Classroom Teacher, Mathematics Department Chairperson

Category	Response
Impact on students	I've always tried to establish a relationship with students and get to know them. I mean, we'll do activities, I'll ask questions, and I talk to my students all the time about their life. Some of them share[d] their problems; some shared things that they're going through. I think it's very important to really get to know your students because I feel like you can get them to do what they need to do to learn math or to pass a class or whatever. So, I think my impact on my students was getting to know them and supporting them.
What teachers should know and be able to do.	They need to get to know their students and have a relationship with them. That's something I learned.

An Interpretive Summary of Tamara's Becoming as an Educator

Tamara became a teacher after changing careers. A middle school math teacher influenced her decision to become a mathematics teacher, and she entered the profession with a 1-year teaching certificate. Tamara had experience tutoring students in her community before starting her teaching career but had not completed a state-approved teacher certification program. During her first year as a classroom teacher, Tamara taught middle-grade mathematics and science courses. However, she felt overwhelmed with her teaching responsibilities and did not fully understand the best practices and resources for teaching and learning mathematics and science. The department chair provided Tamara with teaching strategies for math and science and supported her with planning lessons for instruction. The participant attributed her success to the department chair, who helped her understand the teaching structure and how to use research-based practices to maximize instructional time.

In her second year as an educator, Tamara obtained a better grasp of the best teaching and learning practices. She continued to develop her pedagogical knowledge and sought to support students and teachers needing assistance with instructional practices. Her drive to continue working with students and colleagues inspired her to become a lifelong educator. Tamara worked as a classroom teacher and mathematics department chairperson throughout her educational

career. She learned the importance of understanding students' prior knowledge, building relationships, and learning about students' interests. Tamara said she impacted her students by making mathematics relatable and connecting mathematical learning to their everyday lives. She asserted that effective teaching and learning occur when educators understand the students and communities they serve. She believed that educators who take the time to get to know their students and communities can make instruction relatable and relevant and improve pupils' academic performance and interest in mathematics. Tamara posited that teachers should also know about activities and events that interest students. Tamara believed teachers should support their students with learning mathematical content by building positive relationships to promote meaningful teaching and learning.

The Research Participants' Experiences as University Supervisors

The participants had experience mentoring, supporting, or evaluating teachers before becoming university supervisors. Three of the four participants had served as university supervisors before accepting roles in the funded Noyce project. In the next data analysis phase, I explored the interview responses of Angela, Arlene, and Nina and described their experiences as university supervisors before the funded Noyce project. The following tables present their accounts of the university supervisor role outside of the funded Noyce project.

Table 6

Angela's Experience as a University Supervisor

Category	Response
Interest in/influence to becoming a university supervisor	I came to that work based on the fact that I had experience as a K–12. teacher and I had been an administrator. And, um…the person who hired me thought that those, all of those experiences that I had, would serve as a great benefit in working with novice teachers. So that's basically how I came into the work. And I was actually introduced to it based on being a doctoral student, um…a full-time doctoral student, and um, wanting to just have an experience where I maintain a connection to the schools. And so I learned about university supervision just based on being inquisitive about the different types of graduate assistant programs that there were at the university.
Professional learning received	My own learning experiences [were] my professional development. Um, of course, I've had professional development throughout my professional career. I will say that the department that I worked with did provide professional development to the mentors or to the supervisors.
	I will say that we had specific observation tools that we were trained…to use. And with those tools, you know, students had assignments to do, and we had to use those tools to evaluate assignments that they had. Um, we use[d] those tools…when we would go out to observe them in the field. We would evaluate them on their teaching… The professional development that we had…helped us to understand the tools and the resources that we were using.
First experience as a university supervisor	Building relationships is really important. And so, um… whenever I meet anybody for the first time, I mean, I realized that I have a task to do. And that is to help them to be successful. But the one thing that I want[ed], or would want, and wanted the student that I was supervising to do, and that was to feel comfortable with me.
	I'm conscious and aware, and I had to always just remind myself that these are students and these students are learning. They are not teachers with 3 years of experience who know how to deal with discipline. They may not have what I would call the periphery of veteran teachers, meaning aware of multiple things going on at the same time and being able to address all of the things that are happening simultaneously. And so I think that's a real strength of a university supervisor.

Category	Response
Frameworks used to influence the work	In the last…experience that I had working as a university supervisor, we used the Charlotte Danielson framework. I would just say, like, using the Charlotte Danielson framework…provides, like, a guide for the teacher to know what the expectations are.

An Interpretive Summary of Angela's Experiences as a University Supervisor

Angela became a university supervisor as a full-time doctoral student. She decided to pursue graduate assistantship programs because of her K–12 experience. The university supervisor role enabled her to remain connected with and knowledgeable about K–12 schools. Because Angela considered herself a coach, the university supervisor role enabled her to support preservice teachers before they accepted full-time K–12 teaching positions. Angela received training on tools and resources for classroom instruction and relied on her professional experiences as a K–12 educator.

Angela focused on building relationships during her first experience with mentoring and supporting preservice teachers. She wanted the preservice teachers to feel comfortable and reminded herself that preservice teachers are learning the art of teaching. Angela provided honest feedback to support the preservice teachers' professional growth. Further, she reported using her strong interpersonal skills to mentor and support preservice teachers. Angela considered Danielson's framework for teachers helpful in supporting preservice teachers during the clinical year due to its clear expectations and guidance for effective teaching practices.

Table 7

Arlene's Experience as a University Supervisor

Category	Response
Interest in/influence to becoming a university supervisor	So one of the things I just saw…looking at tuition assistance at the point and then reaching out, speaking with, meeting one of the directors at the time, and she was talking about her needs. Working with different faculty…and they were talking about, you know, "Here's the opportunity to come in and be a supervisor," since I have had opportunities from my past experiences as well.
Professional learning received	The orientation was just, like, the expectation of what the university supervisors would have to do. But most of my experience came from working with districts. So really, like, supervising and mentoring and coaching… All of those skills came prior to me becoming a university supervisor. So when we went to orientation, the orientation just talk[ed] about grading, talk[ed] about you know, the expectations of visitations, and just what the expectations were and some of the pedagogical statuses that the university believed in.
First experience as a university supervisor	I think the teachers that I had for my very first year were slightly different because they worked. They were working. They were there full time, so they were getting the experience for a year versus just one semester. So one of the things that I'm thinking, trying to go back, one of the things that I really helped the teacher…preservice teachers with, because it was really what pedagogical strategy, sharing strategies, best practices with them, going in observations, providing feedback, and any questions that they had that dealt with just implementing lesson plans. I assisted with that. I helped, like, you know, provide the feedback on lesson plans. If there was a conflict between the preservice teacher and the mentor, school-based mentor teacher, I went out to deal with those conflicts. If there were some concerns, [I would] try to work through those concerns.
Frameworks used to influence the work	One of the ones that I really focused on was culturally relevant pedagogy, making sure that the students…. We're meeting the students from their cultural stance, so really teaching to your students and bringing in the cultural aspects of your other students. …And making sure that we use culturally relevant pedagogy, like from Ladson-Billings, from Gay, and people of that perspective.

An Interpretive Summary of Arlene's Experiences as a University Supervisor

Arlene learned about the university supervisor position via a recruitment email. Before accepting the position, Arlene had no previous employment history in higher education; she had only mentored teachers in K–12 schools. Arlene became interested in the job because she sought tuition assistance as a graduate student. She realized the university supervisor position would enable her to work closely with professors and faculty in a postsecondary teacher preparation program.

To prepare for the job of university supervisor, Arlene attended an orientation addressing the expectations for grading and classroom visitations. During her first experience as a university supervisor, Arlene supported preservice teachers in secondary classrooms full time, gaining teaching experience the entire year. She helped the preservice teachers with pedagogical strategies and the best teaching and learning practices. Arlene supported preservice teachers with lesson planning, provided feedback from observations, modeled lessons for new teachers needing additional support, and facilitated professional development workshops to aid the implementation of research-based teaching practices. Arlene viewed her university supervisor role as similar to her role as a K–12 instructional mathematics coach. She used her rapport-building skills to mentor preservice teachers during the clinical year. During her first experience with university supervision, Arlene based her work on the literature on culturally relevant pedagogy, specifically Ladson-Billings and Gay. Arlene drew upon the literature on culturally relevant pedagogy to address the students' cultural stances as part of effective teaching and learning practices.

Table 8

Nina's Experience as a University Supervisor

Category	Response
Interest in/influence to becoming a university supervisor	I became a university supervisor because while I was working, I made connections with P-20 partners. After I retired, I was able to keep those connections. So basically, the university supervisor is in the pipeline of what we call the teacher certification process.
	Well, because I was familiar, it was easy. It would keep me in. I would not be completely closing the door to education. Leadership and education. It would not be closed as when I retired. I wanted to keep my certification active and my experiences and my knowledge active.
Professional learning received	Yeah, I think…I don't, I wouldn't, so again, I would say it exposed me to what was required of me as a mentor. But it didn't prepare me because I came in with this knowledge. So I knew of the Intern Keys, I knew of Danielson's, I knew of InTASC. I had to know that because of what I did for the district, because if I was certifying teachers for the district, just like the university, I had to do exactly what universities do. So I was aware of this. They just told me, basically, the training that I had, was letting me know what was required of me for specific programs.
	The professional learning I got was, these are the key assessments, I got professional learning me to say, this is our program, this is our structure, this is what we're going to require you to do. These are our assignments. And this is our platform, all of that.
First experience as a university supervisor	I was in the classroom observing them, and then providing them feedback and giving them feedback. And I would absolutely say that what I constantly fight with is that teachers that are not yet certified have a hard time being told that they need to, that they're not hitting the standard, I think. So, I have to always be very careful about giving praises but really be very specific on, as to what that standard looks like. And there's so much there. There's somewhat of a disconnect, maybe, with what the district was looking for and what the schools are looking for. But you have to just kind of [lay] out your ideas [and] I tell them that I'm here to help them. I'm here to help them, and they need to be comfortable. They need to be comfortable feeling uncomfortable. And I have to explain that to them. And I tell them that I have certain standards, and I will ask, I will do, I

Category	Response
	will show them how to meet those standards, but I will not minimize my standards. I won't lower my standards, but I will show them how to.
Frameworks used to influence the work	My framework has always been Danielson's, InTASC, and the Teacher Keys. … National Board has a great thing on schools and community, so I always go back to those fantastic standards.

An Interpretive Summary of Nina's Experiences as a University Supervisor

Nina became a university supervisor based on her relationships with colleges and universities as a professional learning coordinator in a public school district. Because university supervision is a component of the teacher certification process, Nina pursued the opportunity after retiring from the public school district. She became interested in the university supervisor role because she had experience with the teacher certification process and mentorship. Further, Nina wanted to maintain the relationships with colleges and universities she established as a professional learning coordinator.

After accepting the university supervisor position, Nina received training for the program she worked with in the university teacher preparation program. The university faculty trained her to upload artifacts and taught her the math and science standards the preservice teachers used during instruction. During her first experience as a university supervisor, Nina focused on preservice teachers' ability to teach the standards accurately. She found it challenging to inform preservice teachers when they facilitated standards-based instruction incorrectly. Nina realized there was a disconnect between the district's expectations for teaching the standards and the local school's understanding of the standards taught during classroom instruction due to inconsistent indicators of effective standards-based instruction. Therefore, Nina promoted consistent, impactful standards-based teaching and learning by encouraging the preservice teachers to

become comfortable with being uncomfortable. She also set high expectations for the preservice teachers she supported. Nina noted that her previous experience with teacher certification programs enabled her to support new teachers during the clinical year. She described trustworthiness as an interpersonal skill that made her a unique and successful mentor. Nina based her work on the InTASC standards, Danielson's framework for teaching, the Teacher Key Effectiveness System, and the National Board Certification standards, which she believed presented similar characteristics of good teaching practices.

Experiences as University Supervisors in the Funded Noyce Project

In this portion of the data analysis phase, I examined the four participants' interview responses regarding their university supervision in the funded Noyce project during the clinical year. Arlene, Nina, and Tamara were university supervisors in the funded Noyce project. Arlene and Nina entered the project with prior experience as university supervisors, whereas Tamara's first experience as a university supervisor occurred during the project. Angela served on the leadership team and supported university supervisors as they mentored the TFs during the clinical year. The following tables present the participants' accounts of their roles and experiences as university supervisors in the funded Noyce project.

Table 9

Angela's Experience With the Funded Noyce Project

Category	Response
Experience in the funded Noyce project	So as a member of the Noyce team, I served on the leadership team of the Noyce project and was serving on the leadership team. And in the role that I served in, I had a lot of input, if you will, on the tools and the resources that we use to support our teachers. And being on the team, working with people who had experiences that were rich experiences really made us strong as a team.

Category	Response
Comparisons to the funded Noyce experience	I would say that it was similar and that…I brought myself into the work, you know, so it's just like, hey, you take yourself with you everywhere you go. So, the way that I perceived the work in the role prior to joining Noyce is the same way that I perceived it when I work as a Noyce…or worked with Noyce. And that way. But the difference between the collaboration with those people and then the collaboration in Noyce [is] I would see them at meetings that we would have once a month. But it wouldn't necessarily mean that I would talk to them outside of those monthly meetings. With Noyce, it was a smaller cadre of university supervisors and the leadership. And so, I thought we had more— It was more cohesive.
Influence of work: Literature, professional experience, or project structure	It was based on literature and research. The project itself was a project to increase the number of STEM teachers in STEM fields in high-need schools. And that in itself comes from the research because we know that a lot of teachers in STEM fields are White males. And so we were looking for minorities, and in particular, Black males. We were looking…we know that in high-need schools, you have teachers who are not certified to teach the subject areas that they teach. And so our goal was to recruit and retain the teachers in these high-need schools to fill those vacancies. Okay. So in that respect, everything that we did was is based in the literature. And then helping teachers to understand that in order for us to have a real social justice kind of framework, because that's one of the frameworks that we did talk about with our teachers.
Understanding of university supervision	"Enrich" is the word that I would use. And you know, like it's like having…after having been a principal, you kind of think, you know, some stuff. Because you think that, you know, you kind of have it all together, and you think you might have experienced, you know, like, wow, I've kind of been through some pretty interesting situations. I don't know if they can get any…more difficult than this or different, but you know, you live, and you learn, like, hey, everything can change. All situations are different. Experiences are different. And so I think it's just— It enriched me, like, in ways that were unintended. I would say it was unintended consequences, so to speak. And in addition to it being enriching, it shifted me.
Successes and challenges	This particular teacher is Hispanic. And one of the things that…I did with all of my… teachers that I work[ed] with [was], again, building a relationship and just getting to know them on a personal level.

Category	Response
	And this is just my personal belief. Her background was in tutoring. So although she had…she may have had an undergraduate degree in mathematics, but it wasn't… This is true for most of the math teachers in our program. They did not come through a traditional teacher education program. And so that in itself can present challenges. And so…they know the content, right? Like, they can work math problems, but knowing how to work math problems and knowing pedagogically how to engage students so that the student is the one doing the learning, right? And how you craft that so that you can hear their voices in instruction. And it's kind of hard not to group them all together and being challenged in that way.
Significant facts about the funded Noyce project	One of the things I think is significant about this Noyce project is making your teaching visible. And when I say that, I'm talking about teachers being given the opportunity to present at conferences. I mean, like, this is very early in their teaching career….right? But because of the support that…we provided as leaders and as supervisors,…coaches, the teachers feel confident enough to…go to conferences and share openly with other teachers, so teachers can learn from them.
	They've gone to conferences, right, and they've gone to national conferences. So they understand, like, what it is. They understand what it's like. So we have a leader within the Noyce project, where both of the leaders are very active in their respective areas. So they've been presidents of professional organizations, right? And so, with the teachers having the exposure this early in their career, and the fact that in the 5 years of the program, we want all of our teachers to have some type of leadership role.

An Interpretive Summary of Angela's Experiences in the Funded Noyce Project

Angela served on the leadership team in the funded Noyce project. She had input into the tools and resources used and collaborated with university supervisors and faculty to help the TFs during the clinical year. She indicated that she became a more decisive and reflective leader after partnering with the university supervisors and faculty to support TFs during the clinical year. Angela based her work in the funded Noyce project on research and literature. The purpose of the Noyce project was to recruit and retain minority STEM professionals as teachers in high-

needs schools; therefore, the literature was essential to the project's success. Angela brought her experiences of leadership and mentorship to the project, and she knew the tools and resources to support and evaluate TFs teachers from her previous experience with university supervision.

Angela considered the funded Noyce project similar to her previous experiences. She perceived the program expectations and evaluation processes as identical to those in other university supervisor roles. However, the funded Noyce project had a smaller cadre of teachers than her previous work. Further, the collaboration in the funded Noyce project included the entire team, resulting in a more cohesive decision-making process.

Throughout her tenure in the funded Noyce project, Angela built relationships with preservice teachers and got to know them personally and professionally. She also learned how to make instructional shifts to support social justice frameworks. However, she faced challenges when helping preservice teachers shift their instructional practices from traditional teaching methods to methods to promote student engagement. Angela found it challenging to encourage TFs to make instructional shifts to meet students' learning needs because many had not experienced a traditional teacher education program. Some TFs learned best practices while teaching their students simultaneously.

The funded Noyce project significantly impacted Angela's perspective of university supervision. She indicated the project enabled her to enrich her understanding of being a university supervisor and her ability to incorporate culturally relevant pedagogy into the teacher preparation process. Angela reaffirmed that the project enables teachers to make their teaching visible by presenting at conferences and serving as leaders for professional organizations early in their educational careers. Ultimately, the funded Noyce project contributed to successful trajectories for preservice teachers in STEM-related fields.

Table 10

Arlene's Experience With the Funded Noyce Project

Category	Response
Experience in the funded Noyce project	I think with any team you're going to have issues, but it influenced my work to help me be a better conflict resolver with some of the preservice teachers that were having issues with other team members, so nothing is perfect. And just to be honest, so to influence my work, really, I had to do a lot more conflict resolution. But that was with certain powers that be…that year. So I think that influenced me to be more of, you know, not [that it took] me from a lot of the coaching, but to really [say], "Okay, let's look at the end goal. Let's work here. Let's work to resolve these issues." So I did find myself, and I think there [were] some power struggles with certain people that were on the team. And I think that did influence me to do a lot of conflict resolution.
Comparisons to the funded Noyce experience	I think [it was] the same, just making sure they had the same expectation. And…meeting the goals of getting the teacher certified. …But the difference is, like, it's that relationship…the longevity of the relationships. Like I mentioned before, I still have two of the people that I supervise, they're still teaching, but we check…they check in every year.
Influence of work: Literature, professional experience, or project structure	I think it was based in all three, and the reason being [is] because with the expectations of focus on the science and math teachers, you know, that helped to build some of the literature that surrounded with that come out with best practice[s] of how students learn. So really focused on prompts, you know, problem-based learning, open-ended questioning, and some of that literature was coming out in that as well as infusing cultural relevance in there. And then so, with my experience of being able to work with all three and put it into context, I think that it really it was all three of those that really made the made it fun and fascinating.
Understanding of university supervision	It enriched me for a being a university supervisor. And it goes back again to, like, my purpose was— It's just not in the realm of getting teachers certified but being a resource for people, even when they get into the professional field.

Category	Response
	But I think, um, it [taught] me to really make sure that, you know what, they can always reach out to me if they…have a question, …if they need assistance with something, if you need for me to reach out and call my contacts. So I think that, because of the way we develop that relationship, it enriched that for me to be more of, you know, a lifelong mentor.
Successes and challenges	I think one of the successful experiences that, um, they had to pass—and I can't even think of the name of the portfolio now because my brain has gone, but they got rid of it. So that was the word they had to actually— It wasn't—it's not GACE, it was something with the ETS. And it's in here…I can't even think of the name of it. This is what happens at old age… So basically, the teachers, in addition to the game, they had to go ahead and do a portfolio style and pass that. So I think one of the major success[es] was that my, my preservice teachers, they all passed. And I think that was a major success. So I think one of the things that contributed to that was the honest feedback that was provided to them. I did not try to, you know, sugarcoat. You know, "This is what we need to do. Let's go look at this again," um, and just having that constant communication contribute[d] to that. So edTP…edTPA. It came out.
	The school reached out…to the guy…whatever the person, the title was at that time. So I think it was, it was a struggle with pedagogy, pedagogy and best practices for teaching mathematics at a middle-school level. One of the things that…she had experienced was teaching from a skill base, but really teaching for students to understand. Really teaching for students to conceptualize and contextualize mathematics.
Significant facts about the funded Noyce project	I think what was significant was…the [Noyce project] collaboration with the districts as well as with the preservice teachers. A lot of times, they…the preservice teachers go in, but then they're just there… [We have] those meetings where we talk to the leadership about their performance. I think that is very significant because a lot of times, they need to hear…everybody's at the table, everybody understand what their expectations are. A lot of times when, like, before you just go in and introduce yourself, and you mainly just work with the mentor teacher and the preservice teacher, but with Noyce project from the district level, the building level as well as, you know, department level, everybody was involved. Everybody was part of the conversation.

An Interpretive Summary of Arlene's Experiences in the Funded Noyce Project

Arlene was a university supervisor in the funded Noyce project. As a project team member, Arlene shifted from some behaviors and practices she used as an instructional coach. As a university supervisor in the funded Noyce project, she mediated and resolved TFs' issues during the clinical experience. Serving as the mediator for various TF concerns enabled Arlene to improve her conflict resolution skills during the clinical experience.

Arlene used the funded Noyce project on the research, literature, and the project's structure to support the TFs' professional development. She found the current research and literature relevant in supporting TFs in implementing effective questioning and problem-based learning in their instructional planning and delivery. Arlene identified her prior supervisory responsibilities as similar to those of a university supervisor in the Noyce project. Arlene considered herself responsible for helping TFs earn their clear, renewable teaching certificates. Compared to previous university supervision experiences, Arlene maintained longevity in the relationships established with the program participants. Although she left the university supervisor role in the funded Noyce project, she stayed in contact with the TFs she supported during their clinical experience. Arlene maintained an interest in the TFs' well-being and continued supporting their professional development as educators.

As a university supervisor in the funded Noyce project, Arlene mentored the TFs and supported them in passing the portfolio assessment. She encountered challenges while helping a TF adjust teaching practices to meet the needs of middle-grade students. Initially, the TF resisted, but Arlene persisted in helping the student teacher make the needed adjustments. The TF learned to help the students conceptualize and contextualize mathematics during the clinical experience.

The funded Noyce project significantly impacted Arlene's experiences with university supervision. She said the project enabled her to enrich her perspective and become more resourceful while supporting the preservice teachers. Arlene reported collaborating and partnering with preservice teachers, mentor teachers, local school district leaders, school administrators, and university professors while mentoring preservice teachers throughout the clinical experience.

Table 11

Nina's Experience With the Funded Noyce Project

Category	Response
Experience in the funded Noyce project	As a member of the team, we collaborated a lot. We got together, we discussed, we collaborated, we shared a vision. We discuss[ed] where…the students were and where we wanted them to go, what was important. So there was a lot of buy-in and a lot of planning and, um, a lot of getting to know our students, where they were in terms of their schools and what they were struggling with. And it was very unique time because before too long, we were in COVID; we were with COVID. That was just— It made me realize how important the site base mentor is.
	Well, the idea is that we were talking about social justice in the team, in the project—culturally sensitive pedagogy. And so we were very much aware of that and helping the candidates understand how that could occur…while they were getting certified, while they were new in their building. And that really has changed my life…
Comparisons to the funded Noyce experience	I think it was different. I think the funded Noyce project had a mission and a purpose that the students had a buy-in, and they were excited about it. And they delivered it. And I don't think that has been the case in other certification. Other times that I was mentoring. I would say that in the Noyce there was a strong enrollment of minority math and science, whereas in the other programs, it might have been, you know, half and half, or a third minority, uh…two-thirds majority. But in the Noyce, it was really strongly minorities.

Category	Response
Influence of work: Literature, professional experience, or project structure	I think it was all, all of them. That's why I think I did a good job fitting in…um, into the project. I felt like there one of the earlier projects that the students did was to know the community that they served, and to have a realization of what the students need and have and what they're exposed to what they're not exposed to. That was amazing.
Understanding of university supervision	I don't think it changed my views because I always, I always— Like I said, shared with you, my experiences have always been in a minority… The majority of the people I work with were in minority, in the minority, are minorities. So it never— It really didn't change my views, but it…expanded my view.
	If I noticed that there's not a specific question that talks about culturally sensitive pedagogy or access, equity, and justice, I will put it into my own…my own fingerprint into how I mentor other, in other schools…
	And I asked [them] to specifically put that in there. So yes, it has changed my views. No, it hasn't changed my views; it has broaden[ed] in my views. It has allowed me to be more consistent and convinced, consistent with my practice.
Successes and challenges	I feel like when I went to help a few teachers, like… I'll tell you an online difference. There was, like…half of our experience was online, the other half wasn't. So the online experience I was using, you know, the Zooms, and I was listening to a very well. This teacher was doing a great job. But I noticed that she was not giving wait time when she would ask the question, and she was just speeding along. This was math. And I'm like, "Oh, my goodness." I'm, you know, needing the time. And so, um, so I had to share with her that and she wasn't quite getting it.
	And I gave her that example, and from that point on, she kept— She understood what wait time was. And I thought I made a difference there because normally she was just a really good teacher. She did a good job. She's just a natural. I always thought she was a natural teacher with little room to…little room to [grasp] what am I trying to redirect.
	One math teacher was employing group work, which is important, right, with middle school. And, um, he was realizing that the students were sitting in groups, but they weren't working in groups. They were always asking him for the, you know, to check the math answer to help them with the questions and stuff. And…I sat there, and I used check marks to see how many times the kids would ask him to come to the group and to teach and teach and teach versus them to work it out, as group

Category	Response
	members, to work with each other. He realized that he had to do better at releasing them, once he taught, releasing them to do the group work.
	I was working with a teacher who didn't get up out of her chair very much. She didn't walk around the classroom, and I was just like, "You cannot teach from behind your desk." You know? And she probably didn't realize that like she should have. So those were two, some of the challenges. Also, just the overall challenges were that during COVID, they just didn't have the on-site mentor.
	Oh, it was crazy because during COVID, the teachers didn't have to take the certification exam, and they were given extra time. And some of the challenges were the teachers weren't quite fully certified, passing the GACE. And we had to get them tutorial, you know?
	I think the fact that we were not allowed in the schools as often as we should have been, that affected it, our mentorship. …Teachers being out with COVID. I mean, the schools were just overwhelming…teachers during the COVID.
Significant facts about the funded Noyce project	Also some positives is we had signature experiences where we went to the Aquarium to learn about science that way. That was awesome. We had that personalized, up-close experience. We also went to Montgomery, Alabama, which was amazing, where we saw all the Civil Rights museums and the history. It was amazing. And that really put into perspective…a lot of…why we were doing what we were doing.
	I think the people I worked with…we all understood each other, we worked well together. We all had great— our strengths. We worked on each other's strengths. We were all willing to go above and beyond. It wasn't just a job. It was a passion for all of us. And I think that that made a difference.
	Well, the importance of teamwork, the importance of getting everyone's feedback and buy-in, listening…and, I just think, the team. …Another thing about the Noyce project is that the students, early on, were told to be leaders, right? I couldn't— I can't help. I didn't. The students— Early on, like after certification, you are to be leaders, …and they all had a chance to present at a conference.

An Interpretive Summary of Nina's Experiences in the Funded Noyce Project

As a university supervisor in the funded Noyce project, Nina collaborated with the team members to structure the support for TFs. She emphasized the importance and significance of social justice and culturally relevant pedagogy in preservice teachers' instructional practices. Part of Nina's work in the funded Noyce project occurred during the COVID pandemic. Thus, Nina mentored the TFs during a difficult time, and she realized the significance of having a site-based mentor during the clinical experience.

Nina used the funded Noyce project on the research, literature, and the project's structure to understand its mission and vision. The literature and program structure showed her the importance of teachers' knowledge about the communities that they serve. Nina drew upon her awareness of the communities where the TFs worked to encourage the implementation of culturally relevant pedagogy as a regular part of instruction.

Nina said her previous university supervision role differed from the funded Noyce project. In the funded Noyce project, TFs learned about the communities and students they served via an opening school experience assignment. Nina's university supervisor role had no such requirement for preservice teachers. Unlike Nina's previous experience, the funded Noyce project also had a mission and vision, and the project leadership team gained buy-in from the TFs. In addition, the funded Noyce had a large enrollment of minority participants.

Nina recalled her successes and challenges during her tenure as a university supervisor in the funded Noyce project. One notable accomplishment was helping a TF with sufficient wait time for students when they responded to questions in class. Nina found this accomplishment memorable because it occurred during a virtual classroom observation. She recalled supporting another TF with classroom management in a middle-grade classroom setting. Nina described the

challenges of encouraging a preservice teacher to structure in-class group assignments and allow students to take ownership of their learning. She also struggled when suggesting a teacher move around the classroom during instruction to monitor students' behaviors and progress. Nina's challenges showed the value of a school-based mentor teacher during the clinical experience. Additionally, the COVID pandemic impacted her ability to support the TFs in preparing for the GACE exam. Some TFs lost their confidence to become fully certified teachers because they did not pass the GACE exam.

The funded Noyce project enabled Nina to expand her views of university supervision. She realized the need for culturally relevant pedagogy in the TFs' instructional practices. She indicated that the funded Noyce team members collaborated well together. The project enabled the TFs to increase their understanding of social justice and culturally relevant pedagogy. The TFs also had opportunities to present at conferences and enhance their knowledge of applicable research-based practices. The funded Noyce project was a unique experience that enabled Nina to enhance her mentorship skills through collaboration with the project team and leaders from the participating school districts.

Table 12

Tamara's Experience With the Funded Noyce Project

Category	Response
Experience in the funded Noyce project	I guess spending a lot of time talking about the students that we had, and what are they, their strengths and weaknesses. I guess…I don't know… It taught me more about what I didn't know…like, working with them and working with the curriculum and working with the curriculum in the practicum. I learned how important it was to really know [the] environment your school is in. I learned that in the opening… They called it the opening school experience. And it allows the students to research where they will be teaching, and do a really a thorough research, you know, looking for, you know, how many…if this is [a] mainly Mexican, or African American, or whatever environment. What's surrounding… What are the communities that [we are] are serving? Who are the people in these communities? What is going on in the community? I guess I can say that I learned how important that really was when [I was] teaching students. I felt like it was, for me, it was more of a learning opportunity…to learn more about the things I did not know, and, at the time, understand why they have open school experience. If you grow up differently from the community that you are teaching in, then you do need to know something about the community, because you would think…and I think that was one of probably my biggest problems. I think I had a better idea of how the standards came into play and how the state adopted them. I had my whole understanding, and all of that became clear. My understanding of why these standards are here. And they're really looking at standards and understanding what they meant. Even with the standards for mathematical practices, understanding those a little bit better, why we need those in the coursework. It really helped me when I was helping the students in that program plan their lesson.
Comparisons to the funded Noyce experience	Tamara's first experience as a university supervisor occurred in the funded Noyce project.
Influence of work: Literature, professional experience, or project structure	Okay, so my experience… I'll start with [my] experience as an educator again. I already had some type of coaching experience coming into this, you know, coming into this program. So I knew how to communicate with my people, because I've always done that well, with when me being a department chair. I knew how to help them.

Category	Response
	The structure of the Noyce project gave me some guidance as, you know, being the university supervisor. I enjoyed when we figured out what type of professional learning we would provide for the math students. I did enjoy that because, like I said, I was learning as well as teaching them.
Understanding of university supervision	I would say expanded…and enriched. …I learned a whole lot just about teaching in general that I didn't know. I had never seen, like, the eight teaching practices. So I was learning that. I'm like, "Where did they come from?" It kind of made me go back and really want to look at all NCTM stuff when I was actually, you know, supervising them. I would go and look on purpose. And I didn't have to do this. This was not part of the program. But I was more of the support for them. So if I see one of the students having issues with differentiated instruction, well, guess what I'm gonna do? I'm gonna go to NCTM. I'm gonna look up anything they have on differentiated instruction, and I'm gonna send— I'm gonna read it first, and I'm going to send that article to them.
Successes and challenges	And I said, "Oh, geez, that's how I'm gonna handle this?" So I was like, "Look, first of all, I need you to breathe." Because she was stressed out, she was… She was doing and she was working another job and trying to do this program and trying to do her work. I said, you know, going to do all of that… "Because this is a fast-paced program, I'm gonna need for you to just, you know, stop." And because, I think she was doing hair—…hair was [her] second job because when she braids hair, she gets money. And I said, "You're gonna have to…figure something out."
	So she eventually came around, but it was me… [One] time I found out she didn't turn something or didn't do something else. I'm like, call[ing] her, say[ing], "Look, I need you. So I'm probably gonna get on your nerves, but I'm trying to help you out. So I need for you to do it." So she came through.
	And so, it was mostly when we go into these professional learning [sessions], we're talking about science. And so, they were getting a little upset. So I had to be the mediator and say, "Hey, we need to have [our] own." I said, "Can they can we split this? Can we have our own professional learning? Or when we do professional learning together, can we have, like, a math part in it and a science? Because right now all we see is science, and that's a little annoying." And so, we ended up changing it second semester.

Category	Response
	I am thinking [of] one of my students, the one that was having struggles. The one that was outspoken. She wanted pedagogical knowledge. She didn't need content knowledge. She understood the content. She needed to know how to teach this, and she would make it known every time: "I need strategies on how to teach this." And so, we would sit down at times, and, you know, talk about what she's teaching. And if I could give her any type of suggestions or strategies, then I would tell her, you know, it could have been, "Maybe don't present it this way. Present it in another way. Make sure you're showing some type of…" Because she was…geometry… That was not her strong subject.
Significant facts about the funded Noyce project	These are students who are coming from professional careers. And some of the things that stood out: some were engineers, some were in the computer industry, some were form other industries. Those skills stood out, but I just felt like some of them didn't know how to bring those skills into the…classroom.

An Interpretive Summary of Tamara's Experiences in the Funded Noyce Project

Tamara became interested in being a university supervisor when she returned to graduate school to finish her doctoral degree. She applied for the role because she enjoyed mentoring and helping teachers. Tamara served as a teacher assistant in a graduate-level course before supporting preservice teachers as a university supervisor during the clinical year. Her first experience with university supervision was with the funded Noyce project.

After accepting the university supervisor position, Tamara received training on the project's structure and goals. Because she did not receive formal training in mentoring and supporting TFs during the clinical experience, she deferred to her experience as a department chair and her motivational reading to mentor the preservice teachers. Tamara described her communication skills as a unique quality for mentoring preservice teachers. Additionally, she asked questions to encourage the preservice teachers to reflect on their instructional practices.

Tamara began working as a university supervisor with the second TF cohort in the project. Her first goal was to learn about the project and the opening school experience to

develop an understanding of the schools and communities where the TFs worked. She indicated the opening school experiences enabled the TFs to understand their students' lives outside of school and their position in the learning environment. While mentoring the TFs, Tamara developed her understanding of the standards of mathematical practices and their significance to teaching and learning mathematics.

Tamara's first experience mentoring the program participants involved virtually observing a TF instructing students in a virtual classroom due to the COVID-19 pandemic. Tamara watched the preservice teacher's lesson as an uploaded recording via a virtual platform, took notes of the instructional practices, and provided a written commentary on the TF's methods. She observed the recording closely to deliver meaningful, impactful feedback. Tamara based her work in the funded Noyce project on the literature, her teaching experiences, and the Noyce project structure. She used the NCTM literature to enhance the TFs' mathematics instruction and used Danielson's framework for teaching to observe and evaluate their progress during the clinical year.

Tamara recalled her successes and challenges as a university supervisor in the funded Noyce project. She described helping one TF balance personal life and professional responsibilities and supporting another with various instructional strategies for secondary mathematics. Some of the challenges she faced were coaching and mentoring the TFs to move beyond traditional teaching practices and implement research-based practices to promote student engagement and achievement.

As Tamara continued working on the funded Noyce project, she transitioned from virtual teacher observations to in-person classroom visits. During these observations, Tamara looked for evidence of standards-based instruction and observed how the TFs engaged students during

instructions, implemented wait time for student responses, and assessed student learning. However, she noticed that the TFs had different dispositions and authenticity between the in-person and virtual observations, with the TFs appearing less nervous and more genuine in their teaching practices during the virtual observations.

Tamara said the funded Noyce project enabled her to expand and enrich her views of being a university supervisor. She became more knowledgeable about the NCTM's eight effective teaching practices, encouraged their use among preservice teachers, and reflected on how she would use them. Tamara affirmed that the funded Noyce project provided teacher preparation and initial certification for preservice teachers who had worked in other STEM professions. She expressed her excitement when the TFs used their experience from their previous careers to engage students in meaningful, relevant learning.

Strategies for Mentoring Preservice Teachers

The clinical experience provides preservice teachers opportunities to apply the theories learned in higher education teacher preparation programs to teaching and learning in authentic K–12 classrooms (AMTE, 2020). The experience includes various activities and assessments to show preservice teachers effective teaching and learning practices. Each participant in this study shared specific strategies for mentoring and supporting preservice teachers during the clinical year.

Table 13

Unique Qualities as a Mentor

Participant	Response
Angela	A unique quality? …Mine always kind of goes back to the fact that I'm a people person, and the work that we do is all about how you connect with people. How you make people feel. How you engage with them.
Arlene	I think my unique quality is being able to build a rapport with them and identify and connect with the struggles that they're having.
Nina	And my interpersonal skills are that, you know, I think they trust me. I think I can build trust. I think they see that I have the knowledge, so they trust me.
Tamara	I would say the way that I communicate to them, I never make someone feel bad. Even if they use a strategy that I disagree with. If I disagree, I may say, "I see how you did this. Have you thought about a different way of explaining this? I ask because there are several other ways." And sometimes they'll say "No" once you explain another way, or they'll ask, "What is another way to explain this?"

Further data analysis showed that the participants' mentorship and support methods aligned with Knight's (2007) model of implementing instructional coaching. Knight suggested that teachers using a "new intervention" (p. 26) improve student success when their teaching practices align with the research. University supervisors are critical in connecting the theories and research preservice teachers learn in teacher preparation courses to practical classroom applications.

The implementation stage of instructional coaching involves collaborating, modeling, observing, providing feedback, and supporting (Knight, 2007). The participants described how they used the components of Knight's implementation stage of instructional coaching to mentor and support preservice teachers during the clinical year.

Table 14

Strategies for Mentoring Preservice Teachers During the Clinical Year

Participant	Response	Alignment to Knight's model of implementing instructional coaching
Angela	We would go observe them in the field. …We would score in a similar way based on what we observed.	Observing and providing feedback
	And in the role that I served in, I had a lot of input, if you will, on the tools and the resources that we use to support our teachers.	Support
	And then helping teachers to understand that in order for us to have a real social justice kind of framework, because that's one of the frameworks that we did talk about with our teachers.	Support
Arlene	I assisted with that. I helped, like, you know, provide the feedback on lesson plans. If there was a conflict between the preservice teacher and the mentor, school-based mentor teacher, I went out to deal with those conflicts. If there were some concerns, [I would] try to work through those concerns.	Observing and providing feedback
	For example, just like if the mentor teacher felt like the particular… [If], my first year…a particular teacher wasn't doing well, you know, [I] went out, coached, modeled, and did things to make sure that they [could] be successful.	Modeling
	So really teaching to your students and bringing in the cultural aspects of your other students. So I really push that for the classroom facilitation.	Support
	So my support with her included me coming out, teaching for her, telling her to notice, um, XYZ.	Support
	And then we went into working on using manipulatives to get the students started. So really coming in modeling for her, you know, planning and modeling for her how to teach from a standard base perspective, let's put it that way.	Modeling
	I think what was significant was…the collaboration with the districts as well as with the preservice teachers.	Collaboration

Participant	Response	Alignment to Knight's model of implementing instructional coaching
	Every…so you had them going…you had the leadership going in [and] looking at it as well as the…the university supervisors, and it was more of a partnership and collaboration.	Collaboration
Nina	I was in the classroom observing them, and then providing them feedback and giving them feedback.	Observing and providing feedback
	As a member of the team, we collaborated a lot. We got together, we discussed, we collaborated, we shared a vision.	Collaboration
	I feel like when I went to help a few teachers, like… I'll tell you an online difference. There was, like…half of our experience was online, the other half wasn't.	Observing and providing feedback
	So the online experience I was using, you know, the Zooms, and I was listening to a very well. This teacher was doing a great job. But I noticed that she was not giving wait time when she would ask the question, and she was just speeding along. This was math. And I'm like, "Oh, my goodness." I'm, you know, needing the time. And so, um, so I had to share with her that and she wasn't quite getting it.	Support
	And I gave her that example, and from that point on, she kept— She understood what wait time was. And I thought I made a difference there because normally she was just a really good teacher.	
	One math teacher was employing group work, which is important, right, with middle school. And, um, he was realizing that the students were sitting in groups, but they weren't working in groups. They were always asking him for the, you know, to check the math answer to help them with the questions and stuff. And…I sat there, and I used check marks to see how many times the kids would ask him to come to the group and to teach and teach and teach versus them to work it out, as group members, to work with each other. He realized that he had to do better at releasing them, once he taught, releasing them to do the group work.	

Participant	Response	Alignment to Knight's model of implementing instructional coaching
Tamara	I would say the way that I communicate to them, I never make someone feel bad. Even if they use a strategy that I disagree with. If I disagree, I may say, "I see how you did this. Have you thought about a different way of explaining this?"	Support
	I'll say, "If you go back and you think about how they learned how they multiply numbers, they use this method called the array method." And I said, "When they used the array method, they split the numbers into place values, which gives them a better— or they can multiply 10 times 10. And everyone knows that's 100.	Modeling
	My first encounter with the students was when they had set up the times that we would observe their classroom, so… And it was a different experience, because I was…we were totally online.	Observing and providing feedback
	We had a code to go into the classroom.	Observing and providing feedback
	Pretty much, they send me their teaching video where they upload in a Torch. I would go into the Torch program, and I started watching the video. And I was just take notes on what I saw or what I observed. And then once I took notes on what I observed, I [would] go back, kind of, like, over the notes. And if I had a question about anything, I would rewind it and then I would say, "What was he thinking here?"	Observing and providing feedback
	After I took notes, I was able to give suggestions…on the side, such as [he] needed to be more clear here. If I didn't understand it, then I knew the students didn't probably understand it, either.	Observing and providing feedback
	But I did see some nervousness. When, physically…if I'm in the room, I felt like they were trying to be exact and perfect and things like that.	Observing and providing feedback

Participant	Response	Alignment to Knight's model of implementing instructional coaching
	It kind of made me go back and really want to look at all NCTM stuff when I was actually, you know, supervising them. I would go and look on purpose. And I didn't have to do this. This was not part of the program. But I was more of the support for them. So if I see one of the students having issues with differentiated instruction, well, guess what I'm gonna do? I'm gonna go to NCTM. I'm gonna look up anything they have on differentiated instruction, and I'm gonna send— I'm gonna read it first, and I'm going to send that article to them.	Support

Collaboration

Reflecting, cocreating, and working as partners are aspects of collaboration (Knight, 2007). The participants in this study described collaboration as critical when supporting and mentoring preservice teachers. The participants discussed the collaboration between the university supervisors and the project's leadership team in the Noyce project. Arlene and Nina mentioned that their university supervisor roles involved partnering with local school district leaders. Collaboration during clinical experiences helps partnerships come to life (Knight, 2007). Collaboration between the Noyce project leadership team, university supervisors, and local school district enabled the university supervisors to support the TF by connecting the theories learned in methods courses to the realities of teaching and learning in secondary mathematics classrooms.

Partnerships between the university supervisor, teacher preparation faculty, mentor teachers, and local school district leaders could create positive relationships to enhance preservice teachers' clinical experiences. Collaborations between these parties enable university supervisors to emphasize the practices learned in teacher preparation courses and introduce new and evolving research-based theories during the clinical experience.

Modeling

Modeling involves entering the classroom and demonstrating a particular skill or practice the teacher is learning (Knight, 2007). In this study, Arlene and Tamara discussed the strategies they modeled for the preservice teachers to enhance their mathematics instruction. Arlene modeled using math manipulatives during instruction to help a preservice teacher struggling with performance plan a lesson. With this approach, Arlene redirected the preservice teacher's practices, ultimately promoting a successful completion of the clinical experience. Tamara also described modeling research-based practices as part of instruction planning to aid preservice teachers with using skills and strategies to explain mathematics concepts in multiple ways. Through modeling, Tamara communicated the strategies the preservice teachers could use during instruction to enhance students' understanding of mathematical concepts. Through modeling, teachers learn how to grasp instructional practices or teach their students skills or concepts (Knight, 2007).

Observing and Providing Feedback

The research participants observed the preservice teachers as they delivered instruction in authentic classrooms during the clinical year. After conducting observations, the participants gave the preservice teachers feedback to support their professional growth as educators. Nina and Tamara addressed their experiences as university supervisors during the COVID-19 pandemic when classroom observations occurred virtually. During the pandemic, the participants observed the preservice teachers' classroom instructions via an online platform, watching video recordings of the classroom and providing commentary on the preservice teachers' instructional practices. Individual perspectives may differ, and no two people will observe the same class similarly (Knight, 2007). After the participants completed the virtual observations, the preservice teachers

reviewed the feedback and reflected on their instructional practices as part of their professional development.

Support

Support includes helping teachers implement a new practice (Knight, 2007). The participants discussed their work as university supervisors in this context and described times they supported preservice teachers during the clinical year. Arlene helped the preservice teachers use social justice frameworks during instruction, supported the leadership of the funded Noyce team, and suggested tools and resources to support TFs during the clinical experience. Arlene supported the preservice teachers in addressing students' cultures as part of teaching and learning. Nina's support included helping a funded Noyce participant use wait time to give students time to think about and process their answers before responding to questions in class. Tamara supported the funded Noyce participants during the clinical year by researching and sharing NCTM literature on differentiated instruction with preservice teachers. Tamara also asked reflective questions to help TFs think about different ways to present mathematical concepts to students to promote conceptual understanding and make their learning relevant to real-world scenarios.

Teacher preparation programs involve supporting preservice teachers as a part of their duties and responsibilities. Arlene, Nina, and Tamara received training on the Noyce program's program structure, expectations, and requirements before mentoring the TFs. The participants learned to support preservice teachers during the clinical year as part of the Noyce project.

Summary

This study focused on four university supervisors' lived experiences mentoring and supporting secondary mathematics instructors during the clinical year. I used the transcripts from

three interviews with each participant to understand their experiences as university supervisors. I analyzed the participants' experiences with the hermeneutic phenomenological approach and created interpretative sumaries of their work as university supervisors during the clinical year. This section presents the phenomenon of interest as a whole entity and the four findings from data analysis.

Research Question 1 was, What are the lived experiences of a university supervisor while supporting preservice teachers of secondary mathematics during the clinical year? The findings showed that the university supervisors (a) had previous K–12 classroom teaching experiences that significantly influenced their mentoring approach, (b) built relationships with preservice teachers throughout the clinical experience, and (c) were life-long learners who embraced mentoring strategies connected to the culture and context in which the preservice teachers immersed. Research Question 2 was, What mentoring strategies do university supervisors use to support the development of well-prepared beginning mathematics teachers? The findings showed that the participants used the implementation component of Knight's coaching model in the context of teaching in urban schools. The implementation component included supporting the preservice teachers; observing classroom instructions and providing feedback; modeling research-based teaching strategies; and collaborating with school-based mentors, administrators, university faculty, and district leaders. The participants emphasized the implementation of culturally relevant pedagogy for mathematics instruction.

Interpretive Summary of the Research Participants' Becoming as Educators

The participants described how they became interested in and pursued careers as secondary educators. Their perspectives were an entry point to analyzing their backgrounds before their university supervisor positions. All the participants identified the people in their

lives who influenced their decisions to become educators, such as family members, including those who worked as teachers; current teachers; former educators, or fictional characters.

The participants also described their career trajectories in education as full-time teachers. As they shared their stories, they expressed frustration and despair when recalling their challenges as novice teachers. The participants reported feeling overwhelmed with managing the responsibilities and expectations of full-time teaching. Despite the difficulties, the participants built relationships to support their development as novice educators. Relationship-building occurred through their connections with school-based colleagues who helped them manage their workloads and their duties as full-time teachers. The participants reported building relationships with assistant principals, department chairpersons, and other department colleagues to promote their professional growth as novice teachers. Thus, when the participants served as university supervisors, they focused on building relationships with preservice teachers throughout the clinical experience.

Interpretive Summary of the Research Participants' Experiences as University Supervisors

The participants discussed how they mentored preservice teachers during the clinical year. Three research participants served as university supervisors before working with the funded Noyce project. Their perspectives were intuitive, and each participant was reflexive while sharing her accounts of mentoring preservice teachers during the clinical year. The participants chose to enter the university supervisor role due to their prior teaching experience. The participants compared mentoring, coaching, and supervising teachers in K–12 school settings and higher education. Each participant had experience mentoring new teachers and possessed unique skills as a university supervisor during the clinical experience. The participants had received no formal training on guiding, mentoring, and supporting preservice teachers during the

clinical experience, instead drawing on their previous teaching experiences. However, their professional development included an orientation to the teacher preparation program structure, including grading protocols and the tools for classroom observations. In their mentoring work, the participants observed their mentees' classroom instruction, scored their performance with an observation tool, and provided commentary on their instructional practices. The participants' experiences aligned with Knight's descriptions of observing and providing feedback. One of the three participants with university supervisory experience before the funded Noyce project assisted preservice teachers in using culturally relevant pedagogy as a regular instruction practice. This experience aligned with Knight's description of support. The findings showed that the participants' K–12 classroom teaching experience significantly influenced their approach to mentoring.

Interpretive Summary of the Research Participants' Experiences as University Supervisors in the Funded Noyce Project

The participants described their lived experiences as university supervisors in the funded Noyce project. All four participants worked as or supported university supervision as part of the funded Noyce team, and each acknowledged the collaboration among the team members. Angela and Tamara indicated that the collaboration enabled the team to work cohesively and meet TFs' professional learning needs during the clinical experience. Arlene and Nina cited team collaboration as a significant part of their experience that enabled university supervisors, the leadership team, local school district leaders, and school-based mentors to engage in conversations about the project's goals, expectations, and vision.

Further data analysis showed that all the participants used the project structure and literature to frame their work with the TFs, specifically literature on culturally relevant

pedagogy. Tamara and Nina developed cultural responsiveness through the project's structure and the opening school experience, which enabled the TFs to learn about the communities where they taught. The university supervisors also learned the significance of knowing the local community's cultures, practices, and available resources. Other strategies for mentoring included observing the preservice teachers' instructional practices in person and virtually and commenting on their performance, which aligned with Knight's model of observing and providing feedback. Tamara helped the TFs implement differentiation strategies, whereas Nina assisted the TFs with wait time during instruction. These practices aligned with Knight's support model. The participants regularly met with the funded Noyce team, district leaders, and school-based mentors to discuss professional development, TFs' progress, and the program's goals and objectives. These practices aligned with Knight's collaboration model.

The participants said the funded Noyce project enabled them to expand or enrich their views of university supervision. Arlene developed her skills and became more resourceful as a lifelong mentor, and Nina became more consistent in her instructional practices. Tamara deepened her understanding of NCTM's eight teaching practices and reflected on them as a part of her professional development. The participants expressed appreciation for the funded Noyce project, acknowledging that the program's structure allowed them to make their teaching visible. The TFs presented at national conferences and held leadership positions in professional organizations during the early stages of their teaching careers. As university supervisors, the participants encouraged the TFs to bring their experiences as STEM professionals to the classroom environment to help students connect teaching and learning to real-world scenarios. Through the funded Noyce project, the participants became lifelong learners who used mentoring strategies connected to the cultures and contexts in which the preservice teachers were immersed.

The participants used the implementation component of Knight's coaching model in the context of teaching in urban schools.

6 DISCUSSION

This chapter presents a Summary of the study and the findings. Chapter 6 indicated how the participants and I developed a new understanding of university supervisors' work. Further, Chapter 6 presents the study's implications, limitations, and recommendations.

A Summary of the Study

There is a lack of understanding and research on the university supervisor role in the teacher preparation process (Asplin & Marks, 2013; Steadman & Brown, 2011). Therefore, the purpose of this study was to investigate university supervisors' lived experiences supporting secondary mathematics preservice teachers during the clinical year. The phenomenological qualitative study had the following research questions:

RQ1: What are the lived experiences of a university supervisor while supporting preservice teachers of secondary mathematics during the clinical year?

RQ2: What mentoring strategies do university supervisors use to support the development of well-prepared beginning mathematics teachers?

I used hermeneutic phenomenology to examine and understand the participants' experiences and interpret their responses to interview questions.

The study included four participants who served as university supervisors to preservice teachers during the clinical year in a funded Noyce project. Data collection occurred via three interviews with each participant, each lasting 60 to 90 minutes. After each interview, I transcribed the participant's responses and provided the transcripts to each participant for validity. Data analysis involved line-by-line coding to identify meaningful statements from each participant's experience separately before making meaning of the participants' experiences as a whole. Throughout the data analysis process, I used the hermeneutic circle to develop and

redevelop my understanding of and interpret the participants' descriptions of the university supervisor role during the clinical year. Themes emerged regarding the participants' teaching experiences and the significance of collaboration in the university supervisor role. The participants shared strategies for mentoring and supporting preservice teachers during the clinical year that aligned with the implementation portion of Knight's instructional coaching model. The interpretations I developed emerged from analyzing the participants' experiences in the funded Noyce project and provided a better understanding of the university supervisor role during the clinical experience. The findings indicated that university supervisors (a) have previous K–12 classroom teaching experience that significantly impacts their approach to mentoring, (b) build relationships with preservice teachers throughout the clinical experience, (c) are life-long learners who embrace mentoring strategies connected to the culture and context in which the preservice teachers immersed, and (d) use the implementation component of Knight's coaching model in the context of teaching in urban schools.

The Advancement of the Research Participants' Knowledge

All the participants shared their experiences as university supervisors during the clinical year. The purpose of data collection and analysis was to understand the participants' knowledge of the university supervisor role and mentorship. Preconceived knowledge or foresight is essential to hermeneutic phenomenological theories because it is the beginning stage of making sense of or understanding the phenomenon of interest (Peoples, 2021). The effectiveness of the clinical experience depends on mentors and supervisors providing opportunities for preservice teachers to acquire essential expertise, abilities, and dispositions for teaching mathematics (AMTE, 2021). The participants used their expertise to create an impactful clinical experience for the preservice teachers. From their first-year teaching experiences, they understood the value

of building relationships with students, colleagues, administrators, and other stakeholders in the learning community. The participants knew the significance of building relationships for education careers. As new teachers, the relationships established with school-based administrators, department chairpersons, and colleagues enabled them to manage their workload and responsibilities. The participants learned effective teaching and learning practices through peer interactions, and relationship-building during their early careers showed them the significance of support and mentorship for novice teachers.

Each participant had several years of classroom teaching experience before becoming a university supervisor. The participants had varied prior teaching experiences and opportunities to serve in a mentoring or leadership capacity in K–12 schools. Based on their prior experiences, the participants understood what teachers should know and do because they had a working knowledge of the skills and traits teachers should bring to their students' teaching and learning experiences.

Three participants held university supervisor roles, observed classroom instructions, and provided feedback to preservice teachers before their roles in the Noyce project. In their prior roles, the participants attended orientation sessions related to the teacher preparation process; however, they lacked formal training for mentoring and supporting preservice teachers during the clinical experience. Therefore, the teachers used their knowledge from their prior teaching experiences to mentor and support preservice teachers during the clinical experience. As university supervisors, the participants used the literature on culturally relevant pedagogy, Danielson's framework of teaching, and the InTASC standards to support preservice teachers.

The participants reflected on their work in the funded Noyce project. All the participants felt the project enabled them to expand and enrich their perspectives of the university supervisor

role. Each participant discussed the collaboration that occurred during the clinical experience. Traditionally, collaboration during practicum or clinical experiences includes the preservice teacher, university supervisor, and mentor teacher (Barahona, 2019; Caires & Almeida, 2007; Lloyd et al., 2020). However, the funded Noyce project included collaboration with university supervisors and faculty, TFs, mentor teachers, and local school district leaders. Partnerships with stakeholders beyond the preservice teacher, university supervisor, and mentor teacher triad in the project contributed to the participants' understanding of the university supervisor role. Furthermore, these partnerships contributed to the participants' knowledge of the NCTM's eight effective teaching practices and standards for mathematical practice.

The participants reported that their work in the funded Noyce project included collaboration, modeling, observing, and providing feedback and support in alignment with Knight's (2007) implementation model for instructional coaching. Further analysis of the interview responses showed that the funded Noyce project included culturally relevant pedagogy and social justice frameworks in the clinical experience. As part of the program structure, the TFs engaged in an opening school experience to learn about the communities around the schools where they taught. The participants indicated this assignment showed the significance of culturally relevant pedagogy and social justice during classroom instruction. The project's structure also contributed to the participants' understanding of the university supervisor role during the clinical experience. Thus, through the project, the participants became more resourceful and impactful as mentors to preservice teachers as part of their professional development.

The Advancement of the Research Knowledge

Interpretative phenomenological scholars may use hermeneutic circles to develop and redevelop a sense of meaning about the phenomena of interest (Dibley, 2022; Peoples, 2021). In this study, I advanced my knowledge by revisiting my biases as the researcher and evolving my understanding of university supervision. I entered this study with over 18 years of secondary mathematics education experience, having begun my teaching career with a bachelor's degree in a STEM-related field and transitioning into education after changing careers. I received support from a university supervisor during a practicum experience in my teacher preparation program. After teaching secondary mathematics for eight years, I transitioned from being a classroom instructor to supporting and mentoring preservice and novice teachers with zero to three years of teaching experience. I also worked as a field supervisor in a public school district's alternative teacher preparation program. As the field supervisor, I learned about Danielson's framework for teaching and the InTASC standards and used these frameworks to guide my work as a mentor for preservice and novice teachers.

This study included reviewing the literature on university supervision and teacher preparation for secondary mathematics. From the literature review, I learned about the ambiguity and limited research of the university supervisor role (Asplin & Marks, 2013; Steadman & Brown, 2011). By reviewing the literature, I refreshed my knowledge of Danielson's framework for teaching, the InTASC standards, and NTCM's eight effective teaching practices. In addition, I learned about the NCTM's standards for preparing secondary mathematics teachers and AMTE's standards for mathematics teacher preparation. The NCTM and AMTE criteria showed me the experiences preservice teachers should have during the clinical experience and what university supervisors should know and do during the mathematics teacher preparation process. I

learned about Knight's (2007) theories of instructional coaching, the partnership philosophy, and the four components of implementing instructional coaching.

After reviewing the literature, I collected data to learn about the participants' lived experiences mentoring and supporting preservice teachers during the clinical year. Before the first interview, I was unaware of the participants' teaching experiences and understanding of what teachers should know and do. After the first interview, I better understood their becoming as educators, their decisions to pursue educational careers, and the skills they believed new teachers should have and bring to the learning environment. I was intrigued to hear that other educators or the portrayal of a teacher influenced the participants' decision to become teachers. The participants considered knowing how to build relationships with students and make learning relatable as important as their content knowledge, if not more important.

During the second interview, I learned more about the participants' work as university supervisors during the clinical experience. Based on my experiences as a preservice teacher during the practicum experience, I assumed their responsibilities in this role included observing classroom instructions once or twice a semester and providing feedback about performance. The second interview provided a better understanding of the scope of university supervisors' work. Although the participants received no formal training about mentoring preservice teachers, they attended orientations about the teacher preparation program structure and learned about the observation tools and grading protocols. However, they relied on their teaching experiences to mentor preservice teachers during clinical experiences. The participants discussed their experiences in the funded Noyce project and how they enriched and expanded their perceptions of the university supervisor role. The project's structure included collaboration with university faculty and supervisors, mentor teachers, local school administrators, and district leaders. The

extension of the collaboration contributed to how the university supervisors supported the TFs during the clinical experience. The program structure included culturally relevant pedagogy at the beginning of the clinical experience via opening school experiences, in which the TFs learned about the communities where they would teach. The opening school activity caused the university supervisors to keep culturally relevant pedagogy at the forefront of their clinical experiences to impact mathematics teaching and learning.

The findings showed that the participants relied on the program structure, the literature, and their teaching and mentoring experiences when mentoring the TFs, using all three components to become more resourceful. The findings contributed to my understanding of how the literature and research framed the teacher preparation process for mathematics education. During the interviews and data analysis, I realized the effectiveness of the funded Noyce project and gained a better understanding of the university supervisor role. The project also enabled the participants to expand their understanding of university supervision. In addition, I developed knowledge of mentoring preservice teachers during the clinical experience. I advanced my knowledge of Knight's theory of instructional coaching, Knight's implementation process for supporting novice teachers' professional development, and the NCTM and AMTE standards for creating meaningful clinical experiences for preservice teachers during the mathematics teacher preparation process.

Delimitations

The purpose of this study was to understand and interpret university supervisors' lived experiences during the clinical year. The research focused on university supervision during the clinical experience and elicited descriptions and interpretations of the university supervisor role limited to the four participants' perspectives. The study had findings limited to the teacher

preparation process at one local public higher education institution over 2 years. This hermeneutic phenomenological study focused on lived experiences to understand the phenomenon of interest. However, the interpretations may not be reflective of or generalizable to the scope of the university supervisor role during the teacher preparation process at all higher education institutions.

Implications and Recommendations for Future Research

The study provided an interpretation of university supervisors' experiences mentoring and supporting preservice teachers during the clinical experience. Individuals continuously evolve their interpretations (Dibley, 2022). This study could provide other university supervisors insight into enhancing the clinical experience for preservice teachers during the teacher preparation process. The findings showed the richness of the university supervisor role and the wealth of knowledge and expertise university supervisors bring to the clinical experience. This study presented four university supervisors' becoming, trajectories, and lived experiences and how they supported preservice teachers in developing professionally and understanding the teacher's role in a secondary mathematics classroom. University faculty could use the findings to expand their collaboration and practices to support preservice teachers. Teacher preparation program leaders may use the information from this study to create working models for helping university supervisors engage in mentorship. Mentors should understand the language and research associated with mathematics teacher preparation to support secondary mathematics educators in completing their practicum and developing effective teaching and learning practices.

The study's findings contributed to the knowledge of university supervision. However, there is a need for more research on the clinical experience for mathematics teacher preparations. Scholars should continue to explore university supervisors' work in other teacher preparation

programs to advance and improve mathematics teacher preparation for current and future teachers.

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APPENDICES

Appendix A

AMTE's Standards for Well-Prepared Beginning Teachers of Mathematics

C.1 Mathematics Concepts, Practices, and Curriculum

Well-prepared beginning teachers of mathematics possess robust knowledge of mathematical and statistical concepts that underlie what they encounter in teaching. They engage in appropriate mathematical and statistical practices and support their students in doing the same. They can read, analyze, and discuss curriculum, assessments, and standard documents as well as students' mathematical productions.

C.2 Pedagogical Knowledge and Practices for Teaching Mathematics

Well-prepared beginning teachers of mathematics have foundations of pedagogical knowledge, effective and equitable mathematical teaching practices, and positive and productive dispositions toward teaching mathematics to support students' sense making, understanding, and reasoning.

C.3 Students as Learners of Mathematics

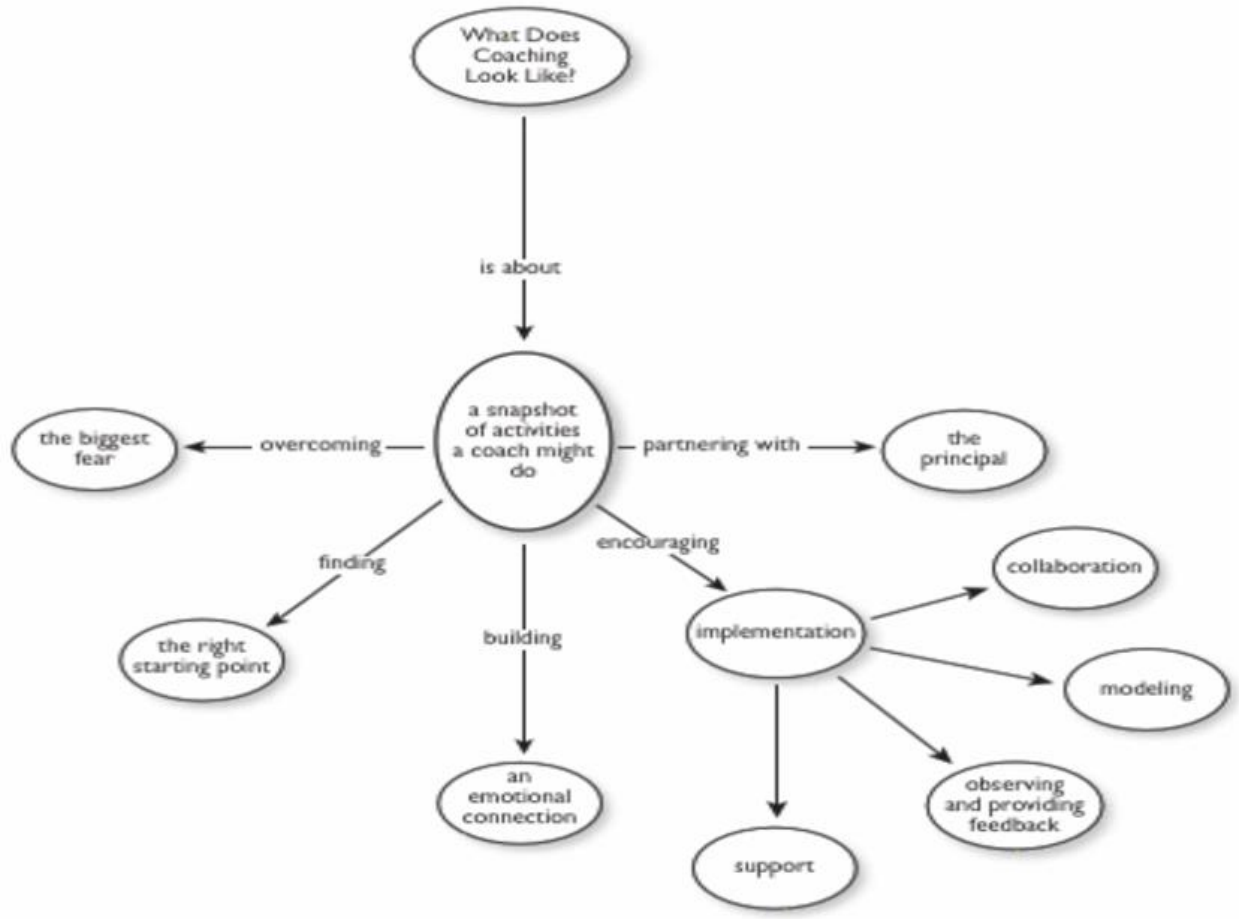
Well-prepared beginning teachers of mathematics have foundational understandings of students' mathematical knowledge, skills, and dispositions. They know how these understandings can contribute to effective teaching and are committed to expanding and deepening their knowledge of students as learners of mathematics.

C.4 Social Contexts of Mathematics Teaching and Learning

Well-prepared beginning teachers of mathematics realize that the social, historical, and institutional context of mathematics affect teaching and learning and know about and are committed to their critical roles as advocates for each and every student. (AMTE, 2020, p. 6)

Appendix B

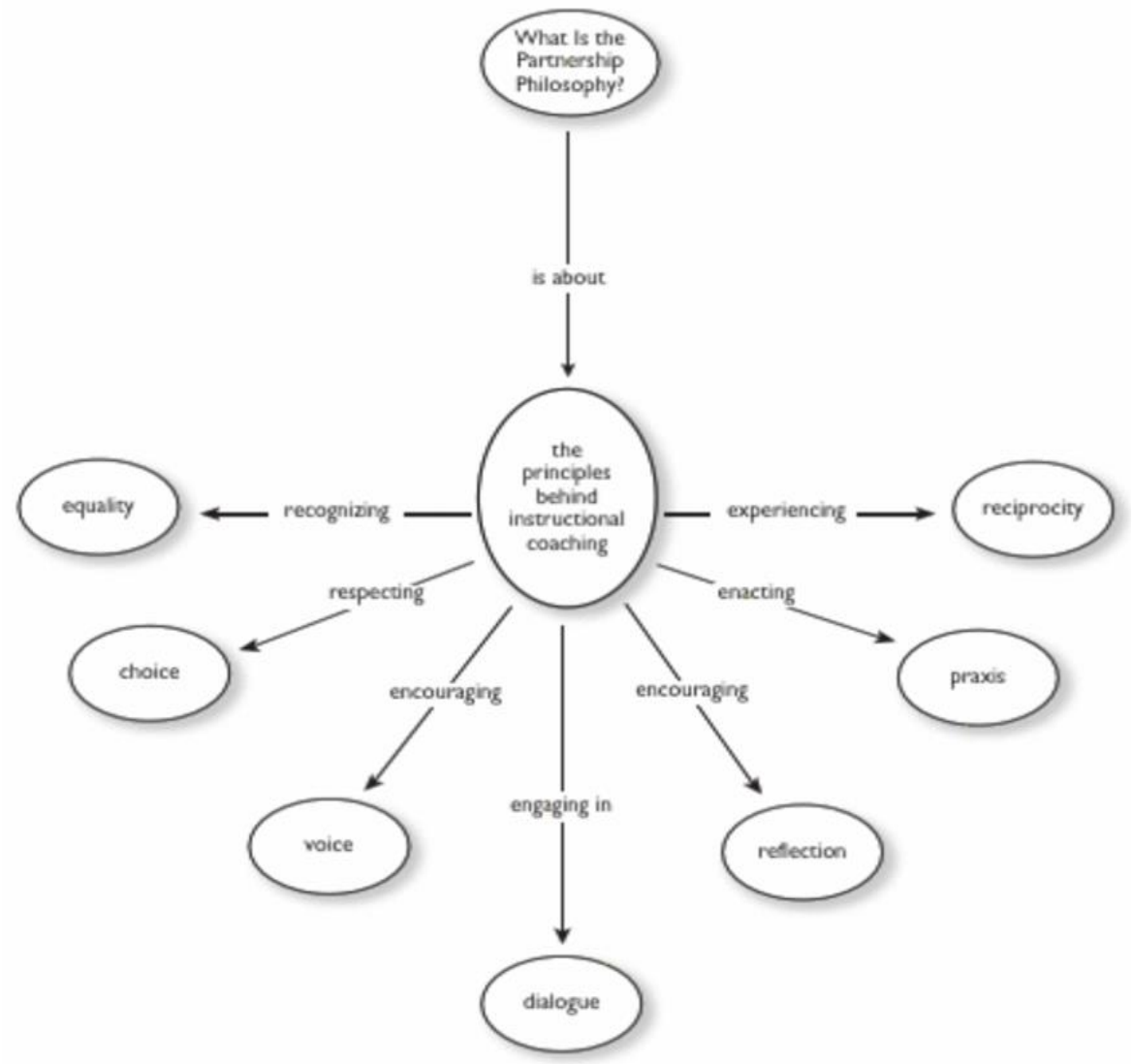
Knight's Model for Instructional Coaching



Note. From *Instructional Coaching: A Partnership Approach to Improving Instruction*, by J. Knight, 2007, p. 18. Copyright 2007 by Corwin Press.

Appendix C

Knight's Partnership Philosophy



Note. From *Instructional Coaching: A Partnership Approach to Improving Instruction*, by J. Knight, 2007, p. 36. Copyright 2007 by Corwin Press.

Appendix D

NCTM's Eight Mathematics Teaching Practices

Establish mathematics goals to focus learning.

Effective teaching of mathematics establishes clear goals for the mathematics that students are learning, situates goals in learning progressions, and uses the goals to guide instructional decisions.

Implement tasks that promote reasoning and problem-solving.

Effective teaching of mathematics engages students in solving and discussing tasks that promote mathematical reasoning and problem solving and allow multiple entry points and varied solution strategies.

Use and connect mathematical representations.

Effective teaching of mathematics engages students in making connections among mathematical representations to deepen understanding of mathematics concepts and procedures and as tools for problem-solving.

Facilitate meaningful mathematical discourse.

Effective teaching of mathematics facilitates discourse among students to build shared understanding of mathematical ideas by analyzing and comparing student approaches and arguments.

Pose purposeful questions.

Effective teaching of mathematics uses purposeful questions to assess and advance students' reasoning and sense making about important mathematical ideas and relationships.

Build procedural fluency from conceptual understanding.

Effective teaching of mathematics builds fluency with procedures on a foundation of conceptual

understanding so that students, over time, become skillful in using procedures flexibly as they solve contextual and mathematical problems.

Support productive struggle in learning mathematics.

Effective teaching of mathematics consistently provides students, individually and collectively, with opportunities and supports to engage in productive struggle as they grapple with mathematical ideas and relationships.

Elicit and use evidence of student thinking.

Effective teaching of mathematics uses evidence of student thinking to assess progress toward mathematical understanding and to adjust instruction continually in ways that support and extend learning. (National Council of Teachers of Mathematics, 2020, p. 10)

Appendix E

NCTM's Standards for the Preparation of Secondary Mathematics Teachers

Standard 1: Knowing and Understanding Mathematics

Candidates demonstrate and apply understandings of major mathematics concepts, procedures, knowledge, and applications in and among mathematical domains of Number; Algebra and Functions; Calculus; Statistics and Probability; Geometry, Trigonometry, and Measurement (National Council of Teachers of Mathematics, 2020, p. 6).

Standard 2: Knowing and Using Mathematical Processes

Candidates demonstrate, in or across mathematical domains, their knowledge of and ability to apply the mathematical processes of problem solving; reason and communicate mathematically; and engage in mathematical modeling. Candidates apply technology appropriately in these mathematical processes (National Council of Teachers of Mathematics, 2020, p. 15).

Standard 3: Knowing Students and Planning for Mathematical Learning

Candidates use knowledge of students and mathematics to plan rigorous and engaging mathematics instruction supporting students' access and learning. The mathematics instruction developed provides equitable, culturally responsive opportunities for all students to learn and apply mathematics concepts, skills, and practices (National Council of Teachers of Mathematics, 2020, p. 19).

Standard 4: Teaching Meaningful Mathematics

Candidates implement effective and equitable teaching practices to support rigorous mathematical learning for a full range of students. Candidates establish rigorous mathematics learning goals, engage students in high cognitive demand learning, use mathematics specific

tools and representations, elicit and use student responses, develop conceptual understanding and procedural fluency, and pose purposeful questions to facilitate student discourse (National Council of Teachers of Mathematics, 2020, p. 29).

Standard 5: Assessing Impact on Student Learning

Candidates assess and use evidence of students' learning of rigorous mathematics to improve instruction and subsequent student learning. Candidates analyze learning gains from formal and informal assessments for individual students, the class as a whole, and subgroups of students disaggregated by demographic categories, and they use this information to inform planning and teaching (National Council of Teachers of Mathematics, 2020, p. 44).

Standard 6: Social and Professional Context of Mathematics Teaching and Learning

Candidates are reflective mathematics educators who collaborate with colleagues and other stakeholders to grow professionally, to support student learning, and to create more equitable mathematics learning environments (National Council of Teachers of Mathematics, 2020, p. 49).

Standard 7: Secondary Field Experiences and Clinical Practice

Effective teachers of secondary mathematics engage in a planned sequence of field experiences and clinical practice in diverse settings under the supervision of experienced and highly qualified mathematics teachers. They develop a broad experiential base of knowledge, skills, effective approaches to mathematics teaching and learning, and professional behaviors across both middle and secondary settings that involve a diverse range and varied groupings of students. Candidates experience a full-time student teaching/internship in secondary mathematics supervised by university or college faculty with secondary mathematics teaching experience or equivalent knowledge base (National Council of Teachers of Mathematics, 2020, p. 54).