# Exploring mentoring relationships in elementary STEM field placements: Lived experiences of preservice and mentor teachers

by

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B.S., Emporia State University, 2016
M.S., Emporia State University, 2018
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# Abstract

Field placements provide preservice teachers with opportunities to take on the work of teaching, but teaching more lessons does not always mean having more opportunities to make instructional decisions. Mentor teachers must support preservice teachers as they learn while also maintaining responsibility for their students and classrooms. Although mentoring has been studied in teacher education, less is understood about how preservice teachers and mentor teachers describe opportunities for reciprocal or collaborative learning within elementary STEM field placements. This basic interpretive qualitative study examined the mentoring experiences of five preservice teachers and two mentor teachers during the Spring 2026 semester. The study was informed by situated learning and Communities of Practice, with attention to participation, mentor authority, and opportunities for shared learning. Data was collected through 13 semi-structured interviews that included interviews with both members of two mentoring pairs. Interview transcripts were analyzed using open coding, pattern coding, and thematic analysis. Nine themes were identified across the three research questions.

Preservice teachers described how trust, feedback, and their relationships with mentors shaped their experiences and their willingness to ask questions, try ideas, and take responsibility for instruction. Their accounts showed that increased teaching time did not always provide the same opportunities to make decisions about student learning. Mathematics offered repeated opportunities to discuss student understanding and work through instructional problems, while opportunities for science instruction varied across placements. Mentor teachers described balancing guidance and feedback with decisions about when to step back and allow preservice teachers to work more independently. The two complete pairs also provided examples of how preservice teachers' observations and instructional ideas became part of shared decision making.

The evidence of mentor reflection differed between the two relationships. These findings suggest that opportunities for reciprocal learning can develop within traditional mentoring relationships even when mentors continue to hold greater authority and responsibility. The study highlights the importance of looking beyond the amount of time preservice teachers spend teaching to consider the instructional decisions they are invited to make and the opportunities they have to contribute to the mentoring relationship.

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Major Professor
Dr. Michael Lawson

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differently. I started wondering not only what preservice teachers were learning from their mentors, but also what mentors might be learning from the preservice teachers they worked with. Those questions eventually became the focus of this dissertation. I also want to thank the preservice teachers and mentor teachers who participated in this study. I appreciate your willingness to share your experiences and reflect on your mentoring relationships. This research would not have been possible without you.

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# Dedication

To the teachers who helped me become the educator I am today and to the future teachers who continue to remind me why this work matters. No matter how long we have been teaching, there is always something we can learn from one another.

# Chapter 1 - Introduction

## Introduction

Teacher preparation programs rely on field experiences to help preservice teachers connect coursework with classroom practice (Feiman-Nemser, 2001a; Orland-Barak & Wang, 2021). In a placement, a preservice teacher must make decisions while managing students, following the curriculum, and responding to needs that do not always appear in a lesson plan. These responsibilities become more demanding as the preservice teacher moves from observing to leading instruction. A mentor teacher can help make that work understandable by explaining decisions, offering feedback, and creating opportunities to try teaching with support (Hobson et al., 2009; Wang & Odell, 2002). For this reason, the relationship between the mentor and preservice teacher is an important part of learning to teach, not simply a requirement attached to a placement.

Across teacher preparation programs, field placements do not provide identical mentoring experiences. Some preservice teachers work with mentors who explain their thinking and make time to discuss instruction, while others have fewer opportunities for those conversations. A mentor's available time, preparation for the role, and classroom responsibilities can affect the support a novice receives (Aspfors & Fransson, 2015; Hobson et al., 2009). The same placement requirements may lead to different opportunities to plan, teach, receive feedback, and make decisions. Looking closely at the relationship within a placement helps explain differences that the placement schedule alone cannot show. Dreer-Gothe (2025) also found that relationships with school colleagues beyond the mentor were associated with preservice teachers' psychological safety and engagement during their placements.

Elementary education brings unique demands that amplify the need for supportive mentoring. Teachers in these settings manage multiple subject areas, create developmentally appropriate lessons, and respond to students' social and emotional needs. The range of work in an elementary classroom can make a field placement rewarding and demanding. Mentors can help preservice teachers interpret classroom events, make instructional decisions, and build confidence as they take on more responsibility (Feiman-Nemser, 2001b). The amount of room a preservice teacher has to make these decisions may depend on how the mentor invites them into the work.

Mentoring in elementary STEM education adds questions about what preservice teachers actually have opportunities to teach. Science instruction can require teachers to draw out students' ideas, use evidence, and respond to explanations that develop during a lesson (Windschitl et al., 2012). Research on preservice elementary teachers also shows that science content knowledge and confidence are relevant concerns in teacher preparation (Menon & Sadler, 2016). Those studies do not establish that every mentor or preservice teacher in this study was uncomfortable teaching STEM. In these placements, mathematics provided repeated occasions for instructional discussion, while access to science teaching varied. This difference made it important to examine the instructional opportunities available within each mentoring relationship rather than assuming that the STEM label described a consistent experience.

Mentoring can involve more than the experienced teacher giving advice and the preservice teacher following it. When both people examine a lesson, student work, or a problem that has arisen, the preservice teacher can contribute observations from teaching while the mentor contributes experience and knowledge of the classroom. Mentoring can also invite experienced teachers to reconsider their own instructional decisions, although mentor learning

should not be assumed in every relationship (Hudson, 2013). Research on mentoring roles and power shows that the mentor's greater authority shapes whether the novice's contribution can enter that conversation (Mackie, 2020; Merket, 2022). That authority can be used to guide the preservice teacher and to create room for more responsibility. This study examined where collaborative learning appeared within existing elementary STEM mentoring relationships rather than assuming that the two people contributed equally.

Research on reverse mentoring provides another way to think about knowledge moving from a less experienced teacher toward an experienced one. Studies have examined formal arrangements in which preservice teachers and practicing educators exchange knowledge about digital competence, teaching approaches, or research-informed practice (Bertram et al., 2023; Porras et al., 2018; Raberger et al., 2024). Those studies do not mean that every preservice teacher brings stronger technology skills or that every mentor changes practice. In this study, reverse mentoring was a point of comparison rather than an intervention. I examined whether the interviews described specific instances in which a preservice teacher's ideas, observations, or teaching contributed to a mentor's thinking or classroom decisions.

This study examined how preservice teachers and mentor teachers described their mentoring relationships in elementary STEM field placements. The focus was on their accounts of classroom responsibilities, feedback, instructional decisions, authority, and opportunities to learn together. Their descriptions allowed me to consider the relationship in the context of the work they were doing. The sections that follow explain the problem, purpose, framework, and boundaries of the study. They also define the terms used throughout the dissertation.

## Broader Context of Mentoring in Teacher Education

Mentor teachers support preservice teachers while continuing to manage the demands of their own classrooms. They are responsible for planning instruction, responding to student needs, and making decisions throughout the school day. Those responsibilities can make it difficult to find time for mentoring conversations. Even highly experienced teachers can feel stretched by these demands, and many mentors note that mentoring requires time, communication, and preparation in addition to classroom teaching experience (Aspfors & Fransson, 2015; Byth, 2025). A mentor may need to explain both the instructional choice and the classroom conditions that shaped it.

Research on mentor preparation and mentoring relationships describes differences in the support available to mentors and the experiences of preservice teachers (Aspfors & Fransson, 2015; Parker et al., 2022). Some mentor teachers receive training or guidance on how to support a novice teacher, while others do not. Some districts and preparation programs offer clear expectations for mentoring, and others leave much of the process up to individual teachers. Mentor teachers may be excellent instructors yet still feel uncertain about how to explain their decisions, how much responsibility to turn over, or how to support a preservice teacher who needs more help. Matsko (2024) also found that mentors' understandings of how preservice teachers learn were reflected in how they described their roles and mentoring practices. This variation leads to very different experiences for preservice teachers depending on the school, the mentor, and the support structures in place (Aspfors & Fransson, 2015; Hobson et al., 2009).

School staffing demands can make time for mentoring difficult to protect. Mentor teachers remain responsible for their own students and instructional obligations while helping a preservice teacher learn to plan, teach, and respond to classroom needs. A placement may offer

regular opportunities for discussion, or mentoring conversations may have to fit around the immediate work of the classroom. Research on mentoring identifies time, preparation, and clarity of expectations as conditions that shape the experience (Aspfors & Fransson, 2015; Hobson et al., 2009). This study did not measure teacher shortages or staffing levels in the participating schools, so these conditions provide context rather than an explanation assigned to any individual placement.

Elementary STEM placements bring the question of instructional access into sharper focus. Preservice elementary teachers' confidence and science content knowledge have been examined as parts of science preparation (Menon & Sadler, 2016). Learning ambitious science teaching also requires opportunities to practice subject-specific instructional work, not only to hear about it in coursework (Windschitl et al., 2012). A mentor's decisions and the classroom schedule can affect whether a preservice teacher gets those opportunities. Mathematics and science did not appear equally often in the interviews for this study, which made variation in access part of the question being examined. The chapter treats uncertainty about STEM instruction as a possible context, not as a characteristic attributed to every participant.

Understanding this broader context helps frame the need for the present study. Teacher preparation programs rely on mentoring to support preservice teacher development, yet there is still much to learn about how mentoring is experienced inside real classrooms. Exploring these experiences in elementary STEM placements can help programs strengthen mentoring structures and better support the development of confident, capable new teachers. It can also help programs see when instructional responsibility is being offered without enough opportunity for discussion. The perspectives of mentors and preservice teachers are both useful for understanding that difference.

## Background of the Study

Elementary STEM placements raise a more specific question about which instructional opportunities preservice teachers actually have. Research has examined preservice elementary teachers' science self-efficacy and content knowledge, while work on science teacher preparation has described the practices novices need opportunities to learn (Menon & Sadler, 2016; Windschitl et al., 2012). Neither source establishes that the specific mentor teachers in this study lacked STEM preparation. What mattered for this study was how participants described the instructional work available to them and the support they received while doing it. Classroom schedules, curriculum expectations, and the mentor's responsibility for students could each shape the decisions open to a preservice teacher. These circumstances made the mentoring relationship important to examine in its actual placement context. Research on elementary science mentoring has also shown that targeted mentor preparation can help shift mentoring conversations toward instructional decisions and evidence of student learning (Melton et al., 2019).

School context also played a role in the opportunities available to participants. Preservice teachers in the university's elementary education preparation program completed school-based placements, but their classrooms did not offer identical schedules or access to mathematics and science teaching. The interviews described mathematics as a regular setting for instructional discussion, while science opportunities differed across placements. These differences should not be attributed to a school's staffing, resources, or priorities unless those details were actually documented. They do show that a preservice teacher's opportunity to participate depends partly on the work available in the classroom. Examining the setting alongside the relationship helped me avoid treating all elementary STEM placements as the same experience.

These conditions help explain why it is useful to hear how preservice teachers and mentor teachers describe mentoring in the context of actual classroom work. Research on mentoring has identified differences in mentor preparation and in the support offered to novice teachers (Aspfors & Fransson, 2015; Hobson et al., 2009). This study adds a closer account of relationships, responsibility, and decision making within a small group of elementary field placements. Interviews could show how participants understood an interaction and why it mattered to them. They could not provide a direct observation of the interaction itself. Attending to the insight and the limit of those accounts was part of the study's design.

This study explored how five preservice teachers and two mentor teachers described their mentoring relationships during elementary STEM field placements. Their accounts offered examples of feedback, changes in responsibility, instructional decisions, and collaborative work around student needs. Interviews from both members of two mentoring pairs made it possible to compare their descriptions of some shared experiences. The other three preservice teachers contributed accounts without corresponding mentor interviews, so the perspective of those mentors could not be inferred. Together, these accounts helped identify where opportunities for reciprocal learning appeared within existing relationships. The study did not test a new mentoring model.

## Statement of the Problem

Mentoring is one of the most important parts of teacher preparation because it is where preservice teachers begin to figure out how teaching really works (Feiman-Nemser, 2001a). Coursework gives them important tools, but it is in the classroom where they learn how to make decisions, respond to students, and manage the day. Even though mentoring is meant to support this growth, the quality and consistency of mentoring can vary a great deal across schools and

placements. Some preservice teachers enter classrooms where mentors communicate clearly, set shared expectations, and create space for gradual responsibility. Others enter classrooms where expectations are unclear or where the mentor is stretched thin and unable to give much support. These differences can shape preservice teachers' opportunities to take responsibility and learn from classroom practice (Aspfors & Fransson, 2015; Hobson et al., 2009).

In teacher preparation programs, mentoring is often viewed as something that naturally happens once a preservice teacher enters the classroom. In reality, mentoring is a complex practice that relies on relationships, communication, and time. Mentor teachers juggle their own teaching responsibilities while also trying to support a novice teacher. Preservice teachers try to learn without feeling like they are interrupting the classroom routine or being a nuisance to the mentor. When these roles are not clearly understood by both sides, the mentoring relationship can become confusing or even stressful. These tensions also matter when a preservice teacher is learning to make decisions during mathematics or science instruction (Wang & Odell, 2002; Windschitl et al., 2012).

STEM instruction adds another layer to mentoring because preservice teachers need opportunities to participate in mathematics and science instruction, not simply observe it. Preservice teachers cannot learn to make science or mathematics instructional decisions in a placement just because it is called a STEM experience; they need opportunities to work with students and reflect on what happens. Research on preservice elementary teachers' science knowledge and confidence helps explain why science preparation matters (Menon & Sadler, 2016). Research on ambitious science teaching likewise emphasizes practice with the actual work of teaching science (Windschitl et al., 2012). However, the opportunities available to preservice teachers may vary depending on classroom schedules, curriculum expectations, and

the responsibilities mentors are able to share. These differences can influence what preservice teachers have opportunities to learn and discuss with their mentors.

Although mentoring is an established part of teacher preparation, studies show that its quality and purposes vary across programs and relationships (Aspfors & Fransson, 2015; Hobson et al., 2009; Wang & Odell, 2002). Mentor teachers may be expected to support a novice while continuing to manage their classroom responsibilities. Preservice teachers may be given teaching time without an equal opportunity to explain their reasoning or take part in decisions. These differences matter because participation in classroom work is part of how a novice learns to teach (Lave & Wenger, 1991). Understanding mentoring requires attention to both the relationships participants develop and the opportunities they have to participate in instructional decisions.

Although research has examined mentoring relationships and mentor preparation, less is understood about how preservice teachers and mentor teachers describe opportunities for reciprocal learning within elementary STEM field placements where access to mathematics and science instruction varies. This gap is important because mentoring involves more than the guidance an experienced teacher provides to someone learning to teach. Preservice teachers also bring ideas, observations, and experiences that may contribute to instructional conversations and decisions. However, mentors remain responsible for their classrooms and often determine when and how preservice teachers can participate in those decisions. Examining these experiences from both perspectives may provide a better understanding of how opportunities for reciprocal learning develop within existing mentoring relationships.

The STEM context made this problem more specific because the instructional opportunities available to preservice teachers are not always the same across subjects. Research

on elementary science preparation has examined preservice teachers' confidence and content knowledge, and science teacher educators have argued for opportunities to practice demanding instructional work (Menon & Sadler, 2016; Windschitl et al., 2012). Yet an elementary placement may give a preservice teacher many chances to teach mathematics and fewer chances to teach science. The nature of the work available can affect what the mentor and preservice teacher have to plan, discuss, and reconsider together. Without describing these opportunities, a study of mentoring could wrongly assume that all participants had the same access to STEM instruction. Considering these differences is important when examining how mentoring relationships support participation and opportunities for learning together.

From a theoretical perspective, mentoring involves participation in the social work of teaching, not only the transfer of strategies from an experienced teacher to a novice. Situated learning and legitimate peripheral participation explain why access to planning, instruction, and decision-making matters as newcomers take part in a professional community (Lave & Wenger, 1991). Communities of practice also draw attention to how participation and identity develop in the classroom and in wider school settings (Wenger, 1998). At the same time, mentor and preservice teacher roles are unequal because the mentor remains responsible for students and the classroom. Research on mentoring roles and authority helps explain how the mentor's position can shape whose judgment is heard and when a preservice teacher can act on an idea (Mackie, 2020; Merket, 2022). These perspectives provide a way to examine how authority and opportunities for participation may influence collaboration and reciprocal learning within mentoring relationships.

Understanding these mentoring experiences requires attention to how preservice teachers and mentor teachers describe their relationships, the responsibilities they share, and the

instructional decisions they make together. Mentoring relationships may provide opportunities for preservice teachers to contribute ideas and participate in decisions while mentors continue to hold responsibility for classroom instruction. These opportunities do not necessarily make the relationship equal, but they may create space for both individuals to learn from their shared work. Examining these experiences can help explain how reciprocal learning might occur within conventional mentoring relationships.

Mentoring cannot be treated as a single experience that unfolds the same way in every classroom. Even when a program sets common expectations, the mentor and preservice teacher work within particular schedules, curricula, relationships, and classroom responsibilities. Research on mentor preparation and how preservice teachers learn through mentoring has shown that the quality of guidance and instructional conversations can influence their learning experiences (Aspfors & Fransson, 2015; Wang & Odell, 2002). These differences make it important to examine mentoring from the perspectives of both preservice teachers and mentor teachers. Understanding how each person views the relationship can provide insight into how responsibilities, expectations, and opportunities for participation are negotiated within the classroom.

## Study Purpose and Research Questions

The purpose of this qualitative study was to examine how preservice teachers and mentor teachers experienced mentoring in elementary STEM field placements. The study focused on relationships, instructional responsibility, feedback, authority, and opportunities for collaborative or reciprocal learning. Research on mentoring roles and power helped frame attention to how a mentor's classroom responsibility could shape a preservice teacher's opportunities to participate (Mackie, 2020; Merket, 2022). I wanted to understand how participants made sense of their roles

while working in actual classrooms. I was also interested in how preservice teachers and mentors described opportunities to contribute ideas, make instructional decisions, and learn from one another. These experiences were examined within existing mentoring relationships where mentors and preservice teachers held different levels of responsibility and authority.

The research questions focused on preservice teachers' experiences, mentor teachers' descriptions of their roles, and opportunities for reciprocal or collaborative learning. Questions about instructional opportunities were also informed by research on elementary preservice science preparation and the work of learning to teach science (Menon & Sadler, 2016; Windschitl et al., 2012). They were exploratory because the study examined relationships already in place rather than testing an intervention. Research on reverse mentoring also provided a point of comparison for considering how knowledge and ideas might move from a less experienced individual toward a more experienced educator (Porras et al., 2018; Raberger et al., 2024). However, this study did not introduce or evaluate a formal reverse mentoring model. Instead, it examined opportunities for reciprocal learning within existing mentoring relationships.

Three research questions guided this study:

1. How do preservice teachers describe their mentoring experiences in elementary STEM field placements?
2. How do mentor teachers describe their roles and experiences in mentoring preservice teachers?
3. What themes or dynamics emerge that reveal opportunities for reciprocal or collaborative learning within these mentoring relationships?

These questions guided the interviews, analysis, and organization of the findings. The first centered on the preservice teachers' descriptions, and the second centered on the participating

mentors' own accounts. The third question focused on opportunities for collaboration and reciprocal learning, including how preservice teachers' ideas and experiences might contribute to shared instructional decisions. The questions did not assume that mentor and preservice teacher roles became equal. Instead, they left room to examine how learning could move in both directions while mentors remained responsible for their classrooms.

Together, these research questions supported an in-depth examination of mentoring in real classroom environments. They provided a way to consider how preservice teachers and mentor teachers understood their relationships and the opportunities available for participation in instructional work. The study also considered how communication, expectations, and classroom responsibilities might influence those experiences. Keeping the questions open allowed for differences in how participants understood and described their mentoring relationships. Because the study relied on interviews rather than direct observations of classroom interactions, the focus remained on participants' descriptions and interpretations of their experiences.

The questions also gave the study a practical focus for teacher preparation. Understanding how mentoring unfolded in these placements can help programs consider how to support mentors and preservice teachers. It can draw attention to the kinds of responsibility preservice teachers receive and the ways mentors invite them to explain decisions. It may also help teacher preparation programs consider how preservice teachers can contribute ideas and participate in shared instructional work while mentors maintain responsibility for their classrooms. By examining these experiences, the study sought to contribute to a better understanding of mentoring relationships and opportunities for reciprocal learning in elementary STEM field placements.

## Significance of the Problem

Mentoring matters because it serves as the link between what preservice teachers learn in coursework and what they actually do with children in a classroom (Feiman-Nemser, 2001a). Many preservice teachers arrive at their field placements wanting to try the strategies they have learned, but they often feel unsure once they step into a real classroom. They rely heavily on their mentor teacher for guidance, reassurance, and space to grow. Supportive mentoring can help preservice teachers take part in the work of teaching and develop a sense of who they are becoming as teachers. When mentoring is inconsistent or unclear, they may leave their placements with doubts about their abilities, or a narrow view of what teaching can look like (Hobson et al., 2009).

The elementary STEM setting makes the quality of mentoring important because instructional opportunities differ across subject areas and placements. Research has examined concerns about preservice elementary teachers' science knowledge and confidence (Menon & Sadler, 2016). Teaching science also asks novices to learn practices such as working with students' ideas and evidence, which require opportunities to try them in classrooms (Windschitl et al., 2012). Preservice teachers also need opportunities to participate in mathematics instruction, where they can learn to respond to student thinking and make instructional decisions. However, participating in one subject does not necessarily mean a preservice teacher has the same opportunities in another. Understanding the instructional experiences can shape what preservice teachers have opportunities to practice and discuss with their mentors.

Teacher preparation programs depend on strong mentoring partnerships with schools, but program leaders may not always know how individual mentoring relationships unfold in classrooms. There is often an assumption that mentoring is happening smoothly, even though the

experience can vary widely from classroom to classroom. Without a clearer understanding of what mentoring actually looks like in these spaces, programs are limited in how they support mentors and preservice teachers. Research on mentor preparation suggests that mentoring requires more than classroom teaching experience and that mentors benefit from preparation and support for their roles (Aspfors & Fransson, 2015; Wang & Odell, 2002). Understanding how both individuals experience mentoring can help programs consider whether their expectations and supports reflect what happens during field placements.

Another reason this problem matters is that mentoring influences how preservice teachers participate in the work of teaching. Situated learning and legitimate peripheral participation emphasize that learning involves becoming involved in the practices of a community (Lave & Wenger, 1991). As preservice teachers gain opportunities to plan, teach, and make decisions, they also begin to participate more fully in the professional work of teachers. Communities of practice connect this participation to the development of professional identity (Wenger, 1998). However, mentor teachers remain responsible for their classrooms, which means they often determine when preservice teachers can take responsibility or contribute to instructional decisions. Understanding how mentors use that authority matters because these decisions can influence the opportunities preservice teachers have to participate and learn (Mackie, 2020; Merket, 2022).

Mentor preparation is also important because experienced classroom teachers are not automatically prepared for every part of the mentoring role. Research on mentor education emphasizes the need to prepare teachers to support novice learning while managing their own instructional responsibilities (Aspfors & Fransson, 2015). Mentors must make decisions about when to provide guidance, when to offer feedback, and when to allow preservice teachers to

work through instructional challenges. These decisions involve more than sharing teaching strategies because they also influence how much responsibility a preservice teacher can assume. A better understanding of mentoring experiences may help teacher preparation programs consider how to prepare mentors for these responsibilities.

Reciprocal learning is another reason these mentoring relationships deserve attention. Mentoring is often understood as a relationship in which an experienced teacher provides knowledge and guidance to someone learning to teach. However, preservice teachers may also bring ideas, observations, or experiences that contribute to instructional conversations. Research on reverse mentoring has examined more intentional arrangements for exchanging knowledge between individuals with different levels of experience (Bertram et al., 2023; Porras et al., 2018; Raberger et al., 2024). Although those arrangements differ from conventional teacher mentoring, they provide a useful point of comparison for considering how knowledge might move in both directions. Understanding these possibilities matters because reciprocal learning may occur even when mentors and preservice teachers do not share equal responsibility or authority.

Studying mentoring in elementary STEM placements can help teacher preparation programs identify the types of support that mentors and preservice teachers actually need. For mentors, this may include time, resources, or clearer expectations about how to guide a novice teacher in areas where both feel uncertain. For preservice teachers, a better understanding of mentoring may help programs to provide opportunities to try new ideas, ask questions openly, and build confidence in teaching STEM. Such attention can help programs consider how field experiences prepare preservice teachers for later teaching responsibilities. It may also encourage programs to examine whether preservice teachers have meaningful opportunities to participate in

both mathematics and science instruction rather than assuming that all STEM placements provide similar experiences.

The significance of this study lies in its attention to how mentoring relationships and instructional opportunities shape preservice teachers' participation in elementary STEM field placements. Examining the experiences of both preservice teachers and mentor teachers may provide a better understanding of how feedback, responsibility, and authority influence opportunities for collaboration. This understanding may help teacher preparation programs consider how they support mentors and structure field experiences. It may also contribute to the literature on reciprocal learning by examining opportunities for shared learning within conventional mentoring relationships rather than a formal reverse mentoring program. By focusing on participants' descriptions of their experiences, the study looked to provide a closer understanding of the everyday work of mentoring and why these relationships matter in teacher preparation.

## Study Overview

This study used a basic interpretive qualitative design to examine how participants understood their mentoring relationships and the classroom experiences associated with them (Merriam & Tisdell, 2016). The interviews centered participants' descriptions of everyday interactions, instructional responsibility, feedback, and collaboration. I considered each account in the context of its placement and compared accounts where both members of a mentoring pair participated. The study attended to lived experience, but it did not use a distinct phenomenological analysis. It also did not include direct observation of classroom interactions or

test a formal reverse mentoring intervention. This design suited questions about how participants understood mentoring across different classroom contexts.

Participant data for the study came from 13 semi-structured interviews with five preservice teachers and two mentor teachers. All seven participants completed an initial interview; four preservice teachers and both mentors also completed a follow-up interview. The two complete mentor-preservice teacher pairs were Garrett and Elisabeth and Kyla and Robert. Michael completed only an initial interview, and the mentors of Ethan, Nicole, and Michael were not interviewed. Written reflections were originally planned and expected, but none were completed, so the interviews were the only participant data source. The interviews allowed participants opportunities to describe experiences of responsibility, feedback, relationships, instructional learning, authority, and collaboration in their own words. Collecting follow-up interviews also allowed the study to examine how some participants described changes across the placement.

I analyzed the interview transcripts through first-cycle open coding, second-cycle pattern coding, and theme development, drawing on Saldaña's (2021) guidance on qualitative coding. I began by reading and rereading the transcripts to become familiar with participants' experiences and to identify initial ideas related to the research questions. As I reviewed the transcripts, I made notes in the margins and began identifying initial codes based on participants' descriptions. I used open coding to identify meaningful statements and longer passages in which participants discussed their mentoring experiences, rather than limiting the coding to individual words or sentences. These passages included descriptions of feedback, instructional decisions, confidence, autonomy, relationships with mentors, and opportunities to participate in mathematics and science instruction. After completing this initial manual coding, I imported the transcripts into

NVivo to organize the codes and continue examining the data. This allowed me to revisit coded passages, consider connections among codes, and organize the information for comparisons across participants.

After developing the initial codes, I examined how they related to one another and began grouping similar codes into broader categories. For example, codes related to feedback, autonomy, and instructional decision-making helped me examine how preservice teachers described opportunities to take responsibility within their placements. I also compared codes across participants and, where both members of a mentoring pair participated, examined similarities and differences in how they described their experiences. Saldaña's (2021) guidance informed my use of open coding and the examination of broader patterns among related codes. This later process was informed by pattern coding as I considered how individual codes connected to larger categories and potential themes. These comparisons, along with analytic memos, helped me develop potential themes that addressed the three research questions.

As I developed and refined the themes, I returned to the transcripts to consider whether they accurately represented participants' descriptions. I examined how the themes related to the coded passages and the broader interview accounts, making adjustments as needed to distinguish overlapping ideas and clarify what each theme represented. I then defined and organized the themes around the research questions before presenting them in Chapter Four. I identified events participants described as significant and later incorporated selected accounts as examples within the findings in Chapter Four. These examples were drawn from interviews and checked against the transcripts; they were a way to present findings, not observations or a separate source of data. The examples provided a way to illustrate particular mentoring experiences while keeping the participants' descriptions connected to the broader themes.

I considered credibility, transferability, dependability, and confirmability as aspects of trustworthiness (Lincoln & Guba, 1985). I sent participants summaries of their main points and invited clarification or correction; participants who responded did not identify concerns with those summaries. I also returned to the transcripts, compared the two completed pairs' accounts where possible, and recorded questions in a journal and analytic memos. These steps helped me examine the fit between participants' words and my interpretations. They did not amount to participant approval of the final themes or examples included in the findings. The absence of written reflections and direct observations remained limits of the available evidence.

Chapter Three provides a detailed explanation of how the study was conducted, including participant recruitment, data collection, analysis, and trustworthiness. Chapter Four presents the findings organized by research question and includes two interview-based examples within themes. Chapter Five discusses the findings in relation to the literature and conceptual framework.

## Theoretical Framework

This study was guided by a theoretical and conceptual framework that viewed learning as a social and relational process. Situated Learning Theory (Lave & Wenger, 1991) explains learning as participation in authentic settings where newcomers engage in the practices of a professional community. In this study, mentoring provided preservice teachers opportunities to participate in the actual work of teaching through observation, planning, instruction, reflection, and decision making. Wenger's (1998) concept of Communities of Practice further explains how participation within a professional community can shape learning and identity. These perspectives provided a way to examine how preservice teachers moved from more peripheral participation toward greater involvement in classroom practice.

Legitimate peripheral participation was important for understanding changes in responsibility across field placements. Lave and Wenger (1991) describe newcomers as beginning with more limited forms of participation and gradually gaining access to increasingly meaningful parts of a community's work. Within this study, that idea helped frame differences in how preservice teachers participated in classroom instruction, decision making, and other professional spaces. Participation was not assumed to increase automatically just because time passed in the placement. Instead, access to fuller participation depended partly on the opportunities, responsibilities, and relationships available within the setting. This perspective also supported attention to how participation and professional identity could develop differently across classroom and school contexts.

Research on power and authority added another layer to the framework because mentor teachers and preservice teachers did not enter the relationship with equal responsibility or status. Mentors remained accountable for students and classroom instruction while also shaping preservice teachers' access to teaching opportunities, decision making, and professional voice (Mackie, 2020; Merket, 2022). This framework did not treat mentor authority as automatically negative or restrictive. Instead, it directed attention to how mentors used their authority to open, limit, or negotiate opportunities for meaningful participation. This made it possible to examine how preservice teachers could gain responsibility and contribute ideas while mentors continued to hold greater classroom authority.

Reciprocal and reverse mentoring literature provided a way to examine moments when learning or influence moved in more than one direction. The study did not implement a reverse mentoring intervention. Instead, reverse mentoring was used as a conceptual lens for noticing moments when preservice teachers' observations, knowledge, or instructional ideas influenced

mentors' thinking or classroom practice (Bertram et al., 2023; Porras et al., 2018; Raberger et al., 2024). These ideas allowed reciprocal learning to be examined without assuming that mentor and preservice teacher roles had to become equal. Participation, identity formation, negotiated authority, and shared learning provided the conceptual framework used to interpret the mentoring experiences described by participants.

## Boundaries of the Study

### Delimitations

The study was deliberately limited to mentoring experiences in elementary field placements where participants described STEM instruction. It included preservice teachers and mentor teachers rather than secondary teachers or participants from unrelated preparation contexts. I examined mentoring relationships as they existed in the placements instead of introducing a new model. The interviews focused on participants' accounts of relationships, instructional work, and opportunities to contribute. These boundaries kept the study centered on everyday mentoring while allowing different mathematics and science opportunities to be described.

The study also included people who volunteered after an invitation. That recruitment approach respected participants' choice to share their experiences. It meant that the study could not claim to capture the perspectives of students or mentors who declined or were not interviewed. Only two mentors participated, although five preservice teachers contributed accounts. I kept that difference visible when comparing relationships and interpreting reciprocal learning. Voluntary participation was part of the study's ethical design and boundary on the perspectives available for analysis.

## Conceptual Definitions

Several key ideas guide how this study approaches mentoring and preservice teacher learning. These concepts help show how the study is framed and why elementary STEM placements provide an important setting for understanding mentoring more deeply.

***Mentoring as a professional learning relationship:*** In teacher education, mentoring is understood as a relationship that develops through shared work, reflection, and ongoing communication. It is not simply supervision or evaluation. Mentors model strategies, explain decisions, and help preservice teachers make sense of the work of teaching. Mentoring is shaped by trust, clarity, and the willingness of both partners to engage in conversation about teaching. In this study, mentoring was viewed as a social and relational process rather than a checklist of tasks (Aspfors & Fransson, 2015; Feiman-Nemser, 2001b).

***Preservice teacher learning:*** Preservice teacher learning happens through participation in real classrooms. It includes understanding routines, recognizing student needs, and trying out instructional approaches with support from a mentor. Preservice teachers learn not only by doing but also through the emotional side of teaching, such as managing uncertainty and building confidence. This study focused on how preservice teachers described learning during STEM teaching and how they make sense of their instructional choices with their mentors (Feiman-Nemser, 2001a).

***The mentoring relationship:*** The relationship between preservice teachers and mentor teachers is central to how field placements unfold. This relationship involves shared expectations, communication patterns, and ongoing decision making. When the relationship feels supportive, preservice teachers are more comfortable asking questions and trying new ideas. When expectations are unclear or communication is limited, the preservice teacher's growth can

slow down. This study used the mentoring relationship as the main lens for understanding how mentoring functions in STEM placements (Aspfors & Fransson, 2015; Hobson et al., 2009).

***STEM instruction in elementary settings:*** STEM teaching in elementary classrooms often requires hands-on learning, inquiry, and flexible thinking. Many teachers, including preservice teachers, report feeling less confident in science and engineering, which can influence how lessons are planned and delivered. Because both mentors and preservice teachers may feel unsure in some parts of STEM instruction, this subject area creates a meaningful context for exploring how mentoring actually works (Menon & Sadler, 2016; Windschitl et al., 2012).

***Reciprocal moments within mentoring:*** Even though mentoring is often viewed as a one-way process, preservice teachers bring strengths of their own, especially in areas like technology or newer teaching practices. Reciprocal learning refers to moments when both partners share ideas, ask questions, or introduce new ways of thinking. While this study did not implement a reverse mentoring model, it examined places where mentoring feels more collaborative or where knowledge flows in more than one direction (Mackie, 2020; Merket, 2022; Porras et al., 2018; Raberger et al., 2024).

These conceptual definitions help frame the study and clarify how mentoring, preservice teacher learning, and STEM instruction are understood throughout the dissertation. They also help explain why the mentoring relationship is the central focus of the research questions.

## Definition of Terms

***Field Placement:*** A school-based experience where preservice teachers spend time in a classroom, observe instruction, take on teaching responsibilities, and work closely with a mentor teacher.

***Elementary STEM Field Placement:*** In this study, elementary STEM field placements referred to elementary classroom placements in which participants described mathematics and science teaching experiences. Opportunities to participate in these subjects differed across placements, and the study did not assume that instruction integrated all four STEM disciplines.

***Mentor Teacher:*** An experienced classroom teacher who works with a preservice teacher during a field placement. In this study, mentor refers to teachers who guide, model, support, and communicate with preservice teachers as they learn the work of teaching (Feiman-Nemser, 2001b; Hobson et al., 2009).

***Mentoring*:** A professional relationship in which an experienced teacher provides guidance, feedback, modeling, and support to help a preservice teacher grow in confidence and practice. Mentoring in this study was understood as a social interaction rather than a set of assigned tasks (Feiman-Nemser, 2001b). The relationship also provided opportunities for participation in the shared work of teaching.

***Preservice Teacher:*** A teacher candidate enrolled in a teacher preparation program who is completing field experiences prior to becoming a licensed classroom teacher. In this study, preservice teachers completed elementary STEM placements as part of their preparation.

***Reciprocal Learning*:** Opportunities for both the mentor teacher and preservice teacher to contribute ideas, share knowledge, or learn from one another within a mentoring relationship. Reciprocal learning does not require the individuals to have equal experience, authority, or responsibility (Mackie, 2020; Porras et al., 2018).

***Reverse mentoring*:** A mentoring approach in which a less experienced individual shares knowledge, skills, or perspectives with a more experienced individual, reversing the traditional direction of knowledge sharing (Bertram et al., 2023; Porras et al., 2018; Raberger et al., 2024).

***STEM Instruction***: Teaching and learning that involve science, technology, engineering, and mathematics as individual disciplines or through integrated approaches. In this study, the term primarily referred to mathematics and science instruction within elementary classrooms, rather than requiring integrated instruction across all four STEM disciplines (Menon & Sadler, 2016; Windschitl et al., 2012).

## Organization of the Dissertation

This dissertation is organized into five chapters. Chapter One introduces the study by presenting the background, problem statement, purpose, research questions, significance, theoretical framework, and key definitions. Chapter Two provides a review of the literature on mentoring in teacher education and elementary STEM settings, along with literature on participation, identity, mentor authority, reciprocal learning, and reverse mentoring as a point of comparison. Chapter Three describes the qualitative research design, participants, data collection methods, and procedures for analysis, trustworthiness, and the departures from the original data collection plan. Chapter Four presents the findings from the interviews, organized by research question, and uses interview-based examples to illustrate the findings. Chapter Five discusses those findings in relation to the literature and conceptual framework, implications for teacher and mentor preparation, schools and districts, recommendations for future research, limitations, and conclusions.

## Summary

This chapter introduced the background, problem, and purpose of the study and outlined the guiding research questions. The framework connected participation, professional identity, mentor authority, and the possibility of shared learning within unequal roles. The chapter also described the theoretical framework and defined key terms that were used throughout the

dissertation. Chapter Two reviews the literature that informed the study, and the later chapters explain the methods, findings, and implications.

# Chapter 2 - Literature Review

## Introduction

Understanding how mentoring works in teacher preparation requires looking across several bodies of literature, since mentoring is not a single practice but a combination of beliefs, relationships, routines, and expectations (Feiman-Nemser, 2001b; Hobson et al., 2009). Research comes from teacher education, adult learning, STEM education, organizational learning, and sociology. Although these areas offer different perspectives on mentoring, they share an interest in understanding how individuals learn through professional relationships and experiences. Wang & Odell (2002) examined different approaches to mentoring and showed how underlying assumptions about teaching and learning influence the support novice teachers receive. Their work provides a foundation for considering mentoring as more than the transfer of knowledge from an experienced teacher to someone entering the profession. A review of these areas helps establish what scholars know about mentoring, what remains unclear, and why it is necessary to study mentoring as it is actually experienced by the people involved (Aspfors & Fransson, 2015).

This chapter follows a broad-to-narrow structure, beginning with research on traditional mentoring in teacher education and moving toward the specific relationships and instructional experiences associated with elementary STEM placements. It begins with research on traditional mentoring in teacher education to show how mentoring has been defined, how it has evolved and how it continues to shape preservice teacher learning. The chapter then moves into literature on mentor preparation, since strong mentoring depends heavily on the professional learning and support mentors receive (Aspfors & Fransson, 2015). From there, the focus shifts to STEM contexts, where both preservice teachers and mentor teachers often face additional challenges related to inquiry, content knowledge, and confidence (Menon & Sadler, 2016). The chapter also

examines situated learning, Communities of Practice, and research on identity, authority, and participation to consider how mentoring relationships shape opportunities to engage in classroom instruction (Lave & Wenger, 1991; Wenger, 1998). Finally, it reviews reverse mentoring as a conceptual model that offers a different way of thinking about knowledge, roles, and expertise (Porras et al., 2018; Raberger et al., 2024). The chapter concludes with a conceptual framework that brings these ideas together for the present study.

The literature included here was identified through searches in ERIC, ResearchGate, and Google Scholar using terms related to mentoring, preservice teachers, mentor teacher preparation, STEM mentoring, inquiry-based instruction, teacher identity, communities of practice, sociocultural learning, and reverse mentoring. I focused on research published within the last 15 years, but I also included earlier foundational work that continues to shape current mentoring practices (e.g., Feiman-Nemser, 2001a; Lave & Wenger, 1991). Studies were selected if they helped explain how mentoring works in teacher preparation programs, how STEM specific challenges shape the mentoring process, how mentors are supported and prepared, or how learning is understood through social and relational theories (Aspfors & Fransson, 2015; Hobson et al., 2009). I also included research examining mentor authority, professional voice, and reciprocal learning because these ideas helped explain how opportunities for participation and collaboration develop within mentoring relationships. Including research from traditional mentoring and reverse mentoring provided an opportunity to consider both established practices and alternative ways of understanding how knowledge may be shared between mentors and preservice teachers.

Research on mentoring has identified several factors that influence the experiences of preservice teachers, including mentor preparation, relationship quality, feedback, and

opportunities to participate in classroom instruction (Aspfors & Fransson, 2015; Hobson et al., 2009; Parker et al., 2022). Other studies have examined how professional roles and differences in authority influence whose knowledge is recognized and how responsibility is shared (Mackie, 2020; Merket, 2022). Although these studies contribute to understanding mentoring, they approach the relationship from different perspectives. Research focused on preservice teacher development does not always provide the same attention to the mentor teacher's experiences, while studies of reciprocal learning often examine arrangements designed specifically to encourage exchanges of expertise. These differences point to the importance of examining how both participants describe mentoring within existing elementary STEM field placements, particularly when opportunities for collaboration and shared instructional decision-making develop without a formal reverse mentoring program.

Although this review focuses on mentoring in elementary STEM field placements, research from other teacher education contexts is included when it provides insight into mentoring relationships, instructional responsibility, and reciprocal learning. These studies are considered in relation to their specific educational settings rather than assuming that the findings apply equally across contexts. The literature reviewed provides a foundation for examining mentoring as a relationship shaped by instructional opportunities, professional responsibilities, and interactions between preservice teachers and mentor teachers. It considers how existing research explains the movement from observation toward greater instructional responsibility and how mentor authority influences that participation. It also examines what is known about reciprocal learning and the extent to which these opportunities have been explored within conventional mentoring relationships. These areas help frame the examination of mentoring from the perspectives of preservice teachers and mentor teachers in elementary STEM placements.

## Mentoring in Teacher Education

Historically, mentoring in teacher education has evolved from informal apprenticeship models to structured partnerships embedded within teacher preparation programs (Feiman-Nemser, 2001a; Hobson et al., 2009). Early models emphasized observation and imitation, while more recent approaches have focused on reflection, collaboration, and professional dialogue. Early mentoring research describes this support as a way to help novices make sense of the routines, expectations, and decisions that shape daily life in classrooms. Much of this early work grew out of apprenticeship models where the mentor guided the novice by demonstrating teaching practices and gradually turning responsibility over to them (Wang & Odell, 2002). In their review of mentoring approaches, Wang and Odell (2002) examined how different assumptions about teaching and learning influenced the support provided to beginning teachers. Their work helps explain why mentoring may focus primarily on providing guidance and technical assistance or place greater emphasis on examining teaching practices. This historical shift reflects a broader movement in teacher education from training toward development, where learning to teach is viewed as a process of participation within professional communities (Lave & Wenger, 1991; Wenger, 1998).

Mentoring has long been a central part of teacher education. It serves as the bridge between what preservice teachers learn in coursework and what they experience in actual classrooms (Feiman-Nemser, 2001a). However, having an experienced teacher available does not necessarily mean that the preservice teacher will receive the same opportunities for learning or instructional responsibility. In traditional settings, mentoring often follows an apprenticeship model. The mentor is seen as the expert who passes on knowledge to the novice, who in turn listens, observes, and applies what they are told (Wang & Odell, 2002). This approach offers

needed support, but it also limits opportunities for shared learning and collaboration. Hobson et al. (2009), in their review of international mentoring literature, identified both benefits and challenges associated with mentoring beginning teachers, including the importance of mentor preparation and the conditions surrounding the relationship. Unlike Wang and Odell (2002), who examined different approaches to mentoring, Hobson et al. considered a broader range of factors influencing mentoring experiences. Together, these reviews suggest that mentoring cannot be understood by only examining what mentors do. The expectations, preparation, and opportunities available within the relationship also influence how mentoring is experienced.

Over time, researchers have shown that mentoring can be a powerful tool for teacher growth when it moves beyond supervision and becomes a more collaborative relationship. When mentors and preservice teachers share ideas, plan lessons together, and reflect together, these interactions provide opportunities to examine instructional decisions and consider different approaches to teaching. Effective mentors do more than check lesson plans or give feedback. They help novices think critically about their practice, connect theory to action, and develop a sense of belonging in the teaching profession. Orland-Barak and Wang (2021) examined mentoring through four approaches: personal growth, situated learning, core practice, and critical transformative mentoring. Their conceptual discussion shows that mentoring may serve different purposes depending on how professional learning and the mentor's responsibilities are understood. Although their work does not report findings from a new participant study, it provides a useful way to consider why some mentoring relationships emphasize guidance and skill development while others create opportunities for reflection and shared learning. This distinction is important because collaboration does not necessarily occur simply because two

teachers work together. It also depends on whether the preservice teacher has opportunities to contribute ideas and participate in instructional decisions.

Mentoring relationships also develop over time rather than remaining fixed throughout a placement. Research connects relational quality, trust, and mentor fit to how comfortable preservice teachers feel asking questions, taking risks, and participating in the work of teaching (Dreer-Goethe, 2025; Izadinia, 2016; Parker et al., 2022). Parker et al. (2022) also support looking at how mentoring relationships change across a placement rather than treating the initial relationship as representative of the whole experience. Feedback can be experienced differently depending on the trust and expectations that have developed within the relationship, especially when correction occurs within unequal mentor and preservice teacher roles (Weston et al., 2025). This means that the mentoring relationship is not simply the setting where feedback and support occur, but part of what determines how that support is experienced. Dreer-Goethe (2025) also found that relationships with school colleagues beyond the mentor were connected to student teachers' engagement and psychological safety during practicum, suggesting that the larger professional environment can also shape how preservice teachers participate.

Mentoring also takes place within unequal professional roles. Mentor teachers remain responsible for students, classroom routines, and instructional decisions, while preservice teachers enter as newcomers whose access to teaching is partly shaped by the mentor. Research on mentoring shows that participation and voice are influenced by role positioning, perceived expertise, and established classroom or institutional routines (Mackie, 2020; Merket, 2022; Van der Kloot et al., 2025). This does not mean that mentor authority is automatically negative because that authority can be used either to restrict participation or to create meaningful opportunities for preservice teachers to make decisions and assume responsibility. More

collaborative participation depends not only on the confidence of the preservice teacher, but also on deliberate invitations and structures that make room for contribution within an unequal relationship (Nelson & Charteris, 2025; Weiss et al., 2024).

Beyond helping new teachers feel more confident, mentoring also supports long-term retention and professional identity. Mentors who model reflective practice and provide constructive feedback can help novices make sense of teaching (Feiman-Nemser, 2001b; Hobson et al., 2009; Ingersoll & Smith, 2003). Research on beginning teachers also suggests that mentoring and induction support can contribute to teacher retention (Ingersoll & Smith, 2003). Mentoring helps novices connect their university coursework to the daily realities of the classroom and develop professional habits that sustain them beyond student teaching (Menon & Sadler, 2016). These experiences contribute to gradual formation of teacher identity and a sense of belonging within a professional community (Aspfors & Fransson, 2015; Lave & Wenger, 1991; Wenger, 1998). In this way, mentoring serves both individual and institutional goals. It provides support for new teachers and strengthens the overall teaching profession by fostering collaboration, shared language, and a sense of belonging.

However, mentoring is not a consistent experience for all teacher candidates. Research shows wide variation in mentor preparation and in how mentoring is enacted across programs and schools (Hobson et al., 2009). This variation is influenced by an important pattern in the research. Many mentors step into the role with little or no formal preparation. While teaching experience provides a foundation, studies show that mentoring requires additional knowledge about communication, adult learning, and how to support novices in reflective practice (Aspfors & Fransson, 2015). Research from several countries has found that even established induction programs often lack structured education for mentors, which limits their ability to offer

consistent and research informed support. Some mentors approach the role as a coach or collaborator, while others see it as a supervisory position. This inconsistency can create confusion about expectations and roles for both the mentor and the preservice teacher. Power imbalances, time constraints, and limited institutional support often limit how much collaboration can occur. These ongoing challenges raise questions about how mentoring can evolve to meet the needs of today's classrooms, especially in areas such as science, technology, engineering, and mathematics when innovation and collaboration are essential. These inconsistencies point to the need for clearer expectations, stronger mentor preparation, and structures that support collaboration. Without these supports, mentoring often depends more on individual personalities and school culture than on shared goals or research-based practices (Hobson & Malderez, 2013).

The patterns described in mentoring research show why STEM contexts require special attention. STEM teaching introduces additional uncertainty and complexity related to inquiry, technology, and problem solving, all of which influence how preservice teachers learn during fieldwork (Menon & Sadler, 2016). These added demands shape the mentoring relationship in unique ways, which is why the next section focuses specifically on mentoring in STEM teacher preparation.

Research consistently shows that effective teaching does not automatically prepare someone to be an effective mentor (e.g., Aspfors & Fransson, 2015; Evertson & Smithey, 2000; Hobson et al., 2009). Mentoring is its own professional practice that involves guiding adult learners, communicating expectations, offering constructive feedback, and supporting the emotional and instructional needs of novice teachers. Mentor preparation is important because experienced teachers must learn how to explain the instructional decisions they make and

support another teacher's learning rather than simply demonstrate their own teaching practices. Although teaching experience provides an important foundation, it does not necessarily prepare mentors to facilitate reflection, discuss instructional challenges, or determine when preservice teachers need additional guidance. The literature also distinguishes between mentoring beginning teachers and mentoring preservice teachers, since the expectations and responsibilities of these groups are not always the same. These differences are important when considering how mentor education supports preservice teachers during field placements.

Empirical research provides evidence that structured mentor preparation can influence how mentors support novice teachers. Evertson and Smithey (2000) conducted an experimental field study in the United States involving 46 mentor-protege pairs, with 23 pairs in a mentoring program and 23 in a comparison group. The researchers used classroom observations, records of mentoring activities, and ratings of student behavior to examine differences in the proteges' classroom practices. They found that proteges working with mentors who participated in the formal program were better able to organize instruction, establish classroom routines, and manage their classrooms early in the school year. Their students also demonstrated better behavior and engagement. Although this study focused on beginning teachers rather than preservice teachers, it provides evidence that preparation for the mentoring role can make a difference in the instructional support novices receive.

Additionally, mentors may rely on their own classroom experiences when determining how to support developing teachers. While this experience can be helpful, it is not always enough to support novices through complex tasks such as planning, reflection, problem-solving, and implementing new forms of instruction (Feiman-Nemser, 2001b). Ulvik and Sunde (2013) examined a formal mentor education program for secondary teachers at a university in Norway.

Their qualitative study explored why teachers participated in the program, how they experienced their preparation, and which aspects they considered valuable. The researchers found that participants moved from a practical understanding of mentoring toward a more conceptual understanding of the role. Participants also developed a shared language for discussing mentoring, a professional network, and a stronger awareness of their responsibilities as mentors. These findings suggest that mentor education may help experienced teachers think more intentionally about how they support another teacher's professional learning. Unlike Evertson and Smithey (2000), who examined outcomes for beginning teachers, Ulvik and Sunde (2013) focused on what mentors learned through their own preparation.

Research in elementary science teacher preparation provides a more direct connection to this study. Miller et al. (2019) examined a research-based professional development program designed to prepare elementary cooperating teachers to mentor preservice teachers during science instruction. The program addressed both effective science teaching and the skills needed to facilitate mentoring conversations about observed lessons. The researchers reported statistically significant improvements in participating mentors' beliefs about effective science instruction than peers who did not receive the same mentoring support. Unlike Evertson and Smithey (2000), this study focused specifically on elementary preservice teachers and the instructional demands of science education. Its findings suggest that mentor preparation can address both the content of instruction and how mentors discuss that instruction with preservice teachers.

Melton et al. (2019) examined a hybrid professional development program designed to support elementary cooperating teachers in mentoring preservice teachers during science instruction. Although 22 mentor teachers participated in the larger study, the researchers focused

their analysis on five teachers who had not previously completed the mentoring professional development offered by the research team. The program combined face-to-face learning about effective science instruction with online modules focused on mentoring practices. Researchers analyzed 17 recorded mentoring conversations, including nine conversations before the professional development and eight afterward. Before the program, conversations focused primarily on classroom management, while later conversations placed greater emphasis on effective science instruction and evidence of student learning. Mentors also demonstrated a greater use of coaching rather than relying primarily on providing advice. Because the analysis involved only five cooperating teachers, the findings should be interpreted within that limited sample. However, the study provides a useful example of how mentor preparation may influence the actual conversations that occur between mentors and preservice teachers.

Mentor preparation also involves learning how to manage the boundaries of the mentoring role. Mentors must decide when to intervene, when to step back, how to directly communicate concerns, and how to protect student learning while allowing preservice teachers to develop their own judgment. These decisions involve more than providing feedback because mentors also determine which instructional responsibilities preservice teachers are ready to take on. Orland-Barak and Wang (2021) describe mentoring as a practice shaped by different approaches to teacher learning and professional development. The studies by Miller et al. (2019) and Melton et al. (2019) add an instructional perspective by showing how mentor preparation can focus attention on evidence of student learning and the questions mentors ask during conversations about teaching. This connection is important because the way mentors communicate their expectations may influence whether preservice teachers are encouraged to explain their reasoning, consider alternatives, and participate in instructional decisions.

A synthesis of mentor education research identifies three dimensions that are important for designing and improving mentor preparation programs: contextual, theoretical-analytical, and relational dimensions (Figure 2.1). The contextual dimension emphasizes that mentor education must be adapted to local structures, expectations, and school cultures. The theoretical analytical dimension highlights the need for mentors to engage with ideas about teaching and learning so they can challenge assumptions and think critically about their mentoring practices. The relational dimension focuses on the importance of trust, empathy, and supportive relationships (Aspfors & Fransson, 2015). Aspfors and Fransson's synthesis focused on mentors of newly qualified teachers, so these dimensions should not be treated as findings drawn specifically from elementary preservice teacher placements. However, they provide a useful way to consider the different aspects of mentor preparation alongside the elementary science studies discussed above. These dimensions reinforce the need to study mentoring in authentic settings, since mentoring is shaped not only by what mentors do but also by the relationships and environments in which it occurs.

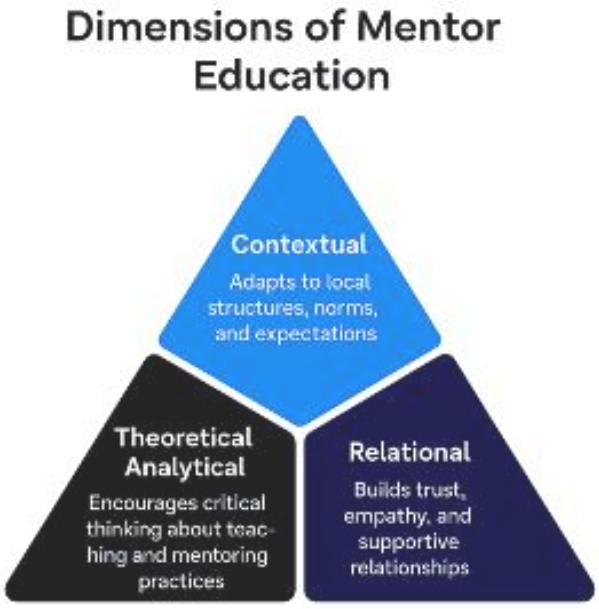



**Figure 2.1 The three dimensions of mentor education (adopted from Aspfors & Fransson, 2015)**

The research on mentor preparation also raises questions about what happens when preservice teachers contribute ideas or approaches that differ from those of their mentors. Studies of professional development demonstrate ways to strengthen mentoring practices, but they do not necessarily explain how both participants experience opportunities for shared instructional decision making within their everyday relationships. In this study, mentor preparation provides an important context for understanding how mentor teachers describe their responsibilities, how preservice teachers experience instructional guidance, and how opportunities for reciprocal or collaborative learning may develop.

## Models of Mentoring

Mentoring can take many different forms depending on program goals, participant roles, and school contexts. These models vary in structure, formality, and purpose. Research has identified a wide range of mentoring approaches, including informal mentoring, intentional informal mentoring, formal mentoring, functional mentoring, group mentoring, mosaic mentoring, peer mentoring, near peer mentoring, e mentoring, triad mentoring, and multiple mentoring arrangements (Alam, 2019). The variety of models shows that mentoring is not a single practice but rather a flexible approach to support teacher development. Although these models differ in how mentoring is organized, they also influence who provides guidance, how participants interact, and the opportunities available for professional learning.

Some models focus on one-to-one relationships, while others involve peer groups or networks. Near peer and peer mentoring models emphasize collaboration among individuals at similar or relatively close stages of professional development, encouraging shared problem solving and mutual support (Aspfors & Fransson, 2015). Mosaic or multiple mentoring models involve several mentors who each contribute different kinds of expertise (Ulvik & Sunde, 2013).

Triad mentoring creates a structured relationship among a preservice teacher, a mentor teacher, and a university supervisor. In traditional field placements, the classroom mentor generally has greater responsibility for guiding instruction and supporting the preservice teacher's development. However, the way that responsibility is shared can differ depending on the expectations of the program and the relationship between participants. These models highlight that mentoring is shaped by context and purpose, and they reinforce the need to understand how mentoring currently functions in a particular program.

Reverse mentoring is one of the less traditional but increasingly relevant models. Although it differs from conventional approaches, it fits within the broader landscape of mentoring models that seek to create more collaborative and reciprocal relationships (Bertram et al., 2023; Raberger et al., 2024). Rather than focusing only on what experienced teachers contribute, reverse mentoring recognizes that less experienced participants may also bring knowledge and ideas that contribute to professional learning. Exploring traditional models alongside emerging ones helps build a foundation for investigating opportunities for reciprocal learning within existing mentoring relationships. These relationships are particularly important in elementary STEM field placements, where preservice teachers and mentors may bring different experiences, instructional approaches, and understandings of mathematics and science teaching.

## Mentoring in STEM Teacher Preparation

STEM teaching brings instructional demands that differ from general classroom practice. In elementary mathematics and science, teachers must consider how students develop understanding through questioning, representations, investigations, and problem-solving. These realities shape the kind of mentoring preservice teachers need during their field placements. Mentoring holds a particularly important role in STEM teacher education because of the

complexity of teaching these subjects. Preservice teachers are expected to develop content knowledge while also learning how to recognize student thinking, respond to misconceptions, and make instructional decisions during lessons. They may enter field placements with ideas about inquiry-based instruction and other approaches emphasized in their university coursework yet find that their cooperating classrooms use different instructional practices. This difference between coursework and classroom practice can create challenges as preservice teachers learn to apply what they have been taught in authentic teaching situations.

Inquiry based learning has been identified as a cornerstone of effective STEM instruction, but it can feel risky for mentors and preservice teachers. Planning lessons that allow students to explore, collect data, and reach conclusions requires time, flexibility, and confidence in classroom management. Windschitl et al. (2012) examined the instructional practices needed to support beginning science teachers and described a framework for developing core teaching practices. Their work emphasized helping novice teachers elicit student ideas, support scientific reasoning, and use instructional tools to make student thinking visible. Although their article did not directly examine mentoring relationships, it provides insight into instructional demands preservice teachers may encounter when teaching science. Mentors can help preservice teachers work through these demands by discussing lesson planning, demonstrating instructional approaches, and explaining decisions made during instruction. These interactions are particularly important when preservice teachers are learning how to move beyond following a lesson plan and begin responding to what students understand.

The challenges of mentoring in STEM also extend to issues of content knowledge and confidence. Preservice teachers often describe feeling uncertain about their own STEM expertise and fear making mistakes in front of students or mentors. Menon and Sadler (2016) examined

preservice elementary teachers' science content knowledge and self-efficacy beliefs. Their research focused on how preservice teachers' knowledge and confidence relate to their preparation for teaching science rather than directly examining mentoring relationships. Supportive mentors can help bridge this gap by providing encouragement, modeling problem solving, and framing mistakes as part of the learning process. However, confidence alone does not explain how preservice teachers learn to make instructional decisions or how mentors contribute to that process. Examining the interactions between preservice teachers and their mentors provides another perspective on how developing teachers approach mathematics and science instruction.

Research specifically examining elementary science mentoring provides a closer look at these interactions. Miller et al. (2019) studied a research-based mentoring program designed to support elementary cooperating teachers and preservice teachers during science instruction. The program addressed effective science teaching and the mentoring conversations that followed observed lessons. The researchers reported improvements in mentors' beliefs about effective science instruction and their ability to facilitate mentoring conversations. Preservice teachers receiving this support also demonstrated greater gains in their beliefs about effective science instruction than comparison participants. Unlike Menon and Sadler (2016), whose research focused on preservice teachers' science knowledge and confidence, Miller et al. (2019) examined the role of mentoring in supporting instructional learning. This distinction helps explain why the mentoring relationship itself deserves attention when studying elementary STEM teacher preparation.

Melton et al. (2019) examined mentoring conversations in a related elementary science professional development program. Their analysis included 17 recorded conversations involving

five cooperating teachers who were new to the program. The researchers found that conversations following professional development focused more on effective science instruction and evidence of student learning rather than primarily on classroom management. They also identified changes toward coaching practices that encouraged preservice teachers to participate more actively in discussions about instruction. While Miller et al. (2019) examined changes in beliefs and mentoring capabilities, Melton et al. (2019) provided a closer examination of what mentors and preservice teachers discussed. Both studies involved structured professional development, so their findings do not necessarily represent mentoring relationships in programs without that preparation. However, they demonstrate how instructional conversations can become an important part of learning to teach science.

Mathematics instruction presents similar opportunities for mentors and preservice teachers to examine student thinking, although the instructional tasks may differ from those encountered in science. Carter and Amador (2015) conducted a qualitative case study examining conversations during elementary mathematics lesson study. They found that questioning, open discussion, and modeling interpretations of student thinking supported preservice teachers' ability to recognize and interpret students' mathematical reasoning. However, conversations focused on instructional procedures and extended talk by the facilitator or classroom teacher could limit these opportunities. Schwartz et al. (2018) examined mathematics-specific feedback provided by university supervisors to elementary student teachers across 250 post-observation forms from five universities in the United States. They found that approximately one-third of the forms did not include mathematics-specific feedback, while the remaining forms varied in their attention to instructional tasks and classroom discourse. Although these studies examined different types of instructional support, both demonstrate the importance of attending to

mathematics content during conversations about teaching. Carter and Amador (2015) focused on the interaction that occurred during lesson analysis, while Schwartz et al. (2018) examined written feedback from university supervisors. Neither study directly examined reciprocal learning within conventional classroom mentoring relationships. Together, these findings provide a foundation for considering how mathematics lessons create opportunities for preservice teachers and mentors to discuss student reasoning and instructional decisions.

Technology integration provides another opportunity to examine how preservice teachers and experienced teachers may contribute different knowledge to professional learning relationships. Bertram et al. (2023) conducted a quasi-experimental study in Germany involving 90 preservice teachers and 57 practicing teachers to examine reverse mentoring as an approach to developing digital competence. The researchers found that participants in both reverse mentoring and collaborative learning comparison groups improved their self-efficacy for teaching with technology. However, reverse mentoring was not significantly more effective than the comparison arrangements, and the researchers did not find significant improvements in technological pedagogical knowledge or positive beliefs about technology integration. These findings suggest that preservice teachers can contribute knowledge to professional learning relationships, but reversing mentoring roles does not necessarily produce greater benefits than other collaborative approaches. Because the study involved a structured intervention focused on technology rather than mentoring relationships within elementary STEM field placements, it does not establish whether similar exchanges occur naturally between preservice teachers and their classroom mentors.

The research reviewed in this section approaches STEM teacher preparation from different perspectives. Menon and Sadler (2016) examined preservice teachers' science

knowledge and confidence, while Windschitl et al. (2012) focused on instructional practices that support learning to teach science. Miller et al. (2019) and Melton et al. (2019) examined structured approaches to improving elementary science mentoring, including instructional beliefs and mentoring conversations. Carter and Amador (2015) examined conversations during elementary mathematics lesson study, while Schwartz et al. (2018) investigated mathematics specific feedback provided by university supervisors. Bertram et al. (2023) considered how preservice and practicing teachers could exchange knowledge through a structured reverse mentoring arrangement focused on digital competence. Although these studies contribute to understanding STEM teacher preparation, they provide less insight into how preservice teachers and mentor teachers experience opportunities for collaborative learning within existing elementary mathematics and science field placements. This gap supports examining mentoring as a relationship in which instructional responsibility, professional experiences, and opportunities for participation influence how learning occurs.

Understanding these tensions is essential for examining mentoring relationships through theories that explain how people learn through participation, relationships, and the negotiation of roles. The next section discusses the theoretical perspectives that help make sense of mentoring as a social and relational process, including how participation and mentor authority may influence opportunities for reciprocal learning.

## Theoretical Perspectives on Mentoring

Mentoring is not only a set of tasks or routines. It is a learning experience that develops through relationships, shared work, and everyday decisions that happen in the classroom. Because of this, theory is helpful for making sense of what mentors and preservice teachers actually do together. Situated Learning Theory and Communities of Practice provide the primary

theoretical foundation for this study because they explain learning through participation in meaningful activities and relationships with others (Lave & Wenger, 1991; Wenger, 1998). These perspectives are particularly useful for examining elementary STEM field placements, where preservice teachers learn within classrooms that already have established routines, expectations, and responsibilities. They also provide a way to consider how mentors influence preservice teachers' access to the work of teaching.

Other perspectives help explain aspects of mentoring that participation alone does not fully address. Research on professional identity considers how preservice teachers understand their developing roles as educators (Beauchamp & Thomas, 2009; Izadinia, 2016). Research on mentor authority and reciprocal learning draws attention to how instructional responsibilities are negotiated and how both participants may contribute to professional learning (Mackie, 2020; Merket, 2022). Together these perspectives provide a foundation for examining how preservice teachers and mentor teachers describe their experiences, how participation is shaped by the mentoring relationship, and where opportunities for reciprocal or collaborative learning may develop.

## Situated Learning Theory

Situated Learning Theory explains learning as something that develops through participation in real settings rather than through the simple transfer of information. Lave and Wenger (1991) describe learning as a social process that happens when people take part in the daily work of a community. In teacher education, this means preservice teachers learn not only from coursework but also by engaging with the daily routines, decisions, and problem solving that occur in the classroom. Mentoring offers an entry point into this professional community. By observing, coteaching, and reflecting alongside mentors, preservice teachers begin to understand

the social and cultural practices of teaching. The classroom setting matters because instructional decisions are shaped by students' needs, available resources, school expectations, and the relationships among the people involved.

Lave and Wenger's (1991) original work examined how newcomers learn through participation in established communities of practice. Their examples came from apprenticeship settings, including tailoring, midwifery, and food production, rather than teacher education. Learning was understood as becoming involved in the work of a community rather than simply receiving information from someone with more experience. Applied to teacher preparation, this perspective helps explain why field experiences provide learning opportunities that cannot be fully reproduced through university coursework alone. Preservice teachers encounter situations in which they must interpret student responses, adjust instruction, and consider the consequences of their decisions. These experiences connect the knowledge developed in coursework with the demands of teaching in an actual classroom.

Situated Learning Theory is useful for understanding the importance of authentic teaching experiences, but participation alone does not explain how preservice teachers gain access to those experiences. A preservice teacher may be physically present in a classroom without having meaningful opportunities to plan instruction, work through instructional problems, or contribute to decisions. The distinction between being present and participation in the work of teaching is important to this study because preservice teachers' experiences may depend on the responsibilities their mentors invite them to assume. Communities of Practice and legitimate peripheral participation provide a more specific way to examine that process.

## Communities of Practice and Legitimate Peripheral Participation

Wenger (1998) expanded the discussion of learning through participation by examining how people develop knowledge and understanding within communities of practice. These communities involve shared activities, relationships, and ways of understanding the work in which members participate. In teacher preparation, a classroom can be examined as a setting in which preservice teachers participate in an established professional practice alongside experienced teachers. They are not learning only by being told what to do. They are stepping into the work with someone who already understands the expectations and rhythms of that classroom (Feiman-Nemser, 2001a; Wenger, 1998).

Within these communities, preservice teachers usually begin with more limited responsibilities and may gradually move toward fuller participation. Lave and Wenger (1991) describe this process as legitimate peripheral participation. At first, preservice teachers observe, help with manageable tasks, and ask questions. Over time they take on more responsibility such as planning lessons, grouping students, choosing materials, assessing student understanding, or leading instruction. Legitimate peripheral participation does not mean that newcomers simply move through a fixed sequence of tasks. It emphasizes how participation provides access to the practices, relationships, and knowledge of a community. In field placements, this movement is influenced by program expectations, classroom conditions, and the mentor's decisions about sharing instructional responsibility.

Mentor teachers play an important role in shaping these opportunities because they remain responsible for classroom instruction while helping preservice teachers learn to teach. A mentor may invite a preservice teacher to explain an instructional choice, contribute to lesson planning, or consider whether students need additional instruction. These interactions can

provide opportunities for preservice teachers to participate in the reasoning behind teaching decisions rather than only carrying out assigned tasks. Feiman-Nemser (2001b) emphasizes the importance of helping beginning teachers learn from practice, while research on mentoring relationships illustrates how guidance and participation are shaped by the interactions between mentors and developing teachers (Mackie, 2020; Merket, 2022).

These ideas also help explain why mentoring experiences differ from classroom to classroom. Mentors vary in how much responsibility they are willing to share and how comfortable they feel opening their classroom to an inexperienced teacher. A preservice teacher may be encouraged to make instructional decisions in one placement but be expected to follow established routines more closely in another. Neither situation can be understood only by counting the tasks the preservice teacher completes. The nature of participation also matters, including whether preservice teachers are invited to explain their thinking, ask questions, and contribute ideas. Communities of Practice provides a useful foundation for examining both participation and the relationships that influence access to it.

Although this perspective helps explain learning through participation, it does not by itself establish whether mentoring relationships are collaborative or whether learning occurs in both directions. Preservice teachers and mentors enter field placements with different responsibilities and levels of authority. These differences make it necessary to consider professional identity and the role of power in determining whose ideas are heard and whose decisions guide classroom instruction.

## Identity Development in Teacher Education

Learning to teach is not only about mastering pedagogy or content. It is also about constructing a professional identity through experiences, interactions, and changing

understandings of what it means to be a teacher. Beauchamp and Thomas (2009) describe teacher identity as complex and connected to personal experiences, professional contexts, and relationships with others. Izadinia (2016) examined mentoring relationships involving preservice teachers and mentor teachers in an Australian secondary school context, providing insight into how relationships with mentors can influence preservice teachers' developing professional abilities. Although that setting differs from elementary STEM placements, the research helps explain why the way preservice teachers are treated and included in classroom work may influence how they understand their roles.

Scholars such as Gee (2000) and Britzman (2003) describe teacher identity as something that forms through social interaction, institutional expectations, and personal histories. This means preservice teachers are constantly interpreting messages from mentors, coursework, school environments, and students. Identity is not something that develops in a straight line. It shifts as preservice teachers face challenges, receive affirmation, and work through tensions during their placements. Mentors play a major role in shaping identity because they control access to teaching opportunities. When mentors trust preservice teachers to try new ideas or lead instruction, such opportunities may support preservice teachers' developing professional identities. When mentors limit their participation or express doubt, preservice teachers may question their ability and belonging within the classroom. These patterns show why identity theory is important for studying mentoring and why mentoring relationships must be viewed as deeply personal and relational.

More recent research also describes preservice teacher identity as adaptive and nonlinear rather than as a steady increase in confidence. Mentoring relationships, changing classroom contexts, and increased participation can reshape how preservice teachers understand their

competence and professional voice over time (Henry & Mollstedt, 2021; Hong et al., 2017; Izadinia, 2016). Changes in confidence may include periods of uncertainty or adjustment rather than a movement from low confidence to high confidence. Parker et al. (2022) also supports examining how participant perspectives and mentoring relationships develop across a placement rather than treating them as fixed. This view of identity is useful for understanding why greater teaching responsibility can strengthen a preservice teacher's sense of being a teacher even while hesitation may remain in settings where others are perceived as holding greater experience or authority.

Identity development is not necessarily a steady movement toward greater confidence. Preservice teachers may feel capable in one instructional situation while remaining uncertain in another. Research on preservice teacher identity and mentoring relationships suggests that experiences of participation, recognition, and support can influence how developing teachers understand themselves and their place within the profession (Beauchamp & Thomas, 2009; Hong et al., 2017; Izadinia, 2016). These ideas provide context for understanding the personal and relational aspects of mentoring. However, the present study did not examine professional identity development as a separate outcome. Instead, identity literature serves as a supporting perspective for considering how preservice teachers describe their experiences and responsibilities within mentoring relationships.

## Power, Authority, and Participation in Mentoring Relationships

Power is built into mentoring because mentor teachers and preservice teachers do not enter the relationship with the same responsibility or status. Mentor teachers remain accountable for students, instruction, and classroom routines, while preservice teachers depend partly on mentors for access to teaching opportunities. Research on mentoring relationships illustrates how

these differences can shape participation, professional voice, and opportunities to contribute to instructional decisions (Mackie, 2020; Merket, 2022). In this sense, power is not only about whether a mentor is supportive or controlling. It is also present in everyday decisions about who teaches, who changes a lesson, who participates in planning, and who has final responsibility.

Mentor authority is not necessarily a negative feature of the relationship. Because mentors remain responsible for the classroom, some difference in authority is expected and may be necessary. The important question is how that authority shapes the preservice teacher's access to meaningful participation. Mentors may retain responsibility for classroom decisions while still inviting preservice teachers to explain their thinking, suggest instructional approaches, and take increasing responsibility for teaching. This distinction is important because sharing participation does not require mentors to give up their professional responsibilities. Research by Mackie (2020) and Merket (2022) provides useful perspectives on how mentoring relationships and instructional conversations are influenced by participants' different roles.

Power also shapes professional voice and the way expertise is recognized. Preservice teachers may have useful knowledge or current instructional ideas but still hesitate to offer them when experienced teachers are already positioned as the experts. Research suggests that voice is influenced by the roles people hold, perceived expertise, and established routines rather than confidence alone (Mackie, 2020; Van der Kloot et al., 2025). This helps explain why a preservice teacher may contribute freely in one-on-one conversation with a mentor but remain hesitant in a larger professional group. More reciprocal participation requires mentors to make room for preservice teachers to contribute rather than assuming that comfort or experience will erase differences in status (Weiss et al., 2024). The opportunity to contribute an idea is different from having that idea considered as part of an instructional decision. For example, a preservice

teacher might suggest a different way to represent a mathematics concept or approach a science investigation. Whether that suggestion becomes part of the lesson may depend on the mentor's response, the needs of the students, and the responsibilities each person holds. These everyday interactions provide a way to examine how authority operates without assuming that every difference in responsibility is a problem.

These differences in power do not mean reciprocal learning is impossible. Mentors and preservice teachers may influence one another even when their roles remain unequal (Ambrosetti & Dekkers, 2010; Hudson, 2013). Hudson (2013) discusses mentoring as a form of professional development in which both mentor and mentee may experience growth. This perspective is useful because it separates the possibility of learning in both directions from the expectation that both participants have equal authority. A preservice teacher may contribute an idea, observation, or instructional approach that influences mentor thinking while the mentor remains responsible for final classroom decisions. In this study, this distinction provides a way to examine whether participants describe opportunities for shared instructional reasoning or changes in thinking within relationships that continue to have different professional responsibilities.

## Reciprocal and Collaborative Learning in Mentoring

Traditional mentoring often emphasizes what the novice learns, but research also shows that mentors can learn through the relationship. Mentoring can prompt experienced teachers to reflect on their own decisions, reconsider routines, and notice alternative approaches to teaching or relationships with students (Betlem et al., 2019; Hudson, 2013). Reciprocal learning does not necessarily involve mentors and preservice teachers exchanging identical kinds of expertise. Instead, it can involve each participant contributing knowledge, questions, or observations that influence the other's understanding or practice. This makes it possible to examine reciprocal

learning within conventional mentoring relationships rather than only within programs specifically designed for that purpose.

Betlem et al. (2019) examined a school-university partnership in rural Australia involving three university academics and teacher-mentors from primary and secondary schools. Using participatory action research, the researchers explored how a structured professional development model supported teachers in developing their understanding of mentoring. Data collected through interviews, a focus group, recorded professional learning sessions, and reflective journals indicated that mentors began to reconsider their roles and place greater emphasis on collaboration, reflection, and supporting mentees in solving problems. The study also highlighted the importance of relationships and opportunities for mentors to discuss their practices with colleagues. Although the research demonstrated how mentors could develop professionally through collaborative learning, it focused on structured professional development rather than reciprocal learning between preservice teachers and their classroom mentors.

Collaboration can also become more visible when mentors and preservice teachers have something specific to examine together. Lesson plans, student work, assessments, and classroom experiences may provide a shared focus for discussing instructional decisions. For example, a mentor and preservice teacher might review student responses after a mathematics lesson and consider whether a concept needs to be retaught. During a science lesson, they might discuss how students responded to a model or investigation and whether the activity supported the intended learning. These examples illustrate how collaboration may develop around the work of teaching, although discussing an instructional problem together does not automatically establish that both participants learned from the interaction. Research on mentoring and professional

learning provides a basis for examining how reflection and instructional conversations may support learning within these relationships (Hudson, 2013; Orland-Barak & Wang, 2021).

An important distinction is that collaboration and reciprocity are related but not the same. Collaboration involves participants working together on a shared task or problem, while reciprocal learning involves evidence that learning or influence moves in both directions. A mentor and preservice teachers may collaborate on planning a lesson without either person changing their understanding. In another situation, a preservice teacher's question or observation may prompt the mentor to reconsider an instructional decision, while the preservice teacher also gains insight from the mentor's experience. These differences are important when examining participants' descriptions because not every positive mentoring interaction should be interpreted as reciprocal learning.

This literature shows that reciprocal learning can occur without making the mentor and preservice teacher equal. Preservice teachers can influence classroom practice and mentor thinking while mentors still hold greater responsibility and authority (Ambrosetti & Dekkers, 2010; Hudson, 2013; Mackie, 2020; Merket, 2022). For the present study, this means examining how participants describe contributing ideas, responding to one another, and working through instructional decisions, instead of assuming that reciprocity is present whenever a relationship is supportive. These considerations also provide a transition to reverse mentoring, which more intentionally organizes opportunities for less experienced participants to share knowledge with experienced professionals.

## Reverse Mentoring as a Conceptual Perspective

Before exploring how reverse mentoring connects to teacher education, it is helpful to understand where the idea originated and why it was adopted in other fields. Reverse mentoring

became prominent in corporate environments as a response to rapid technological change and the need for organizations to learn from younger employees who had more current expertise. Early programs paired senior executives with younger colleagues who could support them in learning about digital tools, social media, and shifting cultural expectations. Chaudhuri and Ghosh (2012) described reverse mentoring as a form of social exchange that recognizes the different knowledge and experiences individuals bring to professional relationships. Their conceptual work emphasized the potential benefits of exchanging expertise across generations rather than reporting findings from a specific mentoring program. This approach challenged the assumption that professional experience always determines who has knowledge to share.

Although reverse mentoring was originally used to transfer technology skills, its educational applications have expanded into other areas of professional learning. In teacher education, reverse mentoring involves intentionally creating opportunities for preservice teachers to share particular knowledge or instructional approaches with practicing teachers. Instead, it offers a structure for recognizing the strengths that preservice teachers bring into their placements. At its core, the premise remains consistent across fields. The individual with more professional experience does not necessarily have greater expertise in every area. However, reverse mentoring differs from reciprocal learning because it formally establishes an opportunity for the less experienced participant to provide guidance. Reciprocal learning can also occur within a traditional mentoring relationship without reversing the participants' roles.

In teacher education, reverse mentoring has the potential to challenge long-standing assumptions about who teaches and who learns. Rather than assuming that preservice teachers are always the recipients of guidance, this approach considers how practicing teachers might also benefit from their knowledge. Porras et al. (2018) conducted a mixed-methods study in

Colombia involving 10 practicing elementary teachers and preservice English teachers to examine reverse mentoring and peer coaching as professional development strategies for elementary English-language instruction. Practicing teachers observed preservice teachers teaching English and then participated in collaborative activities focused on improving instruction. Data were collected through classroom observations, questionnaires, interviews, focus groups, journals, and an English-language assessment. The researchers reported that participants exchanged teaching experiences and instructional strategies in an atmosphere of mutual trust, which supported their professional learning. Because reverse mentoring and peer coaching were combined in the professional development experience, the findings do not establish the separate contribution of reverse mentoring. Although the study involved elementary classrooms, its focus on English instruction and a structured professional development arrangement differs from conventional elementary STEM field placements.

Bertram et al. (2023) examined reverse mentoring through quasi-experimental study involving 90 preservice teachers and 57 practicing teachers in Germany. The researchers examined whether reverse mentoring could support teachers' digital competence through a structured professional learning experience. Preservice and practicing teachers worked together on approaches to integrating digital technology into instruction, while comparison groups participated in other collaborative learning arrangements. The researchers found that participants across the groups improved their self-efficacy for teaching with technology. However, reverse mentoring did not produce significantly greater improvements than the comparison arrangements. The researchers also found no significant changes in technological pedagogical knowledge or positive beliefs about technology integration. These findings suggest that reverse mentoring offers opportunities for professional learning, but intentionally reversing mentoring

roles does not necessarily provide greater benefits than other collaborative approaches. Because the study focused on digital competence within a short intervention, its findings do not directly explain how similar exchanges might occur during extended elementary mathematics and science field placements.

Although Porras et al. (2018) and Bertram et al. (2023) examined different instructional settings, both studies provide examples of intentionally structured reverse mentoring experiences. Porras et al. (2018) focused on professional learning experiences within a program that combined reverse mentoring and peer coaching, while Bertram et al. (2023) compared outcomes across different collaborative arrangements. Both studies created opportunities for preservice and practicing teachers to exchange knowledge rather than examining mentoring relationships as they already existed in elementary field placements. This distinction is important because traditional field placements may provide opportunities for preservice teachers to contribute ideas without formally establishing reverse mentoring roles. The findings provide a basis for considering whether similar opportunities for shared learning develop within existing mentoring relationships.

In this study, reverse mentoring was used as a conceptual perspective rather than an intervention. The study did not attempt to implement a reverse mentoring program. Instead, it examined how traditional mentoring relationships were experienced by preservice teachers and mentor teachers during elementary STEM field placements. Reverse mentoring provided a point of comparison for considering instances in which preservice teachers contributed instructional ideas, shared observations, or suggested approaches that mentors considered or used. These contributions offered opportunities to examine how participants described the exchange of knowledge within their relationships. However, the study did not assume that sharing an idea or

working together meant that both participants learned from the experience. This perspective helped connect the literature on reverse mentoring to the study's examination of reciprocal or collaborative learning within existing relationships where mentors and preservice teachers held different levels of responsibility.

## Conceptual Framework for the Current Study

The conceptual framework for this study brings together the main ideas used to understand mentoring within elementary STEM field placements. Situated learning, Communities of Practice, and legitimate peripheral participation help explain how preservice teachers move into the work of teaching. Identity research helps explain how confidence and professional voice can change as participation and responsibility increase. Research on power and authority helps explain how mentors shape access to responsibility and decision making, while reciprocal and reverse mentoring literature helps identify moments when learning moves in both directions. Together, these ideas provide a way to examine mentoring as both a learning relationship and a relationship where the mentor and preservice teacher do not hold the same roles or responsibilities.

From the perspective of situated learning, mentoring is viewed as participation in an authentic context where preservice teachers learn through engagement in the daily work of teaching (Lave & Wenger, 1991). Communities of Practice expands this view by explaining how mentors and preservice teachers form a shared professional community built on common goals, routines, and problem solving (Wenger, 1998). Within that community, legitimate peripheral participation describes how preservice teachers begin as observers and gradually take on more responsibility as they gain experience and confidence. However, greater participation does not necessarily occur simply because a preservice teacher spends more time in the classroom. The

opportunities available within the placement and the mentor's decisions about sharing responsibility can shape how fully preservice teachers participate in instructional work.

Legitimate Peripheral Participation is especially relevant in STEM placements because opportunities to engage in mathematics and science instruction can vary across classrooms. Their movement from observing to learning STEM instruction depends on the mentor's willingness to hand over parts of the work. This might include tasks like leading investigations, setting up materials, or facilitating small group problem solving. It may also involve planning mathematics lessons, examining student work, or discussing changes to instruction based on student understanding. These experiences provide opportunities for preservice teachers to participate not only in teaching activities but also in thinking and decision making that guide instruction. The framework draws attention to the nature of the responsibility preservice teachers receive rather than assuming that participation always becomes more meaningful as a placement progresses.

Professional identity provides another connection between participation and the mentoring relationship. Research on teacher identity suggests that developing teachers' understandings of themselves are influenced by their experiences, relationships, and opportunities to participate in professional work (Beauchamp & Thomas, 2009; Izadinia, 2016). As preservice teachers take on greater responsibility, they may begin to see themselves differently and become more comfortable contributing to instructional decisions. However, having responsibility for a lesson does not necessarily mean that a preservice teacher feels comfortable contributing ideas in every professional setting. A preservice teacher may feel confident teaching students while remaining hesitant to question or suggest an alternative to a mentor's instructional decision. In this study, identity was not examined as a separate outcome

but provided a supporting perspective for understanding how participants described their developing confidence, responsibility, and professional voice.

Power and authority add another layer to this framework. Mentors and preservice teachers occupy unequal roles, and those differences shape who has final decision-making responsibility, whose knowledge is immediately treated as legitimate, and how freely preservice teachers participate (Mackie, 2020; Merket, 2022; Van der Kloot et al., 2025). The framework does not treat mentor authority as automatically restrictive because mentor teachers remain accountable for students and classroom instruction. Instead, it directs attention to how mentors use that authority to open, limit, or negotiate access to meaningful responsibility and professional voice. This makes power visible as part of everyday mentoring practice rather than as a separate critical layer added onto the study. For example, a mentor may maintain responsibility for a mathematics lesson while still inviting a preservice teacher to explain how they would respond to student misconceptions. These interactions provide opportunities to examine how professional voice develops within relationships where the mentor continues to hold greater classroom authority.

Reciprocal and reverse mentoring literature provides a conceptual bridge between participation, authority, and shared learning. Although this study did not implement a reverse mentoring model, the concept is useful because it draws attention to moments when preservice teachers' knowledge, observations, or instructional ideas influence an experienced teacher (Bertram et al., 2023; Porras et al., 2018; Raberger et al., 2024). These moments do not require the mentor and preservice teacher to become equal or exchange formal roles. Instead, they make it possible to examine how learning can move in both directions while authority remains asymmetrical. This distinction fits the study's goal of examining reciprocity as it emerges

naturally within existing mentoring relationships. It also raises an important question about how opportunities for reciprocal learning develop when one participant remains responsible for making the final instructional decisions.

These perspectives are connected because opportunities for participation, professional voice, and reciprocal learning do not develop independently of the mentoring relationship. A preservice teacher may be invited to lead a lesson but have little opportunity to explain the instructional decisions involved. In another relationship, a mentor may encourage the preservice teacher to question a lesson, examine student responses, or suggest a different approach. Both preservice teachers are participating in classroom instruction, but the opportunities to contribute to instructional reasoning are different. The framework helps explain why these differences matter when examining how preservice teachers and mentor teachers describe their relationships. It also provides a way to consider how a mentor's authority can support meaningful participation rather than viewing authority and collaboration as opposing ideas.

The conceptual model guiding this study includes four interconnected ideas:

1. Mentoring as participation - learning occurs through authentic engagement in classroom communities.
2. Mentoring as identity formation - preservice teachers and mentors shape and reshape their professional identities through interaction and reflection.
3. Mentoring as negotiated authority - mentors retain responsibility for the classroom while access, professional voice, and instructional decision making are negotiated as preservice teachers take on greater responsibility.
4. Mentoring as shared learning - opportunities for reciprocal influence and mutual growth can emerge even when mentor and preservice teacher roles remain unequal.

These four ideas provided a way to interpret the mentoring experiences described by participants, but they were not used as predetermined categories that participants' responses had to fit. The study began with the experiences shared during interviews and the codes and themes developed through analysis. The conceptual framework was then used to consider how those developing findings related to participation, identity, authority, and shared learning. This distinction was important because the study sought to understand mentoring relationships as participants experience them rather than assume that every relationship followed the same pattern. It also allowed the analysis to consider differences across placements, including situations where preservice teachers described opportunities for collaboration without evidence that learning occurred in both directions.

Together, these perspectives provided a foundation for examining mentoring as a relationship shaped by instructional opportunities and unequal professional responsibilities. Situated learning and Communities of Practice explain why participation in classroom work matters, while identity research helps explain how preservice teachers may understand their changing professional roles. Research on authority adds attention to the mentor's responsibility for deciding how instructional work is shared, and reciprocal learning literature offers a way to examine whether both participants contribute to the thinking that guides the work. These connections are relevant in elementary STEM field placements, where the instructional opportunities available in mathematics and science may differ across classrooms. Chapter Three explains how the study was conducted and how the developing findings were interpreted in relation to this framework.

## Summary and Research Gap

The literature reviewed in this chapter highlights how mentoring continues to serve as a cornerstone of teacher education, providing essential guidance, modeling, and support for preservice teachers as they enter the classroom. Research has shown that mentoring involves more than an experienced teacher sharing knowledge with someone new to the profession. The quality of the relationship, the preparation mentors receive, and the opportunities preservice teachers have to participate in classroom instruction all influence how mentoring is experienced (Aspfors & Fransson, 2015; Hobson et al., 2009; Parker et al., 2022). Although mentors provide important guidance and support, mentoring relationships can also create opportunities for reflection, collaboration, and shared instructional decision making. However, these opportunities do not develop in the same way across placements, making it important to examine how mentoring is understood and experienced by the individuals involved.

Research on mentor preparation provides important evidence about how mentoring practices can be strengthened. Studies by Evertson and Smithey (2000) and Ulvik and Sunde (2013) examined mentor education from different perspectives, showing how preparation can influence the support novice teachers receive and how mentors understand their own responsibilities. In elementary science education, Miller et al., (2019) examined professional development designed to strengthen cooperating teachers' mentoring practices, while Melton et al. (2019) analyzed how mentoring conversations changed following professional development. These studies demonstrate the importance of preparing mentors to support instructional learning rather than relying on classroom teaching experience alone. At the same time, much of this research examines formal preparation programs or structured professional development experiences. Although these studies provide valuable insight into improving mentoring practices,

they do not fully explain how preservice teachers and mentor teachers describe opportunities for shared learning within relationships that have not been organized around a specific mentoring intervention.

The literature on elementary STEM teacher preparation adds another important consideration because opportunities to participate in mathematics and science instruction can differ across classrooms. Menon and Sadler (2016) examined preservice elementary teachers' science content knowledge and self-efficacy, while Windschitl et al. (2012) described instructional practices important for learning to teach science. Research by Carter and Amador (2015) provides insight into how conversations about student thinking can support learning during elementary mathematics lesson study. Schwartz et al. (2018) demonstrated that mathematics specific feedback is not always consistently addressed in written feedback provided to student teachers. These studies show that learning to teach mathematics and science involves opportunities to examine instructional decisions, respond to student understanding, and receive feedback that addresses the content being taught. However, they examine different aspects of teacher preparation and do not fully explain how access to mathematics and science instruction shapes the mentoring relationships preservice teachers experience during elementary field placements.

The perspectives reviewed in this chapter show that mentoring is shaped by more than participation alone. Situated learning, Communities of Practice, and legitimate peripheral participation explain how preservice teachers become more involved in authentic classroom work, while identity research helps explain changes in confidence, belonging, and professional voice. Research on power and authority adds that this growth occurs within unequal roles, with mentors retaining greater responsibility even as preservice teachers gain more space to make

decisions and contribute ideas (Mackie, 2020; Merket, 2022). These differences in responsibility are important because mentors often determine when preservice teachers can lead instruction, suggest alternatives, or participate in decisions about student learning. Research on reciprocal learning also suggests that mentor teachers may benefit from the relationship through reflection and exposure to different perspectives (Hudson, 2013). Opportunities to collaborate do not necessarily mean that both participants learn from an interaction. Examining these distinctions can help explain how professional voice, authority, and opportunities for reciprocal learning are experienced within mentoring relationships.

Research on reverse mentoring provides an additional perspective by examining situations in which less experienced individuals are intentionally positioned to share knowledge with experienced professionals. Porras et al. (2018) and Bertram et al. (2023) studied organized professional learning arrangements involving preservice and practicing teachers. Their research demonstrates ways that knowledge exchange can be encouraged, although the findings do not establish that reverse mentoring produces greater benefits than other forms of collaboration. Other research, such as Melton et al. (2019), has examined the instructional conversations that occur between mentors and preservice teachers, providing insight into how mentoring practices may change through professional development. The gap is not that mentoring conversations or reciprocal learning have gone unexamined. Instead, less is understood about how preservice teachers and mentor teachers describe opportunities for reciprocal or collaborative learning within existing elementary STEM field placements, especially when instructional opportunities and professional responsibilities differ. This distinction provides a more specific foundation for this study than assuming that mentoring research has primarily overlooked everyday interactions.

This study addresses that gap by exploring how mentoring is currently experienced by preservice and mentor teachers in elementary STEM field placements. The study focused on how participants described their relationships, instructional responsibilities, feedback, and opportunities to contribute to classroom decisions. It also considered how mentor authority shaped preservice teachers' participation and how opportunities for shared learning developed within relationships where the participants held different levels of responsibility. By including the perspectives of five preservice teachers and two mentor teachers, the study provided opportunities to examine individual experiences and compare descriptions within the two mentoring pairs where both members participated. The interview also provided insight into differences in the mathematics and science instruction participants experienced during their placements. Because the study relied on participants' accounts rather than direct classroom observations, it focused on how mentoring experiences were understood and described, instead of claiming to document every interaction that occurred. This approach allowed the study to examine opportunities for reciprocal learning without assuming that collaboration automatically resulted in changes to both participants' thinking or practice.

The contribution of this study lies in examining mentoring as relationships are shaped by instructional opportunities, professional responsibilities, and the ways mentors and preservice teachers participate in decisions about teaching. Rather than testing a new mentoring model, the study explored how opportunities for reciprocal or collaborative learning were described within existing relationships. The findings may help teacher preparation programs consider how mentors are supported, how instructional responsibility is shared, and how preservice teachers are encouraged to contribute ideas during their placements. They may also provide a foundation for future research examining how mentor authority and opportunities for participation influence

reciprocal learning over time. Chapter Three explains the qualitative research design, participant recruitment, data collection, and analysis procedures used to examine the mentoring experiences.

# Chapter 3 - Methodology

## Introduction

This chapter describes how I examined mentoring experiences in elementary STEM field placements. It explains the qualitative research design, setting, participants, and procedures used to collect and analyze the data. It also documents the difference between the planned written reflection and the interview data that were available for analysis. The chapter explains how I coded the transcripts, developed themes, compared accounts, and selected interview-based examples in Chapter Four. Finally, it describes the steps taken to support trustworthiness, reflect on my position as a researcher, and protect participants.

The study addressed three research questions: (1) How do preservice teachers describe their mentoring experiences in elementary STEM field placements? (2) How do mentor teachers describe their roles and experiences in mentoring preservice teachers? (3) What themes or dynamics emerge that reveal opportunities for reciprocal or collaborative learning within these mentoring relationships? The first question centered the preservice teachers' accounts, and the second centered the participating mentor teachers' accounts. The third brought the accounts together where interviews were available from both members of a mentoring pair. This organization also guided the presentation of findings in Chapter Four.

## Research Design

I used a basic interpretive qualitative design to examine how participants understood their mentoring relationships and the classroom experiences they associated with them (Merriam & Tisdell, 2016). This approach was appropriate because I wanted to understand how preservice teachers and mentor teachers made sense of their experiences within their individual field placements. The study focused on participants' descriptions of relationships, instructional

responsibility, feedback, authority, and opportunities to learn together. Individual interview allowed participants to describe specific experiences in their own words and explain why those experiences were meaningful to them. I examined these accounts within their placement contexts and looked for patterns and differences across participants. Rather than testing a particular mentoring model, I examined relationships that were already established within the participating classrooms.

Although this study focused on participants' lived experiences, I did not use a distinct phenomenological analysis. My purpose was not to identify a single shared essence of mentoring but to understand how participants interpreted their experiences within different classroom settings. I considered each participant's account individually and compared perspectives when interviews were available from both members of a mentoring pair. Similarities and differences between their accounts helped me understand how participants experienced their roles, responsibilities, and opportunities for collaboration. These differences were important because mentoring did not unfold in the same way across the participating classrooms. Because the study relied on interviews rather than direct observations, the findings reflect participants' descriptions and interpretations of their experiences.

## Setting and Participants

This study took place in an elementary teacher preparation program at a small midwestern university during the Spring 2026 semester. The preservice teachers were completing school-based field placements during the final portion of their elementary education program. These placements provided opportunities to apply what they had learned in university coursework while assuming greater responsibility for classroom instruction. Placement expectations included planning and teaching whole-group and small-group lessons in first,

second, or third grade classrooms. During the previous semester, preservice teachers were required to teach lessons across all disciplines, including mathematics and science. However, science instruction was not required during the semester examined in the study. For this study, elementary STEM field placements referred to general elementary classroom placements in which participants experienced or discussed mathematics and, when available, science instruction. The classrooms were not required to be formally designated as STEM classrooms or to integrate all four STEM disciplines. Mathematics appeared regularly in participants' accounts, while opportunities to teach science varied across placements. These differences were important because participants did not have the same opportunities to engage in mathematics and science instruction or discuss those experiences with their mentors.

The final sample included five preservice teachers and two mentor teachers. All participant names are pseudonyms to protect their identities. All five preservice teachers completed an initial interview, and four completed a follow-up interview. Both mentor teachers completed an initial and a follow-up interview, resulting in nine preservice teacher interviews and four mentor teacher interviews, for a total of 13 interviews. Two mentoring relationships included interviews with both members: Garrett and Elisabeth, and Kyla and Robert. Ethan, Nicole, and Michael participated without corresponding interviews from their mentor teachers, and Michael completed only an initial interview. The preservice teachers completed placements in rural, urban, and suburban elementary schools, providing experiences from different school settings and grade levels. Table 3.1 summarized these characteristics and identifies the two relationships in which both members participated. These differences in participation were important because only two mentoring relationships could be examined from both perspectives.

**Table 3.1 Preservice Teacher Participants and Placement Characteristics**

| Preservice Teacher | Grade Level | School Setting | Participating Mentor Teacher | Interviews Completed |
|---|---|---|---|---|
| Garrett | 2nd | Rural | Elisabeth | Initial and follow-up |
| Michael | 3rd | Urban | N/A | Initial only |
| Kyla | 1st | Suburban | Robert | Initial and follow-up |
| Nicole | 2nd | Suburban | N/A | Initial and follow-up |
| Ethan | 3rd | Suburban | N/A | Initial and follow-up |

*Note.* All participant names are pseudonyms. The school settings are described broadly to provide placement context while protecting the identities of participants and participating schools. A mentor listed as N/A indicates that the mentor did not participate in the study, not that the preservice teacher lacked a classroom mentor.

## Recruitment and Data Collection Schedule

I used purposeful recruitment to identify preservice teachers completing elementary field placements relevant to the research questions, followed by voluntary participation (Bloomberg, 2023). As program lead, I emailed approximately 60 preservice teachers completing their final semester of field placements during the Spring 2026 semester to ask whether they wanted to participate in the study. Five preservice teachers volunteered, and all five were included in the study. No additional selection was made from a larger group of volunteers. After students expressed interest, I emailed their mentor teachers to invite them to participate separately. Two of the five mentor teachers agreed to participate. Participation by a preservice teacher did not require the corresponding mentor to take part in the study. I did not supervise or evaluate any of the students who participated, so I had no direct role in evaluating their performance during the study. However, I recognized that students might still perceive me as someone with authority

because of my position within the teacher preparation program. This potential influence is addressed further in the Researcher Positionality and Reflexivity section.

I sought university approval before contacting potential participants. Recruitment and all 13 interviews took place during the Spring 2026 semester. Initial interviews were conducted near the beginning of the semester, and follow-up interviews were conducted near the end. These interviews allowed participants to describe their mentoring relationships and instructional responsibilities at different points during their placements. Table 3.2 documents the sequence of recruitment and data collection, followed by transcription and analysis activities completed after the semester. The original planned data collection timeline is included in Appendix H to document how the procedures initially proposed differed from those completed during the study.

**Table 3.2 Actual Recruitment and Interview Sequence**

| **Preservice Placement (8-16 weeks)** | |
|---|---|
| **Timeframe** | **Activity and Participation** |
| Month 1 | Email invitation to students; email invitation to mentors of students who volunteered |
| Month 2 | Initial interviews with five preservice teachers and two mentor teachers |
| Month 4 | Follow up interviews with four preservice teachers and both mentor teachers; one preservice teacher completed only the initial interview |
| Month 5-6 | Recorded interviews were transcribed; summaries of participants' main points were emailed to participants for clarification or correction. |
| Month 7-8 | Transcripts were coded and compared, themes were developed, and selected interview-based examples were incorporated into the findings. |

Written reflections were included in the original data collection plan and were requested from participants, but none were completed. As a result, the study relied on the 13 completed

interviews as its only source of participant data. The reflections were intended to provide additional accounts of mentoring experiences between interviews and allow me to consider those accounts alongside participants' interview responses. Without the reflections, I could not examine participants' written descriptions of their experiences or compare those descriptions with their initial and follow-up interviews. The available data still allowed me to examine participant's accounts at different points during the placement and compare perspectives within the two completed mentoring pairs. However, the absence of written reflections limited the types of evidence available for understanding how mentoring experiences developed. This departure from the original data collection plan is documented in the study procedures and addressed in the limitations.

## Data Sources and Collection Procedures

Participant data for this study came from individual initial and follow-up semi-structured interviews. Participants used the interviews to describe their mentoring relationships, teaching responsibilities, feedback, instructional decisions, and opportunities for collaboration. The initial and follow up interviews provided accounts from different points in the semester for six participants. Michael's initial interview contributed his perspective at one point but could not establish how his experience developed over the semester. Interviews from the two complete mentor-preservice teacher pairs permitted comparison of how both members described their relationship or a particular event. Written reflections were included in the original data collection plan, with separate prompts developed for preservice teachers and mentor teachers. These prompts are included in Appendices F and G. However, no participants completed the reflections, so they were not included in the analysis. The interviews allowed participants to describe their mentoring relationships, responsibilities, feedback, instructional decisions, and

opportunities for collaboration in their own words. The interview data were used to address all three research questions, with the two complete mentor-preservice teacher pairs providing perspectives for the analysis of reciprocal and collaborative learning.

## Interviews

I used semi-structured interviews so that preservice teachers and mentor teachers could describe experiences in their own words while addressing topics relevant to the research questions. Prompts asked about mentoring roles, classroom interactions, instructional work, feedback, and changes in responsibility. All interviews were conducted through Zoom during the Spring 2026 semester and lasted approximately 45 minutes to one hour. The interview protocols were developed to address the three research questions while allowing participants to describe experiences that were important to them. Questions for preservice teachers focused on how they experienced mentoring, including the guidance they received, their relationships with mentors, and their opportunities to take responsibility for instruction. Questions for mentor teachers focused on how they understood their roles, supported preservice teachers, and made decisions about sharing instructional responsibility. Both sets of protocols included opportunities to discuss collaboration and the contributions each person made to instructional work. The initial preservice teacher and mentor teacher interview protocols are included in Appendices A and B, respectively, and the follow-up protocols are included in Appendices C and D.

The initial and follow-up interviews served related but different purposes. Initial interviews provided an opportunity to learn how participants understood their mentoring relationships and instructional responsibilities earlier in the placement. Follow-up interviews allowed participants to discuss their experiences later in the semester, including changes in responsibility, feedback, instructional decisions, and opportunities for collaboration. Before

conducting each follow-up interview, I reviewed the participants' initial interview. This helped me return to earlier descriptions and consider areas where additional clarification or discussion might be useful. The semi-structured format also allowed me to ask follow-up questions when participants described experiences that were particularly relevant to the research questions.

The follow up interviews provided an opportunity to hear how participants described their experiences later in the placement. I compared the two interviews when a participant completed both, attending to continuity and change in how the participant described their role or relationship. Four preservice teachers and both mentors completed initial and follow-up interviews. I did not infer a semester-long change for Michael from his single interview. I also did not treat a preservice teacher's description of a mentor's thoughts as a substitute for an interview with that mentor. For the two complete mentoring pairs, the interviews made it possible to consider similarities and differences in how the preservice teacher and mentor teacher described the relationships and particular instructional experiences. These comparisons were especially important to the third research question because they provided accounts from both members of a mentoring relationship rather than relying on only one person's interpretation.

All interviews were recorded through Zoom, and Zoom's automated transcription feature was used to generate the initial transcripts. I listened to the recordings while reviewing the transcripts to check their accuracy and correct transcription errors. After this review, I removed identifying information from the transcripts before using ChatGPT to assist with cleaning the text. ChatGPT was used to remove non-substantive fillers, such as "um" and pauses that interrupted readability. I made this decision because the analysis focused on how participants described and understood their mentoring experiences rather than the conversational features of their speech. Pauses and silences were not analyzed as separate features of the interview data.

This cleanup was separate from the coding and interpretation procedures described in the Data Analysis section. The interview transcripts served as the participant data used to examine mentoring experiences and develop the findings.

## Data Management and Researcher Notes

The interview recordings and transcripts were stored on a secure, password-protected device. After Zoom generated the initial transcripts, I reviewed them while listening to the recordings to identify and correct errors. Identifying information was removed before transcripts were submitted to ChatGPT for text cleanup. Those recordings were deleted after transcription and accuracy checking, in keeping with the approved procedures. The interview transcripts and working files were stored with access limited to the researcher. I used pseudonyms for participants and removed or masked identifying details when preparing materials for analysis and reporting. Names and scheduling information were kept separate from the analytic interview materials in accordance with the study's privacy procedures. Written reflections were not stored because none were submitted.

I journaled during the interviewing period and wrote analytic memos while examining the transcripts. The journal captured my reactions and questions as I collected the interview accounts. The memos helped me note developing interpretations, possible connections, and questions to check by returning to the transcripts. They also helped me document decisions about how codes and patterns were organized into broader themes (Saldaña, 2021). These materials documented my analytic thinking, but they were not additional accounts supplied by participants. I distinguished what a participant reported from my interpretation when writing the findings.

**Table 3.3 Alignment between research questions and data sources**

| Research Questions | Data Sources |
|---|---|
| RQ1: How do preservice teachers describe their mentoring experiences in elementary STEM field placements? | Initial interviews with all five preservice teachers; follow-up interviews with four. Claims about change across the semester drew only on the participants with two interviews. |
| RQ2: How do mentor teachers describe their roles and experiences in mentoring preservice teachers? | Initial and follow-up interviews with Elisabeth and Robert, the two participating mentor teachers. |
| RQ3: What themes or dynamics emerge that reveal opportunities for reciprocal or collaborative learning within these mentoring relationships? | Interviews from both members of the Garrett-Elisabeth and Kyla-Robert pairs, supplemented by the other preservice teachers' accounts of collaboration from their own perspectives. |

## Analytic Lens

The conceptual framework described in Chapter Two informed how I interpreted the themes after examining participants' accounts. Situated learning and legitimate peripheral participation drew attention to access to teaching work and changes in responsibility (Lave & Wenger, 1991). Communities of practice drew attention to participation and professional identity within classrooms and wider school groups (Wenger, 1998). Research on mentor authority helped me examine how mentors' classroom responsibility shaped preservice teachers'

opportunities to make decisions, contribute ideas, and develop a professional voice (Mackie, 2020; Merket, 2022). These concepts guided interpretation without serving as a predetermined list of codes.

Research on reciprocal and reverse mentoring also provided a way to consider whether knowledge or influence moved from the preservice teacher toward the mentor (Bertram et al., 2023; Porras et al., 2018; Raberger et al., 2024). I examined whether a preservice teacher's observation, instructional idea, or teaching became part of a mentor's reported thinking or classroom decisions. I also distinguished a shared conversation from a mentor's account of reconsidering practice. The study did not introduce a formal reversal of mentor and preservice teacher roles. References to reverse mentoring served as a point of conceptual comparison for interpretation, not as a description of an intervention implemented in this study.

## Data Analysis

I analyzed the 13 interview transcripts through an iterative process of coding, identifying patterns, and developing themes. Saldaña's (2021) guidance on qualitative coding and analytic memo writing informed the organization and description of this process. I began by reading and rereading the interview transcripts to become familiar with participants' experiences and identify initial ideas related to the research questions. During the first cycle, I manually coded all 13 transcripts using open coding to identify meaningful statements and longer passages that described participants' mentoring experiences. After completing the initial manual coding, I imported the transcripts into NVivo to organize the coded material and examine connections within and across participants' accounts. During the second cycle, I used pattern coding to bring related codes together into broader categories. I then examined these categories to develop themes that explained what participants' experiences revealed about mentoring relationships.

Although I describe the analysis in stages, the process was not linear. I returned to the transcripts, codes and developing categories as I considered how participants' experiences were related and where important differences appeared. I also wrote analytic memos to document developing interpretations, questions, and decisions about combining or distinguishing themes. For participants who completed initial and follow-up interviews, I examined how their descriptions remained consistent or changed throughout their placements. I also examined both members' accounts within the two complete mentoring pairs to better understand how participants described shared experiences. As the themes developed, I returned to the interview data to consider whether they accurately reflected participants' accounts, including experiences that complicated the broader patterns. The conceptual framework informed my interpretation of the findings but did not serve as a predetermined list of codes.

The three research questions helped organize the analysis, but I did not treat each question as a separate process. I examined the five preservice teachers' accounts to understand their mentoring experiences and the two mentor teachers' accounts to understand how they described their roles and responsibilities. For participants who completed initial and follow-up interviews, I considered how their descriptions remained consistent or changed during the placement. I also examined the two complete mentoring pairs to understand how participants described their relationships and shared instructional experiences. These comparisons were particularly important for the third research question because they allowed me to consider both perspectives within the same mentoring relationship. I also considered how the developing patterns connected across the research questions rather than treating each participants' experiences as isolated findings.

## Familiarization with the Interview Data

I read the interview transcripts repeatedly to become familiar with each participant's account of mentoring. For participants with two interviews, I considered what each described near the beginning and end of the placement. I noted experiences and events that participants emphasized, descriptions of instructional work, and differences or uncertainties within accounts. During these initial readings, I paid attention to how participants described their relationships, the responsibilities they were given, and the decisions they made during classroom instruction. I also noted specific experiences that appeared important to individual participants, even when I had not yet identified similar experiences in other interviews. The journal entries written during interviews and subsequent analytic memos helped identify questions to revisit. I did not treat those researcher notes as additional participant interviews or written reflections.

## First-Cycle Coding

During the first cycle of coding, I used open coding to identify meaningful statements and passages within interviews. The units of analysis included individual statements and longer passages in which participants described an experience, explained an instructional decision, or reflected on an interaction with their mentor or preservice teacher. I did not limit the analysis to individual sentences because some experiences were described through several connected statements. When a participant discussed a specific classroom event, I considered the surrounding conversation to understand the context rather than separating one statement from the rest of the account.

The codes helped me identify what participants said about relationships, feedback, responsibility, instructional decisions, authority, and collaboration. For example, descriptions of being trusted to lead a lesson, making decisions about student groups, receiving feedback after

teaching, and contributing instructional ideas were treated as meaningful aspects of mentoring experiences. I also attended to differences in how participants described these experiences. Being given responsibility did not necessarily mean that a preservice teacher felt comfortable making every instructional decision, just as receiving feedback did not always mean that the feedback was experienced as supportive. These distinctions became important when I returned to the coded material as analysis continued.

I also identified specific events that participants described as meaningful to their mentoring experiences. I considered those events within the surrounding interview rather than treating them as independent observations of what happened in the classroom. NVivo helped me organize the transcripts and coded material so I could review passages associated with related ideas across the interviews. I also used manual comparisons to examine how those ideas appeared within individual accounts and across participants. The software supported the organization of the data, but decisions about what to code, how codes related to one another, and what patterns were meaningful remained part of my interpretation. As I returned to earlier passages, I recorded questions and possible connections in analytic memos.

## Second-Cycle Coding and Identifying Patterns

I examined the coded passages for patterns that could help answer the three research questions. During the second cycle of coding, I used pattern coding to examine how related initial codes could be brought together into broader categories. For example, descriptions of taking over instruction, making adjustments to lessons, and being trusted to make decisions were considered together when examining meaningful responsibility. Other codes involving student assessments, misconceptions, and instructional decisions helped identify situations where mentors and preservice teachers worked through problems together. This process involved more

than identifying topics mentioned by several participants. I considered what the experiences had in common, how they differed, and what those similarities and differences helped explain about mentoring.

I compared the five preservice teachers' accounts to identify recurring and shared experiences and important differences across placements. For those who completed both interviews, I examined whether their later descriptions reflected changes in how they understood their relationships or instructional responsibilities. I also considered how the grade level, classroom routines, and available mathematics and science instruction influenced the experiences they described. This helped me avoid assuming that all preservice teachers had the same opportunities simply because they were participating in elementary field placements. I compared Elisabeth's and Robert's interviews to understand how each described mentoring responsibilities and changes in their involvement.

For the two complete pairs, I also considered what the preservice teacher and mentor each said about their relationship and about any events they both described. I used the comparisons to examine whether the participants emphasized similar aspects of their relationship or understood an experience differently. Garrett and Elisabeth, for example, both discussed instructional decision making and the importance of Garrett explaining his reasoning. Kyla and Robert described opportunities to contribute ideas and work through classroom decisions, including the Earth-layers jar activity that Kyla introduced during a science-related lesson. Comparing their accounts helped me consider not only what preservice teachers believed they contributed, but also how participating mentors described responding to these contributions. These comparisons informed initial themes about relational trust, responsibility, instructional judgment, mentor authority, and collaborative learning.

One example of this process involved the developing theme of preservice teacher influence. Kyla described using an Earth-layers jar activity suggested in the curriculum, while Robert discussed why he had not previously used the activity and what he appreciated about Kyla introducing it. Garrett also described suggesting base-ten blocks and other materials to help students understand mathematical concepts. In that situation, he reported that Elisabeth was receptive to his suggestion and helped him consider how to incorporate it into the lesson. These experiences were not identical, but they showed opportunities for preservice teachers' instructional ideas to be considered within classrooms where mentors continued to hold greater responsibility. Comparing the accounts also revealed differences in the evidence of mentor reflection, which became important when defining the theme.

Table 3.4 provides an illustrative example of how these interview accounts can be connected to initial codes, broader patterns, and a final theme. The example includes evidence from both complete mentoring pairs to show how comparison across cases contributed to the development of the theme.

**Table 3.4 Illustrative Coding and Theme Development for Preservice Teacher Influence**

| Initial Evidence | Initial Descriptive Coding | Comparison Across Accounts | Broader Pattern | Final Theme |
|---|---|---|---|---|
| Kyla described using an Earth-layers jar activity from the curriculum and the students' positive response. | Contributing an instructional resource | Kyla identified an idea she introduced into the classroom | Preservice teacher contributes to instruction | Preservice teacher influence |
| Robert described appreciating the jar and reconsidering why | Mentor recognizes preservice | Both participants described the same event, and Robert identified its value. | Preservice teacher contribution prompts mentor reflection | Preservice teacher influence |

| Initial Evidence | Initial Descriptive Coding | Comparison Across Accounts | Broader Pattern | Final Theme |
|---|---|---|---|---|
| he had not used the activity previously. | teacher contribution | | | |
| Garrett described suggesting base-ten blocks and materials for mathematics instruction. | Suggesting an instructional approach | Garrett described an idea that Elisabeth considered when planning instruction. | Preservice teacher ideas enter instructional decisions | Preservice teacher influence |
| Elisabeth described being open to learning from preservice teachers and exchanging ideas with Garrett. | Mentor openness to shared learning | Her account supported openness to preservice teacher contributions but did not establish a specific lasting change from Garrett's suggestion. | Mentor recognition of preservice teacher knowledge | Preservice teacher influence |

This example also illustrates why comparing participants was important. Kyla and Robert both described the Earth-layers jar, and Robert identified the value of using an activity he had not previously included in his instruction. Garrett described a situation in which Elisabeth considered his instructional suggestion, while Elisabeth spoke more generally about being open to learning from preservice teachers. Both relationships provided opportunities for preservice teachers to influence instructional decisions, but the evidence of specific mentor reflection or change was not the same. I considered those differences when developing the broader theme rather than assuming that influence occurred in the same way across both pairs.

## Reviewing and Refining Themes

I returned to the transcripts to consider whether the developing themes fit the participants' accounts. I looked for examples that supported a theme and for accounts that

complicated or limited it. I also examined whether some of the developing categories were closely related and could be combined without losing important differences. This involved reviewing the coded material and comparison tables to determine what each category contributed to understanding the participants' experiences. When categories appeared to describe different parts of the same process, I considered whether a broader theme would provide a clearer explanation.

An example of this refinement occurred during the analysis of RQ3. My earlier analysis included seven findings related to collaboration, preservice teacher contributions, mentor reflection, authority, and classroom structures. As I compared these findings, I recognized that several described different aspects of the same broader patterns. I documented this decision in an analytic memo titled "Methodological Decisions and Boundaries of the Analysis." In that memo, I explained why I combined the preliminary findings rather than retaining them as separate themes:

> For RQ3, I combined my original 7 findings into three broader themes. Shared analysis of student needs, intern observations contributing to decisions, and collaboration around student problems were combined because they all show how mentors and interns used firsthand knowledge and student evidence to make instructional decisions.

The memo also documented how I brought together preservice teacher instructional ideas and mentor reflection because both related to reciprocal influence. Mentor authority and curriculum structure were considered together because they helped explain the opportunities and limits of reciprocal learning. These decisions resulted in three broader RQ3 themes rather than seven separate findings that overlapped in meaning. The memo helped me document why the themes

were combined and reminded me to consider differences in the evidence available across the mentoring relationships. The full memo is included in Appendix I.

Michael's single interview, for example, could inform findings about his experience but could not establish how his experience changed across the full placement. Likewise, the accounts from preservice teachers whose mentors were not interviewed could describe collaboration from the preservice teacher's perspective but could not establish the mentor's experience of that interaction. I also considered examples that complicated the larger patterns, including situations where preservice teachers felt supported but wanted more detailed feedback or were comfortable contributing ideas with a mentor but hesitant to speak in a larger professional group. These experiences helped me avoid presenting mentoring as a consistent progression toward confidence or shared responsibility. They also reinforced the importance of distinguishing a participant's perception of collaboration from a mentor's own description of learning. I revised the themes and the scope of my claims as I considered these differences.

As I refined the themes, I also returned to the conceptual framework to consider how the developing themes related to participation, authority, identity, and reciprocal learning. Situated learning and Communities of Practice helped me interpret the importance of access to meaningful classroom responsibilities (Lave & Wenger, 1991; Wenger, 1998). Research on mentor authority helped explain why preservice teachers' opportunities to contribute depended partly on the responsibilities mentors were willing to share (Mackie, 2020; Merket, 2022). Identity-related literature provided context for participants' descriptions of confidence, belonging, and professional voice. I did not examine identity development as a separate outcome. Reciprocal learning literature helped me distinguish working together from accounts in which a preservice teacher's contribution influenced mentor thinking or decisions. These perspectives

helped interpret the themes already developing from the interviews rather than determining the themes in advance.

### Defining and Organizing Themes

I clarified what each theme contributed to its research question and how it differed from the other themes. The themes were organized under the research questions because each question emphasized a different perspective on mentoring. RQ1 focused on the experiences of the five preservice teachers, RQ2 focused on Elisabeth's and Robert's descriptions of their mentoring roles, and RQ3 examined opportunities for reciprocal or collaborative learning. This organization allowed me to draw on evidence from the appropriate participants while also recognizing connections across the findings.

I kept the preservice teachers' descriptions of mentoring distinct from Elisabeth's and Robert's descriptions of their roles. When examining reciprocal learning, I distinguished shared discussion, the use of a preservice teacher's idea, and a mentor's reported reflection or change in practice. For RQ3, the revised themes were shared analysis of student needs, preservice teacher influence, and asymmetrical reciprocity. The first theme focused on situations where mentors and preservice teachers examined student work or instructional problems together. The second focused on how preservice teachers' contributions could become part of classroom decisions or prompt mentor reflection. The third considered how these opportunities occurred within relationships where mentors retained greater authority and responsibility.

This distinction was important because I did not want every collaborative interaction to be interpreted as reciprocal learning. For example, Garrett and Elisabeth's discussions about grouping students provided evidence of shared instructional reasoning, but that did not necessarily mean Elisabeth changed her own teaching practice. Robert's accounts provided more

specific examples of reflecting on his instruction while mentoring Kyla. Both relationships involved opportunities for collaboration, but the evidence supported different levels of influence on mentor thinking. Defining the themes this way allowed me to describe those differences without minimizing the contributions preservice teachers made.

I also considered how authority and the instructional opportunities available in each placement shaped what participants could do together. This work led to the nine findings organized under the three research questions in Chapter Four.

## Writing the Findings

I developed the findings by bringing together participant quotations, descriptions of specific events, and comparisons among accounts. During the analysis, I identified events that participants described as meaningful to their mentoring experiences. These examples involved specific experiences or instructional decisions that helped illustrate how participation, mentoring responsibilities, or collaborative learning operated within a relationship. These events were not necessarily unusual or dramatic. Their importance was that participants provided enough detail to examine the decisions being made, the contributions of the individuals involved, or the meaning of the experience held for the mentoring relationship.

After coding the interviews and identifying themes and meaningful instructional experiences, I incorporated two selected examples into the related findings in Chapter Four. I selected two events because they provided concrete examples of instructional decision making and preservice teachers' contributions. The first example involved Elisabeth's account of reviewing a mathematics assessment with Garrett and discussing whether students needed additional instruction. Garrett also described similar grouping conversations in which Elisabeth asked him to explain his reasoning. His account was not presented as an independent description

of every detail of the same assessment. The second example involved the Earth-layers jar activity, an event described by both Kyla and Robert. Together, these examples illustrated different ways preservice teachers participated in instructional decisions and contributed knowledge within established mentoring relationships.

Guided by Bhattacharya's (2017) attention to context and researcher interpretation in qualitative inquiry, I drew each example from participants' interview accounts and checked its details against the transcripts. When both members of a mentoring pair discussed an event, I considered their accounts together while preserving differences in what each person reported. I did not treat the examples as direct classroom observations or attempt to reconstruct conversations beyond what participants described. Instead, the examples provided a way to bring related interview accounts together while keeping the instructional situation and the participants' perspectives visible. I explained what each example contributed to the findings and where the evidence limited the claim. I also retained evidence that complicated broader patterns, including differences in mentor reflection and opportunities to teach science. Chapter Four presents the findings, and Chapter Five considers their meaning in relation to the literature and conceptual framework.

## Trustworthiness and Credibility

I considered trustworthiness in terms of credibility, transferability, dependability, and confirmability (Lincoln & Guba, 1985). I used the available interviews, participant responses to summaries, repeated transcript review, and researcher notes in ways consistent with these criteria. The study did not have the multiple participant data sources originally planned, because no written reflections were submitted. It also did not include direct observation of the classroom

events participants described. The following sections specify what was done and the limits of each practice rather than treating any procedure as proof that an interpretation was correct.

## Credibility

Credibility was supported by comparing participants' accounts across the initial and follow-up interviews. For the six participants who completed both interviews, I examined how their descriptions of mentoring relationships, instructional responsibilities, and opportunities for collaboration remained consistent or changed during the placement. For the two complete mentoring pairs, I also compared the preservice teacher's and mentor teacher's descriptions of their relationship and, when available, the same events. These comparisons helped me identify both shared descriptions and differences in how participants understood an interaction. For example, Elisabeth described a specific mathematics assessment that led to a discussion about whether students needed additional instruction, while Garrett described similar conversations in which she asked him to explain his grouping decisions. Kyla and Robert both described the Earth-layers jar activity, which allowed me to compare Kyla's description of contributing an instructional resource with Robert's explanation of why he appreciated it. These comparisons helped me consider the meaning of an experience from both perspectives without assuming that each participant understood it in exactly the same way.

After the interviews, I sent participants summaries of their main points and invited them to clarify or correct anything I had misunderstood. The summaries were sent before I developed the final themes, so participants were reviewing how I understood their interview accounts rather than the conclusions of the study. Five out of seven participants responded, and they did not identify inaccuracies or request corrections. I did not treat a lack of response as agreement, and I did not consider the responses to be approval of the final themes or examples presented in

Chapter Four. I returned to the transcripts as themes developed to check whether my interpretations remained grounded in what participants said. I also looked for experiences that complicated a developing theme. For example, some preservice teachers described supportive mentoring relationships while also identifying difficulties with feedback or uncertainty about contributing ideas. Retaining these experiences helped me present the mentoring relationships as participants described them rather than focusing only on examples that supported a certain pattern.

## Transferability

Transferability was supported through detailed descriptions of the setting, participants, and context (Lincoln & Guba, 1985; Creswell & Poth, 2018). I described the study setting, the participant groups, and the different kinds of classroom opportunities represented in the interviews. I reported that the preservice teachers worked across first through third grade classrooms and that access to science instruction differed among placements. The participant information also included whether the placements were in rural, suburban, or urban school settings. These descriptions provided context for understanding differences in the experiences participants shared.

The instructional opportunities available within each classroom were important to this study. Mathematics provided consistent opportunities for participants to discuss student learning, instructional decisions, and feedback, while opportunities to teach science were less consistent across placements. These differences influenced the kinds of STEM teaching experiences participants could describe and the opportunities they had to work with their mentors on instructional decisions. Including this context helped me avoid presenting the mentoring experiences as though every participant had the same responsibilities or access to instruction. I

connected selected examples to their teaching or mentoring context where the interviews supplied those details. I avoided adding classroom descriptions that had not been reported or that might reveal a participant's identity. These details allow readers to judge whether the findings may be useful in considering another setting, without assuming that the sample represented all elementary placements (Lincoln & Guba, 1985).

## Dependability

The interview protocols, recordings and transcripts, journal entries, coding work, and analytic memos provided records of the study as it proceeded (Merriam & Tisdell, 2016). I used the transcripts and coding records to revisit passages when a theme or interpretation needed refinement. The manual coding, organization of data in NVivo, and participant comparison tables helped me return to earlier passages and examine connections among participants' accounts. Analytic memos also documented questions and decisions that arose as I developed and refined the themes. For example, one memo explained why I combined seven preliminary findings related to RQ3 into three broader themes. This decision reflected my recognition that some initial findings described related aspects of shared instructional decisions, preservice teacher influence, and mentor authority. The memo excerpt in the Data Analysis section and the complete memo in Appendix I provide an example of how I documented the development of analysis.

I documented the departure from the original data collection plan: written reflections were requested and expected but not completed by the participants. Because of this, the analysis relied on interviews. I also made clear which participants completed two interviews and which relationships were represented by both members of the pair. These differences mattered because they affected the patterns I could examine within and across participants' accounts and how I

interpreted the experiences described by participants. Documenting the procedures that occurred, including the changes from the original plan, helped provide an accurate record of how the study was conducted. These records and descriptions help readers follow how the findings were developed, although this chapter does not claim a formal external audit.

## Confirmability

I journaled while conducting interviews and wrote analytic memos as I interpreted the interview material. My position in teacher preparation could affect which experiences I noticed first or found persuasive. Recording questions and reactions helped me recognize possible assumptions and return to the participant's actual words. I compared interpretations with the transcripts and retained accounts that complicated an emerging pattern. These practices were important because I was familiar with mentoring relationships and could have entered the analysis with expectations about how mentors and preservice teachers should work together. The journal and memos helped me consider whether an interpretation came from the participants' descriptions or from my own experience in teacher preparation.

One area where I needed to be particularly careful was interpreting reciprocal learning. I did not assume that a mentor learned from a preservice teacher just because the preservice teacher shared an idea or participated in an instructional decision. Elisabeth described being open to learning from preservice teachers and exchanging ideas with Garrett, while Robert provided more specific examples of reconsidering aspects of his mathematics instruction during Kyla's placement. These accounts supported different interpretations, and I did not treat them as equivalent evidence of changes in teaching practice. I also recognized that the preservice teachers whose mentors were not interviewed could describe collaboration from their own perspectives but could not establish what their mentors learned from those experiences. Making

these distinctions helped me keep my conclusions connected to the evidence available from the interviews.

This process made my reasoning more visible, while recognizing that qualitative interpretation could not be separated entirely from the researcher's perspective (Creswell & Poth, 2018). The reflexive journal, analytic memos, and repeated review of interview passages supported a process in which I could question my interpretations and return to the participants' accounts. These practices did not remove my influence as the researcher, but they helped me recognize it and explain how I developed the findings.

## Researcher Positionality and Reflexivity

As the researcher, I brought my own experiences and perspectives to this study, and it is important to make these visible. My background in teacher education, mentoring, and field placement coordination gave me insight into how mentoring relationships form and how they influence preservice teacher learning. At the same time, this experience means I must remain aware of the assumptions I carry with me. I did not supervise or evaluate the participants in the study, but I am familiar with the structure of their program and the expectations placed on both mentors and preservice teachers. This familiarity created both advantages and responsibilities. As the program lead, I understood the requirements of the field placements and the responsibilities that preservice teachers and mentors were expected to fulfill. However, understanding the expectations of a placement was not the same as understanding how participants experienced those expectations. I needed to remain open to descriptions that differed from what I might have expected based on my professional experience.

My position within the teacher preparation program also created a potential concern related to authority. Although I did not supervise or evaluate any of the participants, I recognized

that preservice teachers might still view me as someone who held influence within their program. This was important because the interviews asked participants to describe their mentoring relationships, including experiences that may have been uncomfortable or challenging. Mentor teachers could also have been aware of my university role when discussing their responsibilities or experiences with preservice teachers. Before conducting this study, I had not previously worked with either participating mentor teacher. I could not assume that participants viewed me only as a researcher simply because I was not responsible for their evaluations. Recognizing this possibility was important when considering how my position may have influenced what participants felt comfortable sharing during the interviews.

I also recognize that my role within a teacher preparation program shapes how I understand the daily realities of field placements. I have seen preservice teachers gain confidence, question their readiness to teach, and navigate the shift from coursework to practice. I have also seen mentor teachers balance support, evaluation pressures, and their own instructional demands. These experiences helped me understand what participants described, but they also had the potential to influence what I noticed and how I interpreted their accounts. For example, I understand why mentors need to maintain responsibility for their classrooms while giving preservice teachers opportunities to make instructional decisions. This experience helped me recognize the challenges participants described, but I also needed to avoid assuming that a mentor's decision to maintain control was either helpful or restrictive without considering the participant's explanation of the situation. I wanted the findings to reflect how participants understood their experiences rather than how I believed mentoring relationships should work.

Because I have worked closely with mentoring systems, I recognize that I may naturally notice certain themes, such as collaboration, support, or the challenges that arise when

expectations do not match. To examine how these assumptions might influence my interpretations, I engaged in reflexive practices throughout the study. I kept a reflexive journal where I recorded thoughts, reactions, questions, and decisions that arose during data collection and analysis. Writing in this journal helped me stay aware of how my own experiences could shape my interpretations. This reflexive journal also helped me track moments when I felt connected to a participant's story or when something in the data surprised me. Rather than treating my first reaction to an interview as an interpretation I could automatically rely on, I used the journal to recognize questions I needed to consider more carefully as I examined the transcripts.

In addition to the reflexive journal, I wrote analytic memos while reviewing and comparing the interview data. The journal was useful for examining my reactions and possible assumptions, while the memos focused more directly on developing interpretations and decisions about the analysis. For example, the memo included in Appendix I documents how I considered findings into broader themes. It also records the importance of preserving experiences that complicated the developing patterns rather than treating all mentoring relationships as though they followed the same progression. These records helped me return to earlier decisions and consider whether an interpretation was supported by the participants' accounts. They also allowed me to recognize situations where the available interviews did not support the same conclusions across every mentoring relationship.

One area where my assumptions were particularly important involved reciprocal learning. Because I entered the study interested in how preservice teachers and mentor teachers might learn from one another, I needed to be careful not to interpret every example of collaboration as evidence that both participants learned something. During analysis, I returned to the interviews

to distinguish situations where participants described working together from situations where mentors described reconsidering their own instruction or using a preservice teacher's idea. I also considered differences between the two complete mentoring pairs rather than assuming that reciprocal learning occurred in the same way in both relationships. This was important because the study was not intended to demonstrate that reciprocal learning always occurred. Instead, I wanted to understand the opportunities for reciprocal learning that participants described and the conditions that shaped those opportunities.

I recognize that my professional experience was part of how I approached this study, and I did not attempt to separate myself completely from that experience. My familiarity with teacher preparation helped me understand the classroom situations and mentoring responsibilities participants discussed. At the same time, my role required me to remain aware of the expectations and assumptions I brought into the research. Reflexive journaling, analytic memos, and returning to participants' accounts helped me examine those assumptions as the analysis developed. These practices did not remove my influence on the interpretation of the data, but they helped me acknowledge it and remain attentive to experiences that differed from my expectations. This was important to presenting the mentoring relationships as participants understood them rather than as I expected them to be.

## Ethical Considerations

Ethical considerations were important throughout this study because participants were asked to discuss their experiences within mentoring relationships connected to a teacher preparation program. Before any data were collected, approval was obtained from the Institutional Review Board at Kansas State University. The approved research procedures provided the foundation for recruitment, informed consent, data collection, and the protection of

participant information. However, I also needed to remain attentive to ethical considerations as the study progressed, particularly because I held a professional role within the program where participants were completing their field placements. My responsibility was to conduct the study according to the approved procedures while respecting participants' decisions about whether and how they participated.

All participants received a consent form that explained the purpose of the study, what participation involved, possible risks, and how their information would be protected. The informed consent form used for the study is included in Appendix E. Participation was voluntary, and individuals could choose to withdraw from the study at any time without penalty. Because I served as the program lead, it was important to consider how participants might perceive my role within the university. Although I did not supervise or evaluate the participating preservice teachers, I recognized that they might still associate me with the expectations of their teacher preparation program. Mentor teachers could have also been aware of my university role when deciding whether to participate. Preservice teachers volunteered independently, and I contacted their mentor teachers separately after the preservice teachers expressed interest. Participation by one member of a mentoring relationship did not require participation by the other. These procedures were important because individuals needed to be able to make their own decisions about participating in the study.

Interviews were scheduled at times that were convenient for participants, and every effort was made to create a comfortable and respectful environment during data collection. The consent process was also treated as an ongoing conversation rather than a single event. Participants were encouraged to ask questions at any point, and I checked in during interviews to make sure they still felt comfortable continuing. This approach helped support a sense of

autonomy and reinforced that their participation was truly voluntary. Because participants were discussing their professional relationships and classroom experiences, I recognized that some topics could be uncomfortable to discuss. I also understood that my role within the program might influence what participants felt comfortable sharing, even though I was not responsible for evaluating them. These considerations remained important when interpreting their accounts because I could not assume the interviews captured every concern or experience participants had during their placements.

Protecting participant information was another important consideration. Interviews were conducted and recorded through Zoom, and I used Zoom's automated transcription feature to generate the initial transcripts. I reviewed the transcripts while listening to the recordings to check their accuracy and correct transcription errors. Before using ChatGPT to assist with removing non-substantive fillers and pauses, I removed identifying information from the transcripts. This step was intended to reduce the risk of disclosing participant identities during transcript cleanup. ChatGPT was used for this text cleanup task rather than as a substitute for my coding and interpretation of the interviews. The interview recordings and transcripts were stored on a secure, password-protected device. The recordings were deleted after transcription and accuracy checking, consistent with the procedures described earlier in this chapter. The interview transcripts and working files were stored with access limited to the researcher.

I assigned pseudonyms and removed or masked identifying details in materials used for analysis and reporting. The written chapter avoided identifying the schools, districts, students, and classroom details that could make a participant recognizable. The two complete pairs were described as pairs because that relationship was necessary to answer the third research question. I kept identifiable scheduling and recruitment information separate from the material used for

interpretation under the approved privacy procedures. Because the study included only five preservice teachers and two mentor teachers, I recognized that changing names alone could not guarantee that participants would be unrecognizable to individuals familiar with their placements. I included information about grade levels and school settings because those details provided context for understanding the experiences, but I avoided naming schools, districts, or cities and limited other identifying details. When presenting the two mentoring pairs and the examples in Chapter Four, I focused on the instructional experiences and decisions participants described rather than unnecessary details about the individuals or schools involved. These decisions were intended to balance the need to provide enough context for the findings with the responsibility to protect participants' confidentiality.

## Summary

This chapter documented the methods used to study mentoring experiences in elementary STEM placements. I used a basic interpretive qualitative design to examine how preservice teachers and mentor teachers described their mentoring relationships, instructional responsibilities, and opportunities for reciprocal learning. Seven participants contributed 13 interviews, including two complete mentor and preservice teacher pairs. Six participants completed both initial and follow-up interviews, which allowed me to examine how they described their experiences at different points during the Spring 2026 semester. The two complete mentoring pairs also provided opportunities to compare the perspective of the preservice teachers and mentor teacher within the same relationship. Written reflections had been planned, but none were completed, so the interview transcripts were the participant data analyzed.

I coded all transcripts using NVivo and manual work, wrote analytic memos, developed themes, and included selected interview-based examples within the findings. Through open coding, pattern coding, and comparisons across participants, I identified and refined nine themes organized around the three research questions. I also described how the available data supported some comparisons while limiting claims about unrepresented mentor perspectives and unobserved classroom interactions. The chapter addressed the steps I took to support trustworthiness, my position as the researcher, and the ethical considerations involved in conducting the study. Chapter Four presents the findings produced through this process.

# Chapter 4 - Findings

## Introduction to the Findings

This study examined the mentoring experiences of preservice teachers and mentor teachers in elementary STEM field placements. The study was guided by three research questions: (1) How do preservice teachers describe their mentoring experiences in elementary STEM field placements? (2) How do mentor teachers describe their roles and experiences in mentoring preservice teachers? and (3) What themes or dynamics emerge that reveal opportunities for reciprocal or collaborative learning within these mentoring relationships? The findings are based on interview data, although participants contributed different amounts of data across the study. The findings in this chapter are organized by research question and then by the broader themes that developed across the interviews. Participant quotes are included throughout the chapter to keep the findings connected to how participants described their own experiences. Specific events illustrate how themes such as mentor fit, responsibility, instructional decision-making, and reciprocal learning appeared within individual placements; they do not imply that every participant had the same experience.

## Participant and Data Overview

The findings presented in this chapter are based on interviews with five preservice teachers and two mentor teachers. Garrett, Kyla, Ethan, and Nicole completed an initial interview and a follow-up interview, while Michael completed only the initial interview. Elisabeth and Robert were the two mentor teachers who participated and provided the mentor perspective used in the analysis. Because the amount and type of interview data were not the same across all participants, each research question could not be answered using the exact same group of participants. These differences are important because they affect which participants can

be used to describe change over time and which relationships can be examined from the preservice teacher and mentor perspectives. Table 4.1 shows the interview data contributed by each participant.

**Table 4.1Participant Interview Data**

| Participant | Role | Interview Data |
|---|---|---|
| Garrett | Preservice Teacher | Interview 1 and Interview 2 |
| Kyla | Preservice Teacher | Interview 1 and Interview 2 |
| Ethan | Preservice Teacher | Interview 1 and Interview 2 |
| Nicole | Preservice Teacher | Interview 1 and Interview 2 |
| Michael | Preservice Teacher | Interview 1 only |
| Elisabeth | Mentor Teacher | Interview 1 and Interview 2 |
| Robert | Mentor Teacher | Interview 1 and Interview 2 |

All five preservice teachers contribute to Research Question 1 because each described their mentoring relationship, support, responsibility, and instructional experiences. However, claims about change across the placement are based only on Kyla, Garrett, Ethan, and Nicole because Michael did not complete a follow-up interview. Michael's account is still important for understanding mentor fit, the effect of changing mentors, and the beginning of increased teaching responsibility, but it cannot show change across the full placement. Research Question 2 is based only on Robert and Elisabeth because they were the only mentor teachers who participated, so preservice teacher descriptions of mentors are not used as substitutes for the

mentors' own accounts. Research Question 3 relies most strongly on the Kyla-Robert and Garrett-Elisabeth pairs because these are the only relationships represented by interviews from both members of the mentoring relationship. The other preservice teachers can describe collaboration or sharing ideas from their perspective, but their accounts cannot establish whether their mentors experienced learning or influence in the same way.

The findings across the three research questions are organized around nine themes. Table 4.2 provides an overview of the themes identified for each research question before they are discussed in greater detail throughout the chapter.

**Table 4.2 Overview of Findings by Research Question**

| Research Question | Finding/Theme | Central Idea |
|---|---|---|
| RQ 1 | Relational trust, mentor fit, and feedback | Shaped preservice teachers' ability to ask, try, contribute, and learn. |
| RQ 1 | Mentor-supported responsibility | Meaningful responsibility supported confidence, ownership, and voice. |
| RQ 1 | Mathematics | Most consistent setting for repeated instructional learning. |
| RQ 2 | Expectations and gradual release | Mentors adjusted support according to perceived readiness. |
| RQ 2 | Feedback, students, authority | Mentors balanced preservice teacher learning against responsibility for |

| Research Question | Finding/Theme | Central Idea |
|---|---|---|
| | | students. |
| RQ 2 | Mentor reflection | Mentoring created opportunities for mentor learning, but unevenly. |
| RQ 3 | Shared analysis of student needs | Concrete problems created space for joint thinking. |
| RQ 3 | Preservice teacher influence | Preservice teacher ideas could enter classroom decisions and mentor reflection. |
| RQ 3 | Asymmetrical reciprocity | Opportunities for learning in both directions existed while authority remained unequal. |

Although the findings are organized by research question, several patterns connect the participants' experiences. Having more opportunities to teach did not always mean having more opportunities to make instructional decisions. The preservice teachers described how their relationships with mentors influenced whether they felt comfortable asking questions, contributing ideas, and taking responsibility for instruction. The mentor teachers descried making decisions about when to provide guidance and when to allow the preservice teacher to work more independently. In the two complete mentoring pairs, these experiences also created opportunities for shared instructional decision making and, in some situations, mentor reflection. Together, these findings show why mentoring involved more than gradually increasing the number of lessons preservice teachers taught.

## Preservice Teachers' Mentoring Experiences

The first research question asked, "How do preservice teachers describe their mentoring experiences in elementary STEM field placements?" All five preservice teachers, Garrett, Kyla, Ethan, Nicole, and Michael, contributed to this research question. Garrett, Kyla, Ethan, and Nicole completed both an initial and a follow-up interview, which allowed me to look at how their experiences changed across the placement. Michael completed only the initial interview. His experience is included in findings related to mentor fit, support, early responsibility, and instructional learning, but his case is not used to make claims about change across the full placement. Across the five preservice teachers' accounts, mentoring was described as more than receiving advice from an experienced teacher. The preservice teachers described relationships in which they were learning the expectations of an established classroom while also beginning to take responsibility, make decisions, and contribute their own ideas. Even with these differences, three themes were present across the cases: relational trust, mentor fit, and feedback shaped the mentoring experience; mentor-supported responsibility was connected to confidence, classroom ownership, and professional voice; and mathematics provided the most consistent space for instructional learning.

### Relational Trust, Mentor Fit, and Feedback Shaped the Mentoring Experience

The relationship with the mentor mattered across all five cases, but relational trust seemed to involve more than just liking the mentor or getting along well. The preservice teachers connected the relationship to whether they felt comfortable asking questions, making mistakes, trying ideas, and becoming involved in the classroom. Garrett, a preservice teacher, described how his relationship with Elisabeth, his mentor, changed as he became more comfortable in the placement. His account also offers a way to examine whether feeling comfortable with a mentor

translated into feeling that he had a place in the classroom. Garrett described that change in his relationship with Elisabeth in the following way:

> I think it's kind of grown into deeper than a professional, like, a little bit further. I think it started out very professional, because I was very, you know, new, trying to be impressive of, you're my mentor, I'm going to respect you, and so I think we've kind of gotten past that kind of, how do I describe it, like maybe a wall of that nervous, kind of, I'm not comfortable with your classroom. We've kind of definitely gotten over that, I feel comfortable in the classroom, I feel like I have a place in the classroom, and she's definitely made me feel that way.

Garrett's words suggest that the change in the mentoring relationship was not only about becoming more comfortable with Elisabeth personally. He began to see himself as having a place in a classroom that had already belonged to someone else before he arrived. His description is important because he connected the mentoring relationship to his growing sense that he belonged in the classroom, not simply to whether he and Elisabeth got along. He specifically linked his growing comfort to feeling that he had "a place in the classroom." That wording connects the relationship with Elisabeth to his participation in the classroom, which is the larger pattern examined in this finding.

That sense of belonging did not mean Garrett always felt free to change what was already happening in the classroom. He described the classroom as highly structured and said that there were practices he questioned but chose not to challenge. When discussing his hesitation about the amount of iPad use, Garrett explained that the students and teacher were already used to the routine and said, "I don't want to disrupt what they do, and then when I leave, it's different, they have to switch back." Later, he described the classroom structure as something he enjoyed but

said it could also make him feel “a little held back” from putting more of his own ideas into instruction. Garrett’s case shows that a positive mentoring relationship did not automatically mean unrestricted professional voice. He felt increasingly accepted in the classroom while still recognizing that he was entering an established space temporarily, and that awareness influenced which ideas he felt were appropriate to raise.

At the same time, Elisabeth did create opportunities for Garrett to contribute ideas within those established routines. Garrett described suggesting physical base-ten blocks and different mats that might help students represent mathematical thinking. He said Elisabeth responded, “I think that’s a good idea, I think we should do that,” and then helped him think about how the idea could be implemented in the lesson. Garrett later connected these kinds of exchanges to the mentoring relationship itself, explaining that sharing his own experiences and ideas “helps deepen the relationship” because his mentor could see that he cared and was trying to bring what he already knew into the classroom. In this case, sharing an idea was not separate from relationship development. Garrett’s growing ability to contribute became part of how the relationship moved from a more formal mentor-preservice teacher relationship toward one where his own thinking also had a place.

Kyla, a preservice teacher mentored by Robert, had a different experience that shows that a productive mentoring relationship was not always comfortable. She described herself as a “people pleaser" who had been paired with a mentor who was “very direct.” Kyla saw value in that directness because, as she explained, “I know what I need to fix,” but she also acknowledged that there were times when the feedback was “hard for me to hear.” The relationship therefore cannot be understood simply as either supportive or unsupportive. Robert’s direct feedback gave

Kyla clarity, but receiving that feedback also required her to work through how she responded emotionally to correction.

One event illustrates this tension particularly well. While Robert was out of the classroom, Kyla had to respond to a playground behavior issue at the same time she was trying to begin the next lesson. When Robert returned, Kyla experienced his response as very direct and initially felt that she had made a poor decision. Later, the two talked about what had happened, and Kyla explained that she had not known what to prioritize and "didn't have anybody to bounce anything off of." After talking it through, she described the situation as "a huge learning experience for me, and now I know what to do." The later conversation gave her an opportunity to explain her reasoning, understand his expectations, and leave the situation with a clearer idea of how she would respond in the future. In Kyla's case, mentoring sometimes included both the discomfort of correction and the opportunity to make sense of that correction afterward.

Ethan and Nicole, both preservice teachers, described relationships that felt supportive earlier in their placements, although that support looked different in each case. Ethan described his mentor as welcoming and open to questions and later explained that when he became overly critical of his own teaching, she helped him look at what had also gone well. He said that even when he did not feel confident, she "helped me find where I was excelling." For Ethan, mentor support did not only involve correcting what needed to improve. His mentor also helped him look at his teaching more fully when his own evaluation of a lesson became overly negative. This suggests that feedback within the mentoring relationship could help a preservice teacher develop judgment about his own teaching rather than simply depend on the mentor to identify mistakes. Nicole valued being able to maintain her own personality in the classroom, explaining, "I feel like I can be more of myself." At the same time, Nicole said that because she was her

mentor's first student teacher, she sometimes wanted feedback that was more detailed about what she could improve. Her experience shows that relational support and instructional feedback were related but were not the same thing. A preservice teacher could feel accepted and comfortable with the mentor while still wanting the mentor to push her instructional thinking more specifically.

Michael, another preservice teacher, provides the clearest example of how much mentor fit could affect participation. When talking about his first mentor, Michael said, "I didn't feel comfortable asking questions or like changing things up." After moving to a new mentor, he described the experience differently, saying, "I don't feel any sort of anxiety asking questions. I feel like I can implement my own things in the room." The difference was not only that Michael preferred the personality of the second mentor. The new relationship changed what he believed he could do in the classroom. Asking questions, changing an activity, and bringing in an idea became easier when he was less worried about how those actions would be received.

Michael also described his new mentor supporting his new role while he was teaching. When students did not respond to one of his directions, the mentor would repeat the expectation because, as Michael explained, "she has the same expectations happen for me as they do for her." He said this made him feel "uplifted" because classroom management was not simply being "thrown on" him while he was still learning. This is another way the mentoring relationship affected participation. Michael's mentor was not taking classroom responsibility back from him, but she was using her established relationship with the students to support his developing role. Across the five cases, the mentoring relationship shaped more than comfort or personal connection. It influenced whether preservice teachers felt able to ask questions, work through feedback, contribute ideas, and begin making decisions as teachers.

## Taking Responsibility and Developing a Professional Voice

Across the cases, mentor-supported responsibility was connected to confidence, classroom ownership, and professional voice. However, the interviews suggested that spending more time in the classroom alone did not account for the responsibility preservice teachers began to take on. Mentors helped create, negotiate, or step back from opportunities that allowed preservice teachers to take on more of the actual work of teaching. This included teaching lessons, but it also included managing students, responding to problems, adjusting instruction, and deciding what should happen next. For Garrett, Kyla, Ethan, and Nicole, greater confidence appeared alongside these opportunities to take meaningful responsibility. Mentoring in these cases involved gradually making room for the preservice teacher to act rather than only telling the preservice teacher how to act.

Garrett, who was mentored by Elisabeth, described taking responsibility for mathematics instruction while continuing to work within the classroom structure Elisabeth had established. During mathematics instruction, he described himself as teaching one differentiated group while also monitoring students working independently. Elisabeth remained in the room but was often working at her own table, which meant Garrett was responsible for the immediate instructional work while still having the mentor available. At the same time, Garrett said that the regular math lessons were “very structured” and that Elisabeth was “very specific in what she likes done in the classroom.” His experience suggested that greater responsibility did not necessarily mean complete freedom over instruction. Instead, Garrett was learning to exercise more responsibility within classroom structures and expectations that remained largely established by his mentor.

Kyla, who was mentored by Robert, illustrated more clearly how stepping back could itself become part of mentoring. Kyla described the point when Robert pushed her to stop looking to him for every decision:

> I was also deferring to [Robert] too much as I took over. You know, I would look to [Robert] for the answer when I just needed to do it myself. And once I gave myself that pep talk, and [Robert] said, quit asking me, just do it.

Robert's response changed what was expected of Kyla within the mentoring relationship. Rather than continuing to confirm each decision, he expected her to act on what she already knew. In this case, stepping back was not the absence of mentoring. It was a mentoring decision that created room for Kyla to begin making classroom decisions without first asking for permission. The support was still available, but Robert was shifting when and how he provided it.

Kyla later described what happened when she was given the opportunity to do that. After teaching all day and preparing for the following week while Robert was largely out of the room, he returned and reacted to how much she had completed. Kyla remembered him asking, "oh my gosh, are you a teacher?" and responding, "I think I am!" She interpreted his message as telling her to "get out of your own head" and stop looking to him "to give you permission to do it." Later, Kyla made the connection between responsibility and confidence directly: "I knew that once I had more responsibility, I would be more confident." She continued, "I'm glad that I'm finally at the point where I am in charge of the classroom, because now I can just do what I know and do it." The progression in Kyla's account is important because Robert did not build her confidence only through encouragement. He created a situation where she had to use the knowledge and skills she had already developed. Kyla's confidence grew as she experienced

herself making decisions and managing the classroom without continually checking with him first.

Ethan, another preservice teacher, shows a different way that mentors could support increasing responsibility. Early on, Ethan tried teaching mathematics in ways that were similar to his mentor because those were the approaches he had been observing. He eventually realized that some of those approaches did not work as well for him. Rather than simply abandoning them, Ethan described having "regular conversations" with his mentor where he could say, "this isn't working, can I change it to this?" He would try the change and then return to the conversation if another adjustment was needed. Mentoring in this case gave Ethan a place to test his developing judgment. He did not have to either copy the mentor or independently invent his own practice. He could gradually move toward his own approach through conversation, experimentation, and revision.

Nicole, also a preservice teacher, described increasing responsibility even more directly. During full-time teaching, she said she had "the responsibility of all kids on me" and was no longer looking to someone else to decide what should happen. Instead, Nicole said, "it's my decision to make what to do." Her words show a change in how she understood her role in the classroom. Responsibility was no longer only completing the lessons her mentor had given her. It also meant noticing what students needed, making a decision, and accepting that she was the person expected to act on it.

Nicole's experience also showed that taking responsibility for instruction did not mean she stopped consulting her mentor. During a mathematics lesson on money, Nicole's mentor was not in the room because Nicole was in full takeover. However, Nicole had talked with her beforehand about how long students might need to continue using manipulatives because it was

not a topic that she had previously taught. Nicole described this exchange as "collaborating." I interpreted this as an example of Nicole remaining responsible for the lesson while using her mentor's experience to think through an unfamiliar instructional decision.

Michael described an earlier stage of taking on classroom responsibility. After changing mentors, he had begun taking over phonics and mathematics and was working with his mentor to determine when additional subjects would be added. By discussing when to add subjects, his mentor helped him take on teaching responsibilities gradually rather than all at once. That support mattered because Michael was still learning classroom management and becoming comfortable in a new placement. Because Michael completed only an initial interview, his account shows how he described this transition at one point in the placement, not how his independence developed over time.

Greater classroom responsibility also did not mean the preservice teachers automatically felt the same confidence speaking around experienced educators. Ethan described a clear difference between conversations with his mentor and larger team conversations. He explained that "one-on-one, I feel very, very comfortable talking to my mentor teacher" and said they could "spitball ideas back and forth at each other." In larger planning conversations, however, he sometimes struggled to enter the discussion because the teachers already had an established way of working together. The mentoring relationship gave Ethan a smaller professional space where his ideas could be discussed even before he felt equally comfortable contributing in the larger team.

Nicole described a similar tension more directly. When discussing PLC meetings, she said that as a student teacher, "you're like, I don't actually work here." She described it as feeling that "you're not actually a teacher there. Like, you are, but you aren't. It's a confusing

headspace." Nicole was already taking substantial classroom responsibility when she made this distinction. Her experience shows that acting as the classroom teacher and feeling like a full member of the professional community were not the same thing. Mentoring appeared to provide a space where professional voice could begin to develop before that same sense of authority extended into every setting.

Across these accounts, the preservice teachers described responsibility developing in different ways rather than being handed over at one point in the placement. Garrett was given increasing responsibility while continuing to work within Elisabeth's established structure. Robert pushed Kyla to stop seeking permission and then stepped back enough for her to experience herself as the teacher. Ethan's mentor supported him through repeated conversations as he tried and revised different approaches, while Nicole combined full classroom responsibility with continued consultation when she needed it. Michael's experience shows the earlier part of this process, where the mentor helped structure what he was ready to take on. Together, these accounts suggest that mentor support mattered not simply because preservice teachers taught more, but because they had opportunities to make instructional decisions while still receiving guidance. Ethan's and Nicole's accounts also suggest that feeling confident in the classroom did not necessarily mean feeling equally comfortable participating in larger professional groups.

## Mathematics Provided the Most Consistent Space for Instructional Learning

Mathematics was the most consistent STEM area across all five placements, but the importance of mathematics was not simply that the preservice teachers taught it frequently. Mathematics repeatedly created situations where a preservice teacher had to notice what students understood, decide whether an instructional approach was working, and determine what should happen next. Those situations also gave preservice teachers and mentors something concrete to

talk about together. As a result, mathematics became one of the clearest places where mentoring moved beyond general advice and into discussions about instructional decisions about student learning. The repeated nature of mathematics instruction gave preservice teachers opportunities to try an approach, talk with the mentor, adjust it, and see how students responded.

Garrett's mathematics experience with his mentor, Elisabeth, shows how instructional learning could happen within an already structured classroom. He described the mathematics block as differentiated and highly organized, and early lessons required him to learn the routines, vocabulary, and materials used in Elisabeth's classroom. Garrett specifically identified mathematical vocabulary as something he had to learn, explaining that language he remembered from his own schooling. For example, the term "borrow" from his own schooling differed from the term "regrouping" used in the placement. As described earlier, Garrett suggested base-ten blocks and mats to help students represent their thinking. Elisabeth accepted the idea and helped him consider "the best way" it could work within the lesson. This interaction shows mentoring as a space where a preservice teacher's idea could enter the classroom while still being shaped through the mentor's experience.

Kyla's mathematics experience with her mentor, Robert, involved learning to make mathematics much more concrete for younger students. After previously teaching sixth grade, she said returning to first-grade mathematics required her to be "very concrete," "very explicit," and not assume that students understood foundational concepts. She described using manipulatives, pictures, and other representations and said the experience had "made me a better math teacher." The classroom provided a setting where she could see how Robert and the established curriculum approached young children's mathematical thinking and then practice those approaches herself. At the same time, Kyla was not only reproducing what was already

being done. She described changing parts of the problem-set routine and using exit tickets to determine what needed to be revisited the next day. Mathematics therefore became a space where observation of established practice gradually moved into her own instructional decision making.

Ethan's liquid volume lesson provides one of the clearest examples of mentoring supporting instructional judgment. Before teaching the lesson, Ethan reviewed the curriculum and noticed that students were being asked to determine whether objects had more or less than a liter without first having a clear frame of reference for what one liter looked like. Ethan explained how he and his mentor decided to use a two-liter bottle containing one liter of water to give students a clearer frame of reference:

> It didn't give a good frame of reference, and so I mentioned it to my mentor. And then, I don't know if she had the idea, or if I had the idea, because it was somewhere in that conversation we decided.

What makes this event important is not just the instructional material they chose, but how Ethan and his mentor worked together to make that decision. He first noticed a possible problem in the curriculum, brought that concern to his mentor, and then worked through a response with her. The fact that Ethan could not remember who originally suggested the final solution is meaningful because the decision developed through their conversation rather than clearly belonging to only one person. Mentoring in this moment was not the mentor telling Ethan how to improve the lesson. It gave Ethan space to notice a pedagogical problem, reason through it with his mentor, and begin exercising more instructional judgment himself. Afterward, Ethan said the experience "gave me a bit of confidence to be able to look at lessons and decide, this isn't gonna work, or this is gonna work."

Nicole also used the mentoring relationship to think through mathematics before she taught it. Earlier in the placement, she described coming before a lesson and practicing it with her mentor. Nicole said, "I literally practiced it with her there" and would ask whether what she planned to say would be enough "for the kids to actually learn what they need to." This was more than checking whether she had followed the teacher's manual correctly. Nicole was using her mentor's experience to think about how students might hear and understand her explanation. As she gained experience, that type of support became less necessary for every lesson, but the mentor remained someone she could consult when she encountered a decision she had not made before.

Michael's fractions lesson shows that this type of instructional decision-making could begin relatively early in the placement. He noticed that students were struggling to connect ideas about fractions, looked at the provided Eureka lessons, and developed an activity where students physically placed themselves along a number line using fraction cards. Michael explained that the activity was "not really in our curriculum." When he told his mentor what he planned to do, he said that she was "very encouraging about that." The importance of the event was not only that Michael created a more active lesson. His mentor's response gave him room to act on something he had noticed about student understanding rather than requiring him to follow the provided curriculum exactly as written.

The cases also show that this instructional judgment developed within limits. Ethan described his mathematics curriculum and pacing guide as "very, very structured," which meant that he had little control over larger decisions such as what lesson would be taught or when it would be taught. He said science had "a little bit more wiggle room" in terms of pacing and activity choices. Garrett also described structure as both helpful and somewhat limiting, while

Kyla said that the Eureka curriculum did not leave much room for "flexibility and creativity." These comments show that mentor-supported autonomy did not develop in a setting where every instructional choice was open. Often the meaningful decisions were smaller ones about representations, manipulatives, grouping, wording, pacing within a lesson, or whether students needed additional support.

Science did not provide the same kind of consistent experience across the five placements. As explained in Chapter Three, preservice teachers were required to teach across all disciplines during the previous semester, but science instruction was not required during the semester examined in this study. Ethan had the strongest evidence of sustained science teaching, while the other preservice teachers encountered science through different structures, including integrated curriculum, a separate STEM setting, another teacher, or not yet having taken over science at the time of the interview. Kyla, for example, explained that most science content in her classroom was embedded within literacy because students attended a separate STEAM class for more intensive science experiences. This uneven access affected what preservice teachers and mentors had opportunities to work on together. Mathematics appeared regularly across the placements, creating more occasions for preservice teachers to teach, observe student thinking, ask questions, adjust instruction, and return to the mentor with another problem. The strength of the mathematics finding is therefore also a finding about the opportunities the individual placements created for mentoring around STEM instruction.

### Summary of Research Question 1

Across the five cases, the preservice teachers described mentoring as a process that shaped both how they participated in the classroom and how they began taking responsibility for teaching. Relational trust mattered because it affected whether preservice teachers felt able to ask

questions, admit uncertainty, receive feedback, and contribute ideas. The cases also show that trust did not mean every interaction was comfortable or that preservice teachers were free to change anything they wanted. Garrett felt increasingly that he had a place in Elisabeth's classroom while still being careful not to disrupt established routines, and Kyla learned to work with a mentor whose direct feedback could be difficult to receive. Michael's change in mentors provided a clear example of how the relationship could change what a preservice teacher believed he was allowed to ask, try, and contribute. Across these different experiences, the mentoring relationship became most useful when preservice teachers could continue being learners while increasingly participating as teachers.

Responsibility was also closely connected to the way the preservice teachers described their development, but the evidence shows that responsibility was part of mentoring rather than something separate from it. Mentors could provide structure, talk through a decision, reinforce the preservice teacher's role, allow an idea to be tried, or intentionally step back so the preservice teacher had to make the decision. As responsibility increased, Garrett, Kyla, Ethan, and Nicole described greater confidence and classroom ownership, although professional voice in larger groups of experienced teachers developed less evenly. Mathematics provided the most consistent setting for this process because it repeatedly gave preservice teachers and mentors actual instructional problems to work through together. The strongest examples were not simply moments when a mentor told a preservice teacher what to do, but moments when preservice teachers began making more of the instructional judgments themselves. Overall, the preservice teachers described mentoring as a relationship in which support and responsibility worked together as they moved from learning how an established classroom functioned toward taking a more meaningful role in the decisions and work of teaching.

## Mentor Teachers' Roles and Experiences

The second research question asked, "How do mentor teachers describe their roles and experiences in mentoring preservice teachers?" Two mentor teachers, Elisabeth and Robert, contributed to this research question. Elisabeth mentored Garrett, and Robert mentored Kyla. Elisabeth taught second grade, while Robert taught first grade during the semester examined in this study. Because they were the only mentor teachers who completed interviews, this section is based only on their descriptions of mentoring and is not meant to represent the mentors in the other three placements. Across the two cases, mentoring was described as more than giving advice or allowing a preservice teacher to practice teaching. Elisabeth and Robert described having to decide what the preservice teacher needed, what students needed, and when their own involvement should increase or decrease. Three themes were present across their accounts: mentoring involved establishing expectations and gradually releasing responsibility; mentoring required ongoing judgment about feedback, student needs, and when to use authority; and mentoring created opportunities for mentors to reflect on their own practice.

### Mentoring Involved Establishing Expectations and Gradually Releasing Responsibility

Elisabeth, Garrett's mentor, and Robert, Kyla's mentor, described mentoring as a process in which the mentor's role changed as the preservice teacher became more capable of working independently. Early support involved making expectations clear, modeling classroom practices, answering questions, and helping the preservice teacher understand how the classroom worked. Elisabeth described establishing classroom expectations before encouraging preservice teachers to develop their own teaching styles. Robert explained that he would "step them through things a whole lot more" when working with student teachers. Later, the mentor could begin giving the

preservice teacher greater responsibility for both teaching and the decisions that came with teaching. Neither mentor described this as something that happened automatically because a certain number of weeks had passed. Instead, both described watching the preservice teacher and deciding when more independence made sense. Their accounts suggested that gradual release depended on the mentor's judgment about readiness rather than simply following a placement schedule.

Elisabeth was clear that giving a preservice teacher responsibility did not mean giving up every expectation already established in her classroom. She believed that preservice teachers needed to learn the classroom rules and routines, but she also wanted them to begin figuring out who they were as teachers. There were things she expected to remain consistent, while other parts of instruction could become more flexible as the preservice teacher took over. This created a balance between entering an established classroom and developing an individual teaching style. Elisabeth explained how she approached that balance:

> When a preservice teacher comes into my room, I'm a very big believer on expectations, and so I usually go through and say, okay, these are the expectations, these are the classroom rules that I want you to follow, but when they start teaching on their own, I say, I want you to start bringing in what you think your teaching style is.

What stands out in Elisabeth's description is that independence was not the same as having no boundaries. She continued to identify parts of the classroom that were not open for change, but she intentionally created space within those boundaries for the preservice teacher to make instructional choices. Her emphasis on the preservice teacher beginning to develop a teaching style of their own suggests that she did not see successful mentoring as producing another teacher who taught exactly as she did. At the same time, she remained the person deciding which

expectations needed to stay in place. Mentoring in her classroom involved giving up some control without giving up responsibility for how the classroom functioned. Elisabeth later explained that outside of the classroom expectations she wanted maintained, she gave preservice teachers "kind of, like, free reign" with guidance available when they needed it.

Elisabeth's follow-up interview showed that this shift was not only part of her general mentoring philosophy; she believed it had happened during Garrett's placement. She described the beginning of the semester as more focused on "what are the expectations, what do you know," while by the end they had developed a better connection. She said they could "bounce ideas off of each other" as Garrett began bringing more of his own ideas into his teaching. When he wanted to try something, Elisabeth remembered responding, "go for it." Her description shows a movement from establishing expectations toward giving Garrett more room to make instructional choices as she became more confident in what he could do.

Robert described a more direct effort to move Kyla toward independence. He said she entered the placement "a little green" and initially looked to him for confirmation whenever she needed to make a decision. Robert eventually told her, "You are in charge. You have got to act like it," and told her to quit looking to him for confirmation and "you just need to do it." He described a noticeable change after that conversation, saying that Kyla began taking things on and acting "like she is the teacher in the room, which is what I want her to be." Robert's response shows that he did not view confidence as something the mentor could give a preservice teacher through reassurance. At some point, he believed Kyla needed to experience herself making decisions without first receiving his approval.

Robert still described providing substantial support before reaching that point. When comparing student teachers with experienced teachers he mentored in the building, he said that

with a student teacher, “I step them through things a whole lot more.” He had them plan with him, observe how he worked, and receive more detailed guidance because they did not yet have the same classroom experience. During mathematics, Robert initially modeled instructional moves, guided Kyla through lessons, and sometimes used a coteaching approach. Once he saw that she understood what she was doing, he said he was able to “quickly back off” because she no longer needed the same amount of support. His account shows that stepping back came after support rather than instead of support.

Looking across both mentoring relationships, gradual release involved more than giving the preservice teacher additional lessons to teach. Elisabeth and Robert were also deciding when the preservice teacher could make choices, change instruction, manage students, and function without immediately checking with the mentor. Their approaches were different, but both used their position as the established classroom teacher to create the conditions for greater independence. Early in the placement, that authority was more visible through expectations, modeling, and guidance. Later, it could become less visible when the mentor allowed a decision to remain with the preservice teacher. In that sense, one goal of mentoring was for the mentor to become less necessary without becoming completely uninvolved.

### Mentoring Required Ongoing Decisions About Feedback, Student Needs, and Authority

Elisabeth, Garrett’s mentor, and Robert, Kyla’s mentor, described mentoring as requiring continual decisions about feedback and intervention. Neither mentor talked about feedback as something that happened only after a formal observation. Elisabeth described situations where she needed to step in during mathematics instruction to correct inaccurate vocabulary, while also wanting Garrett to recognize and correct mistakes independently when possible. Robert

described providing reminders during instruction or discussing concerns afterward, particularly when Kyla missed student behavior or other classroom needs while focusing on teaching. What made these decisions complicated was that the mentor was supporting the preservice teacher while still being responsible for the students in the classroom. Their accounts suggest that mentoring required them to decide not whether a preservice teacher had made a mistake, but whether that mistake needed immediate attention or could become part of the preservice teacher's learning later.

Elisabeth described this tension when talking about mathematics. She wanted preservice teachers to have an opportunity to recognize mistakes and correct them independently, but she was less willing to wait when inaccurate mathematical vocabulary or procedures could affect what students learned. For example, she described stepping in if a preservice teacher continued using "borrowing" rather than "regrouping," because she wanted students hearing and using the correct mathematical language. Elisabeth explained, "I try not to step in because I want them to learn," but immediately added that children are like "sponges" and may believe something is correct simply because the teacher said it. Her account shows that giving a preservice teacher room to learn from a mistake had limits when the mentor believed student understanding could be affected.

Elisabeth's account suggested that mentor authority was not only about maintaining control of the classroom. Elisabeth sometimes used her authority by intervening, but she could also choose not to intervene and allow Garrett to work through something himself. The difficult part was determining which response better served the situation. When student learning was not immediately at risk, waiting could give the preservice teacher space to reflect and make a correction independently. When she believed students might learn something inaccurately,

stepping in became part of her responsibility as their classroom teacher. Her account suggests that mentoring required balancing Garrett's opportunities to learn with her responsibility for student understanding.

Robert also described feedback as taking different forms depending on what Kyla needed. He talked about encouragement when she was doing well, quick reteaching when there was a misconception, reminders during lessons, and later conversations when something did not have to be corrected in the moment. Some of his more difficult conversations focused on helping Kyla recognize and respond to student needs beyond the content of the lesson. Robert described situations where Kyla became focused on work on her computer and missed the way he was interacting with students, reinforcing behavior, or attending to other things happening around the classroom. These experiences led Robert to describe one of the larger lessons he wanted student teachers to learn:

> I always want them to focus on the fact of it's not just about the lesson, there could be more to it, you know, whether that's helping a kid get over whatever there could be some challenge that they're trying to get through, or maybe they're really upset about X, Y, and Z.

Robert's description suggested that he saw mentoring as helping Kyla learn what experienced teachers notice beyond lesson delivery. Knowing the content and planning a lesson were important, but they were not enough if the preservice teacher did not also notice student behavior, emotions, engagement, and other situations developing around the room. Robert's more direct feedback was aimed at widening Kyla's attention instead of just correcting one instructional move. From his perspective, becoming a teacher meant learning to hold several

responsibilities at the same time. Mentoring gave him a role in making those less visible parts of teaching more visible to the preservice teacher.

In both relationships, mentor authority remained part of everyday instructional decisions, even as the preservice teachers took on more responsibility. Robert demonstrated this when Kyla appeared hesitant to change materials he normally used. He told her, "This is yours. If you want to modify it, you can," and later told her, "You do you, like, this is your classroom." Robert continued to hold responsibility for the classroom, but he used his position to make clear that Kyla could make this instructional decision herself. His account suggests that mentor authority did not disappear as Kyla gained independence. Instead, Robert's response helped create room for her to make her own choices within the established mentoring relationship.

Both mentors also made clear that this kind of mentoring required work from the mentor. Elisabeth said mentors needed to go into the experience understanding that they were guiding someone toward becoming a teacher and that "you've got to be 100% in." Robert was even more direct, saying mentoring was "more work" and "a lot of work, but it's worth it," especially during the first few weeks when the preservice teacher needed more support. In his follow-up interview, Robert also described thinking about what he could do differently the next time he mentored someone, including whether better communication could make the experience more successful. Continually watching, explaining, answering questions, correcting, and deciding when to back away added work to responsibilities they already had as classroom teachers. Gradual release therefore changed the experience for the mentor as well as the preservice teacher because the mentor's workload and involvement could shift as the preservice teacher became more independent.

## Mentoring Created Opportunities for Mentors to Reflect on Their Own Practice

Elisabeth, Garrett's mentor, and Robert, Kyla's mentor, both described the possibility that mentors could learn through the experience, but this theme did not appear in exactly the same way across their initial and follow-up interviews. Elisabeth began her interview by saying that mentoring could be "really, really beneficial to both of us" because "I learned from them as well as they learn from me." She also described preservice teachers bringing information from their university courses and said she viewed the placement as "a learning experience for me, as it is for the preservice teachers." At the same time, Elisabeth did not describe major changes to her own practice as a result of this particular placement. When directly asked whether mentoring prompted her to reflect on her own instructional choices, she answered, "Maybe a little, but not really."

That response is important because it complicates the finding rather than weakening it. Elisabeth clearly believed mentors could learn from preservice teachers, and she described herself as open to their ideas and strategies. She also said that when preservice teachers brought in mathematics approaches they had learned, "I watch, and I learned from them as well." However, the evidence does not support saying that Garrett caused Elisabeth to substantially rethink her own teaching during this placement. Her account is better understood as openness to learning and increased awareness rather than a clear change in established practice. This contrasts with Robert, who identified specific instructional choices that he reconsidered after observing Kyla.

Robert described a more noticeable effect on his own teaching. In his follow-up interview, he connected that reflection directly to mathematics and to the work of helping Kyla complete her Teaching and Learning Portfolio (TLP). Looking closely at Kyla's planning

required him to examine both what she was doing and some of the instructional choices already being made in his own classroom and building. Robert explained:

> Having her use her TLP to walk through this, because then it made me really dissect what is she doing, because I knew she needed some assistance, and two, what are we doing as a building to make math better? And so I really, it's changed the way I do things.

Robert's follow-up description shows that helping Kyla work through mathematics planning also caused him to examine his own teaching. That reflection became clear as he compared the instructional decisions he was asking Kyla to make with some of the choices he was making himself. Robert also described a building-wide effort to examine whether Eureka Math was being taught as intended, so the evidence does not support saying that Kyla alone caused the changes he made. Instead, mentoring Kyla became part of a broader process that made him examine the materials and routines he was already using. He described recognizing that some of his own slides contained many of the same things he was telling Kyla to remove and later said, "I have redone the way I've done math since I've had her in my room." In Robert's case, mentoring created opportunities for Kyla's teaching to become one source of evidence he used to reflect on and reconsider his own practice.

The difference between Elisabeth and Robert is not interpreted as Robert learning more from mentoring. The evidence only indicated that he named more specific changes during the interview. Elisabeth described mentoring as mutually beneficial and said she learned from preservice teachers, but she was also clear that this specific placement had not caused a great deal of reflection on her own instructional choices. Robert described several concrete examples of reconsidering his mathematics instruction while mentoring Kyla. Keeping those accounts different is important because mentor learning did not appear in one consistent form across the

two accounts. The broader finding is that mentoring could create opportunities for mentor learning, not that every mentoring relationship produced the same amount or type of change.

### Summary of Research Question 2

Elisabeth and Robert described mentoring as an active process that changed as the preservice teacher became more capable of teaching independently. Both established expectations, modeled classroom practices, provided feedback, and then adjusted their involvement based on what they believed the preservice teacher was ready to do. Elisabeth described wanting preservice teachers to bring in "who you are" as a teacher while still maintaining parts of the classroom that she considered important. Robert was more direct in pushing Kyla to stop looking to him for confirmation and begin acting as the teacher. Their accounts show that gradual release involved more than assigning additional lessons because mentors were also deciding when preservice teachers were ready to take greater responsibility for classroom and instructional decisions.

The mentors also described their role as requiring continual judgment. They had to decide when a preservice teacher needed immediate correction, when an issue could wait, and when stepping in might take away an opportunity for the preservice teacher to make a decision independently. Their responsibility for students remained part of those decisions, especially when content accuracy, behavior, or student needs were involved. At the same time, mentor authority could also be used to create room for the preservice teacher by making it clear that a different approach was allowed. Therefore, mentoring involved managing the tension between remaining responsible for the classroom and allowing the preservice teacher to experience meaningful responsibility.

Finally, both mentors described mentoring as an experience from which mentors could learn, although the evidence looked different between the two accounts. Elisabeth described learning from preservice teachers and being open to new ideas but did not identify major changes to her own practice during this placement. Robert gave more specific examples of reconsidering mathematics instruction and other classroom practices after observing Kyla. The difference between their accounts suggests that mentor learning should not be assumed simply because a mentoring relationship exists. Overall, Elisabeth and Robert described mentoring as work that required guidance, judgment, patience, changing levels of involvement, and a willingness to remain open to what the experience might also teach the mentor.

## Reciprocal and Collaborative Learning Within the Mentoring Relationships

The third research question asked, "What themes or dynamics emerge that reveal opportunities for reciprocal or collaborative learning within these mentoring relationships?" The strongest evidence for this question came from the two accounts in which both members of the mentoring pair were interviewed: Garrett and Elisabeth, and Kyla and Robert. The other preservice teachers described collaboration with their mentors, but without interviews from those mentors, their accounts could not establish how the mentors experienced those interactions. Across the two complete pairs, reciprocal learning did not mean that the mentor and preservice teacher held equal roles or contributed equally to every decision. Instead, it became visible when both people brought something useful to a student or instructional problem and when preservice teacher observations, ideas, or teaching became part of the mentor's thinking or classroom decisions. Three themes emerged: shared analysis of student needs created opportunities for collaboration; preservice teacher ideas and teaching influenced mentor thinking and practice; and reciprocal learning was asymmetrical and shaped by classroom structures.

## Shared Analysis of Student Needs Created Opportunities for Collaboration

Collaboration was most visible when the mentor and preservice teacher worked through a specific question about student learning or an instructional decision. In both pairs, these conversations often centered on a student who was struggling, grouping decisions, misconceptions, or whether instruction needed to continue or be retaught. Mathematics created repeated opportunities for this because the participants had student work, assessments, and responses to instruction that they could examine together. The preservice teacher sometimes brought information from teaching the lesson or working closely with individual students, while the mentor brought greater experience and knowledge of the classroom. Student needs gave both people something concrete to contribute rather than leaving the interaction as the mentor giving advice and the preservice teacher receiving it.

Garrett, the preservice teacher paired with Elisabeth, described this kind of collaboration when talking about decisions involving students and grouping. By the end of the placement, Elisabeth was asking Garrett what he thought rather than immediately telling him how she would handle the situation. Garrett described comparing their reasoning and being asked to explain why he had made a particular choice. He also began to understand that making a different decision from Elisabeth did not automatically mean that his decision was wrong. He explained:

> She'd be like, how would you do this? And then I would explain, she's like, okay, so this is what I did, let's compare, like what I thought, or how would you have grouped these students? And I would group them, and we'd talk about it, and then she'd be like, okay, this is how I would have grouped them, can you explain why you grouped them this way, and kind of give me more of that support of just because you did it differently doesn't

mean it's wrong. We can see it differently, and we can do things that are different, but also targeting the same thing.

Garrett's description shows that collaboration involved more than Elisabeth asking for his opinion and then making the decision herself. She asked him to explain the thinking behind his decisions and then placed her own reasoning beside his. This gave Garrett a role in working through the problem rather than only receiving the answer from the more experienced teacher. The important part was not that Garrett and Elisabeth always disagreed or that his decision replaced hers. Instead, his observations and reasoning were treated as information that could matter when deciding what students needed. Garrett described student data as the area where "the most collaboration would happen" and estimated their contributions as "60-40," with Elisabeth contributing more.

In Elisabeth's second-grade classroom, Elisabeth recalled reviewing a three-digit subtraction assessment with Garrett after he had given it to a mathematics group. Most students appeared ready to move forward, but two were still struggling with the skill. Rather than simply telling Garrett where to place them, Elisabeth asked what he saw in the results and discussed whether they should continue with the group or receive more instruction. They decided to move the two students to another group for reteaching, and Elisabeth reported that the students scored better when assessed again. Garrett described similar grouping conversations in which Elisabeth asked him to explain his choices and compare his reasoning with hers, helping him see that a different instructional decision was not necessarily a wrong one. Although Garrett described similar conversations, the details of this particular assessment came from Elisabeth's interview.

This example illustrates how Elisabeth involved Garrett in interpreting assessment results and determining what instruction the students needed next. Kyla and her mentor, Robert, showed

a similar pattern. Kyla described working with Robert to reorganize intervention groups, saying, "we collaborated on what we wanted to do with them," and that they used student data and instructional resources to decide what the groups needed. Robert also described Kyla identifying skills students were struggling with and proposing what she wanted to address during mathematics intervention time. As Kyla took on more teaching responsibility, she had information about students that could become part of their decisions. Robert still brought more experience, but Kyla's direct work with students gave her something meaningful to contribute.

Their collaboration also moved beyond academics. Robert described an ongoing behavior concern where previous approaches had not worked, and he and Kyla began "brainstorming" possible responses. Kyla volunteered to monitor the student during recess and helped use a social story they developed as part of the response. Robert later described it as "a problem we did have to work through together and figure out how to solve." This example is important because neither participant was simply following an already established answer. The need to solve an actual classroom problem created space for them to reason and act together.

Across the two pairs, shared analysis did not mean that mentor and preservice teacher contributed the same kind or amount of knowledge. Mentors generally knew more about the students, curriculum, classroom history, and established routines. However, as the preservice teachers began teaching more, they also developed first-hand knowledge that could matter because they were working directly with students and observing how instruction was going. The strongest collaborative moments occurred when that information was brought into a conversation rather than remaining with one person. In those situations, the mentoring relationship moved beyond the mentor telling the preservice teacher what to do and toward both people contributing

to the decision. These examples provide evidence of shared instructional reasoning, but they do not necessarily establish that the mentor changed their own thinking or teaching as a result.

### Preservice Teacher Ideas and Teaching Influenced Mentor Thinking and Practice

Reciprocal learning was also visible when a preservice teacher's ideas or teaching affected how the mentor thought about instruction. This is different from having a positive relationship or talking together about teaching. For learning to move toward the mentor, the preservice teacher had to contribute something that the mentor considered, used, or reflected on. The evidence of specific mentor reflection or change was more explicit in the Kyla and Robert pair than in the Garrett and Elisabeth pair. That difference is important because reciprocal learning did not appear in the same way or to the same degree in both relationships.

As discussed in the findings for Research Question 2, Elisabeth, Garrett's mentor, described herself as open to learning from preservice teachers. In her follow-up interview, she explained that preservice teachers sometimes brought different techniques or ways of relating to students and said, "I learn from them as they learn from me." By the end of Garrett's placement, Elisabeth also described being able to "bounce ideas off each other" and said Garrett was bringing more of himself into his teaching. Garrett, however, had difficulty identifying something he believed he had specifically taught Elisabeth and initially answered, "At the moment, no, not really," when asked whether she had learned something from him. Their combined accounts support shared thinking and openness to preservice teacher ideas more strongly than they support a claim that Garrett substantially changed Elisabeth's established practice.

Garrett's suggestion to use base-ten blocks, discussed earlier in RQ1, also matters here because Elisabeth considered using his idea in the lesson. Garrett recalled her saying, "I think

that's a good idea, I think we should do that," before they discussed how to implement it. This is important because Garrett's contribution did not remain only a suggestion; Elisabeth treated it as something worth using and worked with him on how to make it fit the lesson. The example supports preservice teacher influence on classroom decision-making without showing that Elisabeth permanently changed her own instructional practice. It fits the broader pattern in this pair of openness to Garrett's ideas while keeping the claim about mentor change limited.

Robert, Kyla's mentor, described the mentor side of reciprocal learning more directly. He said that mentoring made him think about his own practice and consider what he might do differently in the future. Rather than describing himself only as the person teaching the preservice teacher, he talked about mentoring as something that also made him examine his own work. He connected that reflection to the different perspective that another person brought into his classroom. Robert explained:

> I would say, you know, I learn a lot, you know, even though I know they're meant to be where they learn from us, you know, kind of thing. Like, I actually learn things about, like, my teaching, like, things to do differently. Those are some things that I've noticed, or things that maybe I'm like, oh, next time I want to make sure I do this differently, or it just gives me a different perspective.

Robert's description shows that he did not experience mentoring as knowledge moving in only one direction. Supporting Kyla sometimes caused him to look back at the same instructional choices he was asking her to examine. This became particularly clear in mathematics, where working through Kyla's TLP led him to look more closely at his own instruction and at how mathematics was being taught in the building. At one point, after telling Kyla that students did not need so much information on the screen, Robert questioned why he was still using slides

with so much text himself. He later said, “I have redone the way I’ve done math since I’ve had her in my room.”

That example needs to be interpreted carefully because Kyla was not the only reason Robert was reconsidering mathematics instruction. Robert also described a building-wide effort to examine whether Eureka Math was being taught with fidelity. What the mentoring relationship did was place Robert in a situation where he had to examine Kyla’s instruction closely, explain decisions to her, and then notice similar issues in his own practice. Kyla’s teaching became part of that reflection rather than the sole cause of it. This distinction is important because the data support mentor reflection and change without requiring a stronger causal claim than the interviews can support.

During a lesson on the history of Earth that both Kyla and Robert described, Kyla made a jar with layers of rock, clay, and dirt, an activity that was suggested in the curriculum. She explained that she valued concrete, visual experiences and remembered the students responding enthusiastically when she showed them the jar. Robert recalled that Kyla had asked whether she could make it and that he encouraged her to go ahead, even though he had not made the jar in previous years. Kyla remembered Robert asking to keep it and saying that the activity reminded him how much students enjoyed experiences of that kind. Together, their accounts show that Kyla used a curriculum activity Robert had passed over in previous years and that he came to appreciate the value of her decision.

Kyla still did not clearly see herself as someone who had taught Robert very much. When asked whether Robert had learned from her, she said, “I don’t know, that’d be an interesting question for [Robert],” and pointed mainly to examples such as the jar. That uncertainty is useful because Robert himself identified more specific ways the mentoring experience affected his

thinking. A preservice teacher could therefore contribute to mentor learning while still seeing the mentor primarily as the expert in the relationship. The evidence suggests that reciprocal learning could occur without the preservice teacher necessarily recognizing their own influence at the time.

Across the two pairs, preservice teacher influence was not always dramatic or easy to identify. Elisabeth described learning from preservice teachers and exchanging ideas with Garrett, but neither participant named a major instructional change that could clearly be traced to Garrett. Robert identified more specific examples of reconsidering mathematics instruction while mentoring Kyla. This does not mean Robert learned more than Elisabeth. It means that the evidence of specific mentor change was stronger in one pair than the other. The findings therefore support mentor reflection and reconsideration more strongly than they support claims of permanent or long-term instructional change.

## Mentor Authority and Classroom Structures Shaped Asymmetrical Reciprocal Learning

Reciprocal learning in these relationships did not make the mentor and preservice teacher equal partners. Learning could move in both directions, while mentor authority continued to shape how responsibility and instructional decisions were shared. How that authority operated could change depending on the situation and the opportunities mentors provided for preservice teachers to contribute. Elisabeth and Robert, the mentor teachers in the two complete pairs, remained the established classroom teachers and continued to have greater experience, authority, and responsibility for students. Garrett and Kyla, their preservice teachers, could contribute ideas and observations, but they did so within classrooms that the mentors had already created. That difference shaped how comfortable preservice teachers felt speaking up and how much they

believed they could change. Reciprocity developed within the unequal mentoring relationship rather than replacing that difference.

Kyla described this most clearly when talking about taking over Robert's classroom. She knew that the placement expected her to become responsible for the class, but she continued to see Robert as the person who was ultimately in charge. That made taking control uncomfortable even when she knew she was supposed to do it. Later, increased responsibility and experience made it easier for her to bring forward her own ideas. Kyla explained the difficulty she experienced:

> It was really, it's hard for me to just take control when the person who is, you know, really in charge is there. It's hard for me to do that, and I think it just, I just feel like it's rude, and even though I know I'm supposed to be doing it.

Kyla described feeling that Robert remained the person in charge, even as she took on more classroom responsibility. Even later in the placement, she described approaching Robert with "absolute deference" because she still viewed him as the expert with many years of experience. At the same time, increased responsibility gave her more experience from which to form ideas of her own. She was not becoming equal to Robert in authority, but she was becoming more able to contribute informed ideas within the relationship. The reciprocity depended partly on her having enough real classroom responsibility to develop knowledge worth bringing into their conversations.

Garrett also recognized that his contributions did not make the relationship equal. When discussing collaboration around student data, he estimated that Elisabeth contributed about 60 percent and he contributed about 40 percent. Elisabeth described the mentor side of this tension as finding a "happy medium" because it was still her classroom while Garrett also needed

opportunities to determine what he wanted his own classroom to look like. Later, she said preservice teachers know they are in "somebody else's classroom" and may worry about stepping on toes, so she believed mentors had to allow them opportunities to experiment. Elisabeth's authority shaped both the classroom expectations Garrett worked within and the opportunities she created for him to contribute to instructional decisions.

Classroom and curriculum structures also affected how much room there was for reciprocal learning. Kyla described working in a setting where she was expected to follow the curriculum closely, saying that much of the time she was "following the script and doing the things." Garrett similarly described Elisabeth's classroom as highly structured and said that although he liked the routines, they sometimes made him feel "a little held back" from adding more of his own ideas. These structures did not prevent collaboration, but they shaped the types of decisions that were available to preservice teachers. Grouping, manipulatives, student support, reteaching, and smaller lesson adaptations often provided more room for shared decision-making than changing the curriculum itself.

Mathematics provided the most consistent space for this type of work because it occurred repeatedly and gave the pairs visible evidence to discuss. They could teach a lesson, see where students struggled, look at work or assessment results, make a change, and then observe what happened. Science created fewer repeated opportunities in these two placements. In Kyla's placement, much of the science content was embedded within ELA or handled through STEAM (science, technology, engineering, arts, and mathematics) rather than through a separate daily science block. In Garrett's placement, science and social studies were taught to both second grade classes by another teacher rather than primarily by Elisabeth. The structure of the

placement influenced not only what the preservice teachers taught, but also where mentor and preservice teacher had repeated opportunities together.

The two pairs also reached collaboration through different relationship paths. Garrett and Elisabeth developed a comfortable relationship in which Elisabeth increasingly asked for his ideas and he felt able to bring suggestions to her. Kyla and Robert had more visible tension early in the placement because Kyla described herself as sensitive to Robert's direct feedback and hesitant to take control. Their relationship still became collaborative as Kyla gained responsibility and they became more comfortable working through classroom needs together. This suggests that reciprocal learning did not depend on one particular communication style. What mattered was whether the relationship eventually created enough trust and space for both people to contribute to the work.

### Summary of Research Question 3

Across the two complete mentor-preservice teacher pairs, reciprocal and collaborative learning was most visible when participants were working around a specific student or instructional need. Both mentoring pairs used student observations, assessment information, instructional experiences, and classroom problems to make decisions together. The mentors generally brought more experience and knowledge of the established classroom, while preservice teachers sometimes contributed first-hand information from teaching or working closely with particular students. Preservice teacher contributions also had the potential to influence mentor thinking, although that influence was clearer and more specific in Robert's account than in Elisabeth's. The findings showed reciprocity as something that developed through shared work rather than simply through having a supportive relationship.

At the same time, the reciprocal learning was asymmetrical. Mentors retained more authority, experience, and final responsibility. The preservice teachers continued to recognize that difference even as they became more involved in classroom decisions. Meaningful responsibility gave preservice teachers opportunities to notice problems, develop ideas, and contribute knowledge of their own. Mentor openness and relational trust helped determine whether those contributions could enter the conversation. Collaboration was visible when both people contributed to a student or instructional decision. Evidence of reciprocal learning required more, including examples in which a preservice teacher's contribution influenced a mentor's thinking or practice. Curriculum, classroom routines, scheduling, and access to different content areas also shaped whether there was enough room for shared decision-making to occur. Overall, reciprocal learning did not require the mentor and preservice teacher to contribute equally. Opportunities for reciprocal learning developed when preservice teachers contributed ideas or observations that mentors considered as part of their instructional decisions or reflection.

## Chapter Four Summary

Across the three research questions, mentoring was described as a process that changed as preservice teachers became more involved in the work of the classroom. Relational trust, mentor fit, and feedback shaped whether preservice teachers felt comfortable asking questions, making mistakes, trying ideas, and beginning to make decisions of their own. At the same time, increased responsibility did not mean that mentor support was no longer needed. Mentors continued to make decisions about when to provide guidance, when to intervene, and when to step back so that preservice teachers could work through a decision independently. As preservice teachers took on more responsibility, they described greater confidence, classroom ownership, and opportunities to develop their own instructional judgment, although these changes did not

occur in the same way across all of the placements. Mathematics provided the most consistent setting for this instructional learning because it gave preservice teachers and mentors repeated opportunities to notice student understanding, discuss instructional problems, make adjustments, and see how students responded.

As preservice teachers became more involved in teaching and classroom decision-making, they also had more to contribute to the mentoring relationship. The clearest examples of collaboration occurred when mentors and preservice teachers were working through a specific student or instructional need, and both brought information that could help them decide what to do next. This did not make their roles equal. Mentors remained the established classroom teachers with greater experience, authority, and responsibility for students, while preservice teachers continued to work within classrooms, routines, and curricula that were already in place. However, preservice teachers' observations, ideas, and experiences with students could become part of the classroom decisions and, in some cases, contribute to mentor reflection on practice. The opportunities for this kind of shared work varied across the placements and were influenced by the relationship between the mentor and preservice teacher, the responsibility given to the preservice teacher, and the instructional opportunities available within the placement. Overall, the findings describe mentoring as more than the transfer of knowledge from an experienced teacher to a preservice teacher. Mentoring also created opportunities for preservice teachers to develop and contribute their own instructional thinking and, when those contributions were taken up within the relationship, for learning and reflection to move in both directions. Chapter Five considers these findings in relation to the literature, theoretical framework, and broader purpose of the study.

# Chapter 5 - Discussion and Conclusions

## Introduction

This study examined the mentoring experiences of preservice teachers and mentor teachers in elementary STEM field placements. The study focused on how preservice teachers described their mentoring experiences, how mentor teachers described their roles, and where opportunities for reciprocal or collaborative learning appeared within those relationships. Chapter Four presented the findings and showed that mentoring involved more than providing guidance or feedback to a preservice teacher. Across the findings, participation, responsibility, relationships, authority, and reciprocal learning were connected in ways that helped explain how the mentoring relationships developed. This chapter discusses what those findings mean in relation to the literature and conceptual framework presented in Chapter Two.

The discussion is organized around three larger ideas that developed across the research questions. The first considers how meaningful participation and responsibility were connected to preservice teacher learning and identity. The second focuses on mentor authority and how it shaped access to responsibility and professional voice. The third examines reciprocal learning and how learning could move in both directions even though mentors and preservice teachers continued to hold different roles and responsibilities. The chapter then discusses implications of the findings, recommendations for future research, limitations of the study, and conclusions.

## Summary of Findings by Research Question

For the first research question, preservice teachers described mentoring experiences shaped by trust, feedback, and opportunities to assume responsibility. Their accounts showed that teaching more lessons did not always give them more say in instructional decisions. They described growing confidence as they responded to student needs and made more decisions

during teaching. That confidence did not extend equally to every setting, as some remained hesitant to contribute in larger professional conversations. Mathematics offered repeated opportunities to discuss instruction, while opportunities to teach science varied across placements.

For the second research question, Elisabeth and Robert described setting expectations, modeling classroom practices, providing feedback, and adjusting their support as their preservice teachers developed. Both remained responsible for their students and classrooms while deciding when to intervene and when to step back. Their accounts showed that gradual release involved judgments about readiness and student needs, rather than teaching time alone. They also described making room for preservice teachers to try ideas within classrooms the mentors had already established. Both were open to learning through mentoring, although Robert identified more specific examples of reconsidering his own practice.

For the third research question, collaborative learning was most clearly documented in the two pairs for which both mentors were interviewed. Garrett and Elisabeth described comparing instructional reasoning and discussing student needs, while Kyla and Robert described shared decisions and Kyla's contributions to classroom practice. These opportunities often arose around specific assessments, lessons, or student concerns. The preservice teachers brought knowledge from working with students, while their mentors brought greater classroom experience and retained final responsibility. The findings showed reciprocal influence in these two relationships without suggesting that the participants held equal roles.

# Discussion of Findings

## Meaningful Participation, Responsibility, and Identity

One of the clearest patterns across the findings was that meaningful participation involved more than just teaching more lessons. The preservice teachers who completed follow-up interviews described increased confidence and greater responsibility for instructional decisions as their placements progressed, although these experiences differed across participants. This included managing students, responding when something was not working, adjusting instruction, and deciding what should happen next. This connects with Lave and Wenger's (1991) idea that learning develops through participation in the real work of a community and with Wenger's (1998) work on Communities of Practice. Feiman-Nemser (2001a) also describes learning to teach as something that develops through actual participation in teaching practice. This pattern also reflects legitimate peripheral participation because preservice teachers were moving from observation and more limited tasks toward greater involvement in the decisions and responsibilities of classroom practice (Lave & Wenger, 1991). The findings from this study support these ideas, but they also suggest that the amount of teaching alone may not be what made the experience meaningful. The stronger connection seemed to be between responsibility and having opportunities to make decisions while teaching.

That responsibility also seemed connected to how the preservice teachers began to see themselves as teachers. Kyla connected having more responsibility with feeling more confident in her role, while Ethan and Nicole showed that being able to act as the teacher in the classroom did not always mean feeling like a full member of the larger professional community. With his first mentor, Michael said he did not feel comfortable asking questions or changing things, while with his second mentor he felt able to ask questions and bring in his own ideas. These accounts

suggest that confidence in classroom instruction and a sense of belonging in other professional settings did not always develop together. Research on teacher identity has shown that identity develops through experience, interaction, reflection, and the settings where preservice teachers are learning to teach (Beauchamp & Thomas, 2009; Izadinia, 2016). Wenger's (1998) discussion of participation in professional communities helps explain why taking responsibility within a classroom did not necessarily mean feeling comfortable contributing in a larger team or PLC meeting. This fits with research connecting relational quality, trust, and mentor fit to preservice teachers' willingness to ask questions, take risks, and participate in the work of teaching (Izadinia, 2016; Parker et al., 2022). Rather than showing a consistent progression toward confidence, these interviews point to the importance of the settings and relationships in which preservice teachers were invited to contribute. The participants' descriptions of their experiences were relevant to this literature, even though I did not examine identity development as a separate outcome.

Mathematics provided the most consistent place for this type of participation because it repeatedly gave preservice teachers and mentors something specific to work through together. Preservice teachers could teach a lesson, see where students struggled, consider a representation or different approach, discuss what happened with the mentor, and then make another decision about instruction. Ethan's liquid volume lesson is one example because he noticed a problem with the lesson, brought it to his mentor, and worked through a solution with her instead of being told what to do. Research on mentoring has shown the importance of connecting mentoring conversations to actual instructional practice and making the reasoning behind teaching decisions more visible (Mok & Staub, 2021; Orland-Barak & Wang, 2021). The findings from this study were consistent with that work. Unlike Carter and Amador's (2015) study of mathematics lesson-

study discussions and Schwartz et al.'s (2018) examination of university supervisor feedback, this study examined how preservice teachers and their classroom mentors described working through instructional decisions within their existing placements. Mathematics created these opportunities more often than science, but that difference appeared to be connected to the structure of the placements rather than something unique about mathematics itself. Science was taught differently across the placements, while mathematics occurred regularly and gave preservice teachers repeated opportunities to teach, notice student thinking, discuss problems, and make adjustments. These findings add to that literature by showing that access to meaningful instructional work may depend not only on the content area, but also on how opportunities are organized within the placement.

One finding I did not anticipate was how little a placement schedule alone could tell me about the development of a mentoring relationship. In my work with field placements, I had been accustomed to thinking about progress in terms of when preservice teachers began teaching specific lessons or assumed more responsibility. I expected those milestones to be more central in participants'' descriptions. Instead, their accounts repeatedly emphasized opportunities to explain their reasoning, respond to students, make decisions, and contribute ideas with a mentor. This did not make program expectations unimportant, but it changed how I understood what meaningful participation looked like within those expectations.

### Mentor Authority Shaped Participation and Professional Voice

Mentor authority remained an important part of the mentoring relationships because mentors and preservice teachers did not enter the placement with the same roles or responsibilities. The mentor teacher was still responsible for the students, instruction, classroom routines, and the decisions that affected the classroom even as the preservice teacher took on

more responsibility. The findings do not suggest that this difference needed to disappear for the preservice teacher to become more independent. Instead, what seemed to matter was how the mentor used that authority and whether it created or limited opportunities for the preservice teacher to participate. This fits with research showing that unequal roles can shape participation, professional voice, and whose judgment carries more weight within mentoring relationships (Mackie, 2020; Merket, 2022). Rather than presenting authority as a choice between restricting or allowing participation, these perspectives help explain how authority shaped everyday decisions about whose judgment was heard and when preservice teachers could act on their ideas.

Elisabeth and Robert showed this in different ways as they gradually gave Garrett and Kyla more responsibility. Neither mentor described this as something that happened just because a certain number of weeks had passed. Elisabeth emphasized established classroom expectations, while Robert described stepping back as Kyla became more ready to make decisions. Their accounts suggest that gradual release involved judgments about readiness rather than just following a placement schedule. This is consistent with mentoring literature describing mentors as guiding novices and gradually turning responsibility over while continuing to use professional judgment about when support or intervention is needed (Orland-Barak & Wang, 2021; Wang & Odell, 2022). Their responsibility for student learning also shaped those judgments. Elisabeth described deciding when to intervene to prevent students from developing misunderstandings, while Robert adjusted the timing and type of feedback Kyla received. Together, these accounts suggest that stepping back could be an intentional mentoring decision rather than a withdrawal of support. From a situated learning perspective, that choice gave the preservice teacher

opportunities to participate in the reasoning involved in teaching, not just the delivery of lessons (Lave & Wenger, 1991).

The findings also showed that mentors could use their authority to make it clear that the preservice teacher was allowed to make decisions. Elisabeth's invitation for Garrett to try his ideas and Robert's encouragement for Kyla to adjust classroom materials illustrated how mentors could recognize preservice teachers as contributors to instructional decisions. In those moments, the mentor was not giving up responsibility for the classroom. Instead, the mentor used authority they already had to create room for the preservice teacher to take responsibility. This connects to Mackie's (2020) and Merket's (2022) discussions of how mentor authority shapes participation and whose knowledge is recognized within mentoring relationships. It also extends the discussion of legitimate peripheral participation by showing how access to instructional decision-making could develop through the mentor's everyday interactions with a preservice teacher (Lave & Wenger, 1991). That support still did not mean preservice teachers felt the same level of professional voice everywhere, as Ethan and Nicole, both preservice teachers, showed when they were comfortable in the classroom or with their mentors but more hesitant in larger team or PLC settings. Their experiences suggest that professional voice depended partly on the setting and the opportunities available to contribute, which is consistent with Wenger's (1998) discussion of participation within professional communities.

### Reciprocal Learning Developed Through Shared Work but Remained Unequal

Collaboration was most visible when the mentor and preservice teacher had a specific instructional decision to work through together. Across the two complete pairs, these moments often developed around student needs, grouping decisions, assessment information, misconceptions, behavior concerns, or decisions about whether instruction needed to change. In

those situations, the mentor was not simply giving advice and the preservice teacher was not only receiving it. Garrett and Kyla could bring information from their own teaching and work with students, while Elisabeth and Robert brought greater experience and knowledge of the established classroom. This fits with research showing that mentoring conversations can become more collaborative when they are connected to student work, observations, lesson materials, or other evidence from actual teaching (Goldshaft & Sjølie, 2024; Orland-Barak & Wang, 2021). Research on joint reflection also supports the idea that mentors and preservice teachers can work through teaching problems together rather than reflection belonging only to the preservice teacher (Tiainen & Lutovac, 2024). These situations gave participants a practical reason to work through decisions together, although collaboration did not necessarily mean both people learned from the exchange.

The findings also showed that reciprocal influence did not always look the same. Garrett and his mentor, Elisabeth, showed it mostly through sharing ideas, comparing their reasoning, and using some of Garrett's suggestions in the classroom. Elisabeth described herself as open to learning from preservice teachers, but neither she nor Garrett identified a major change in her teaching that could be connected to his influence. Robert gave more specific examples of reflecting on his own practice while mentoring Kyla, including reconsidering parts of his mathematics instruction. The Earth layers jar also provided a clear example because Kyla and Robert both remembered the same event and described an idea from Kyla becoming part of the classroom. Research has shown that mentors can learn through mentoring and that the roles of mentor and preservice teacher can be interconnected rather than learning moving only from the experienced teacher to the novice (Ambrosetti & Dekkers, 2010; Hudson, 2013). The findings support Ambrosetti and Dekkers' (2010) description of interconnected mentor and preservice

teacher roles and Hudson's (2013) view of mentoring as potential professional growth for both mentor and mentee. However, the findings also demonstrate a tension between opportunities for reciprocal learning and evidence that mentor learning actually occurred. Elisabeth and Garrett described exchanging ideas and working through instructional decisions, but neither identified a substantial change in Elisabeth's teaching that could be attributed to Garrett. Robert provided more specific examples of reconsidering his own instruction while mentoring Kyla. This does not contradict research describing mentoring as a potential source of learning for both participants, but it shows why collaboration and openness to learning should not automatically be interpreted as evidence of changes in mentor practice.

Reciprocal learning also did not remove the difference in authority between the mentor and preservice teacher. Elisabeth and Robert remained responsible for their classrooms, while Garrett and Kyla continued to recognize that their mentors had more experience and final responsibility for students. At the same time, the preservice teachers were able to contribute observations, ideas, and knowledge from their own teaching experiences. This is consistent with research showing that mentors and preservice teachers can influence one another even when their roles, authority, and responsibilities remain unequal (Ambrosetti & Dekkers, 2010; Hudson, 2013; Mackie, 2020). One way to describe the pattern in this study is asymmetrical reciprocal learning. By that, I mean that learning and influence could move in both directions even though authority and responsibility did not move equally. The preservice teachers became contributors within the relationship without becoming equal to the mentors in experience or classroom authority.

Reciprocal learning seemed to depend partly on whether the placement gave preservice teachers enough opportunity to develop something meaningful to contribute. As preservice

teachers taught more, worked with students, and made more instructional decisions, they gained information and experience that could become part of conversations with their mentors. This connects reciprocal learning back to legitimate participation because preservice teachers needed access to real teaching work before they could develop observations, experiences, or instructional ideas that could be brought back into the mentoring relationship (Lave & Wenger, 1991). The differences in opportunities across placements showed that reciprocity depended partly on access to meaningful and repeated participation, not only on the quality of the mentoring relationship. A supportive relationship mattered, but there also had to be something meaningful for the mentor and preservice teacher to work on together. Unlike studies that examined intentionally structured reverse mentoring arrangements (Bertram et al., 2023; Porras et al., 2018), this study examined mentoring relationships that were already established within elementary classrooms. The findings suggest that opportunities for reciprocal learning can develop through everyday instructional work without formally changing the roles of mentor and preservice teacher.

## Significance of the Findings

The significance of this study lies in how it connects responsibility, authority, and reciprocal learning within the everyday work of elementary STEM mentoring. In these placements, meaningful responsibility included opportunities to notice student needs and make decisions, as well as opportunities to teach lessons. Mentors' authority remained present as preservice teachers gained responsibility, and the way mentors used it affected whether preservice teachers could act on their own ideas. The two complete mentoring pairs showed ways preservice teachers could contribute to classroom decisions, while Kyla and Robert's accounts provided the clearer example of a preservice teacher contributing to a mentor's

thinking. This pattern helps explain how learning could move in both directions within unequal roles. Because the study included only two complete pairs, it offers an interpretation of these relationships rather than a claim that all elementary STEM mentoring relationships develop this way.

# Implications

## Implications for Theory

### Participation Across Professional Settings

The findings offer a. more specific illustration of situated learning and Communities of Practice by showing that participation developed differently across the professional settings preservice teachers encountered. Preservice teachers in this study became more involved in the work of teaching as they took responsibility for instruction, students, and classroom decisions, which is consistent with Lave and Wenger's (1991) view of learning through participation and Wenger's (1998) Communities of Practice. Lave and Wenger (1991) use legitimate peripheral participation to describe how newcomers gain access to increasingly meaningful parts of a community's practice, while Wenger (1998) emphasizes that participation develops through relationships within the community. However, the findings also showed that fuller participation was uneven across professional settings. A preservice teacher could therefore participate more fully in classroom instruction while remaining more peripheral in a PLC or team discussion. Participation was therefore relational and situated rather than a single, linear movement toward becoming a full participant. Because Wenger (1998) connects participation and identity, this also helps explain why preservice teachers could feel like teachers in one setting while still feeling like newcomers in another.

### Mentor Authority Within a Community of Practice

The findings also suggest another way to think about mentor authority within a community of practice (Lave & Wenger, 1991). The mentor's greater authority did not disappear as the preservice teacher became more independent, and the findings do not suggest that it needed to. Instead, mentors helped shape when and how preservice teachers were able to take responsibility and make decisions. Authority shaped the circumstances in which preservice teachers could act: mentors maintained classroom expectations and responsibility while also determining when to invite independent decisions or new ideas. Elisabeth's encouragement for Garrett to try his ideas and Robert's invitation for Kyla to change materials show how mentors used their established positions to open participation. Read alongside Mackie (2020) and Merket (2022) these examples show how authority shaped access to responsibility, instructional decisions, and professional voice within the two pairs. In this study, negotiated authority sometimes meant using the mentor's position to make a preservice teacher's greater participation possible.

### Mentoring as Shared Learning

The findings also add to the idea of mentoring as shared learning. Research on reciprocal mentoring has shown that mentors and preservice teachers can influence one another even while holding different roles and levels of responsibility (Ambrosetti & Dekkers, 2010; Hudson, 2013). Mackie (2020) adds an important reminder that this shared learning still occurs within relationships where authority is uneven. That was visible in this study when preservice teachers contributed observations, instructional ideas, or knowledge developed through their own work with students and those contributions were considered during instructional decisions. Robert also described reflecting on his own teaching while mentoring Kyla, providing more direct evidence of mentor learning that was available in Elisabeth's account. Both mentors continued to hold

greater classroom authority and responsibility, even as their preservice teachers contributed ideas and participated in shared instructional reasoning. I describe these opportunities for reciprocal influence within unequal roles as asymmetrical reciprocal learning. I am not using this phrase to suggest a separate theory or to argue that all mentoring relationships work this way. Instead, it provides a useful way to describe the different forms of influence identified across the two complete pairs and to connect participation, negotiated authority, and shared learning within the framework. The findings suggest that becoming a legitimate contributor did not require the preservice teacher to stop being a learner, just as learning from a preservice teacher did not require the mentor to give up the role of the more experienced teacher.

## Implications for Teacher Preparation Programs

The findings suggest that teacher preparation programs should look beyond how much time preservice teachers spend teaching and pay closer attention to the kind of responsibility they are actually given. In this study, teaching more lessons mattered, but some of the clearest examples of learning appeared when preservice teachers were also expected to notice student needs and help decide what should happen next. Elisabeth's account of reviewing a mathematics assessment with Garrett illustrates this kind of responsibility. She described asking him to interpret the results before they decided how to respond to two students who needed reteaching. Programs could look for authentic work such as planning individual lessons, units, and assessments; responding to student needs before, during, and after instruction; and participating in decisions about grouping or classroom routines. Those opportunities would show more about a preservice teacher's role than a record of teaching hours alone. This is consistent with Lave and Wenger's (1991) view that learning develops through participation in authentic practice and with the work of Feiman-Nemser (2001a) and Orland-Barak and Wang (2021), who describe learning

to teach through engagement in the actual work of teaching. Looking at the decisions preservice teachers are invited to make alongside the lessons they deliver may give programs a fuller picture of their development.

Teacher preparation programs may also need to think more intentionally about how preservice teachers are prepared to develop a professional voice (e.g., Mackie, 2020). Ethan described feeling comfortable sharing ideas with his mentor but hesitating in larger team conversations, and Nicole described a similar difference in PLC meetings. Their experiences suggest that classroom responsibility did not automatically tell them how to enter conversations among experienced teachers with established routines and relationships. Programs could help preservice teachers practice asking questions, explaining an instructional choice, and offering an observation from their work with students. They could also work with placement schools to establish when preservice teachers will be invited to discuss student learning in team or PLC meetings and what contribution is expected of them. Mackie (2020) connects voice with role positioning and perceived expertise, while Dreer-Goethe (2025) connects relationships beyond the mentor to student teachers' engagement and psychological safety during practicum. However, helping preservice teachers develop a professional voice cannot be the responsibility of preparation programs alone. The demands of teaching and the working conditions within schools may also affect whether teachers have the time and psychological safety to welcome preservice teachers' contributions. Although this study did not directly examine those working conditions, the findings suggest that preparation programs and placement schools must work together to create meaningful opportunities for participation.

Another implication for teacher preparation programs involves the STEM opportunities available within the placement. Mathematics gave the participants repeated lessons and student

work to discuss, while access to science varied across placements. As Ethan's lesson on liquid volume showed, an instructional problem could become a shared decision with a mentor when the preservice teacher had an opportunity to teach and notice how students responded. From a situated learning perspective, access matters because preservice teachers can only participate in practices they are given opportunities to enter (Lave & Wenger, 1991). Programs may need to document what content preservice teachers teach, how often they teach it, and whether they repeatedly plan and adjust instruction within each STEM area. When a placement provides limited access to one STEM area, programs can then consider whether that experience needs to be strengthened somewhere else in the preservice teacher's preparation. These differences also suggest that classroom schedules, curriculum expectations, and which teacher is responsible for a subject can affect opportunities for content-specific mentoring, even when the mentoring relationship itself is supportive. The larger implication is that the quality of a STEM field experience depends partly on the opportunities the preservice teacher actually has, not simply on the type of classroom in which the placement occurs.

## Implications for Mentor Preparation

Mentor preparation should also include attention to how mentors decide when to step in and when to step back. Elisabeth and Robert described watching what the preservice teacher was doing and deciding whether the situation called for support, correction, or more independence. Sometimes student learning or classroom needs meant the mentor needed to intervene. At other times, stepping in too quickly could take away an opportunity for the preservice teacher to work through a problem or make a decision independently. In these cases, stepping back was not the same as providing less support. It could actually be part of the mentoring process when the preservice teacher was ready to use what they had already learned. Elisabeth and Robert's

descriptions echo field-based mentoring research that treats support as something mentors adjust within the actual work of teaching rather than as a simple handoff of responsibility (Orland-Barak & Wang, 2021). More general research on mentor education also supports the need for mentors to receive preparation for a role that requires skills beyond being an effective classroom teacher (Aspfors & Fransson, 2015). Mentor preparation could give mentors opportunities to think through how they make these decisions rather than assuming that knowing when to intervene will come automatically with teaching experience. One way to address this would be through brief classroom scenarios during mentor orientation or regular check-ins. Mentors could discuss when a preservice teacher should be allowed to work through an instructional problem, when student needs require intervention, and how to follow up afterward so the preservice teacher understands the reasoning behind the decision.

Mentor preparation could also help mentors make more of their instructional thinking visible to preservice teachers. The findings showed that some of the most useful conversations happened when mentors and preservice teachers worked through something specific, such as student work, assessment information, grouping, misconceptions, or a lesson that needed to be adjusted. Rather than only telling a preservice teacher what they do, mentors can explain why they are making a decision and ask the preservice teacher to explain their own reasoning. Mok and Staub (2021) found that making the thinking behind planning and teaching practices explicit was an important part of coaching, mentoring, and supervision for preservice teachers. Orland-Barak and Wang (2021) also emphasize mentoring that supports preservice teachers in learning the actual work of teaching within field-based settings. This also aligns with practice-based mentoring research showing that student work, observations, assessments, and lesson materials can provide a shared focus for instructional reasoning (Goldshaft & Sjølie, 2024; Tiainen &

Lutovac, 2024). The findings from this study suggest that using real evidence from the classroom gives mentors a natural way to make that thinking visible. Mentor preparation could include practicing conversations around content-specific examples, such as examining a student's mathematical misconception and deciding whether reteaching is necessary. Rather than immediately providing an answer, mentors could practice asking preservice teachers what they noticed in the student work, what they think the student understands, and what instructional decision they would make next. This can move the conversation beyond whether a lesson went well or poorly and toward understanding why a particular instructional decision makes sense.

A third area for mentor preparation is the authority mentors bring into the relationship. Because the mentor is the established classroom teacher, a preservice teacher may hesitate to change something or offer an idea even when the mentor believes the preservice teacher is free to do so. Robert had to make it clear to Kyla that she could make decisions without continuing to seek his approval, and Elisabeth described giving Garrett more freedom to act on his own ideas. Research on power and mentor roles shows that the way mentors use their position can shape the role preservice teachers are able or willing to take on (Mackie, 2020; Merket, 2022). Mentor preparation could help mentors recognize that a preservice teacher may need more than general encouragement to participate. Sometimes the mentor may need to clearly show that the preservice teacher's observations, ideas, or decisions are welcome. This does not mean that mentors should always agree with every idea or give up responsibility for their classroom. It means helping mentors recognize that the authority they already have can be used both to guide the preservice teacher and to create room for the preservice teacher to contribute. Mentor preparation could also address how mentors help preservice teachers participate in professional conversations outside of their classrooms. This might include explaining the expectations of PLC

or grade-level meetings, identifying appropriate opportunities for preservice teachers to contribute, and discussing those experiences afterward. Ethan's and Nicole's accounts suggest why this matters. Both described becoming more comfortable with instructional responsibilities while remaining hesitant to contribute in larger professional settings. Preparing mentors to support participation in these settings could help preservice teachers develop a professional voice beyond their individual classrooms.

The teacher preparation program already provides several resources to support mentor teachers in their roles. At the beginning of the placement, mentors are invited to a meeting where expectations are reviewed and they have opportunities to ask questions. Mentors also have access to a website with resources related to evaluations, supporting interns who are struggling, podcasts, and optional evaluation tools focused on specific areas. In addition, mentors and university supervisors completed an evaluation at the same time to discuss rubric scoring and develop a shared understanding of expectations. These existing supports provide a foundation for the additional mentor preparation opportunities suggested in this section. However, this study did not specifically examine how Elisabeth and Robert used these resources or how the resources influenced their mentoring practices. The recommendations presented here are therefore intended to build on existing supports rather than suggest that mentor preparation was absent.

## Implications for Schools and Districts

The larger school environment also matters in how preservice teachers begin to see themselves as members of the profession. Ethan and Nicole, both preservice teachers, were becoming more confident in their classrooms but were still more hesitant in larger team or PLC conversations. This shows that the mentor relationship is only one part of the preservice teacher's experience in a school. Dreer-Goethe (2025) also found that student teachers'

connections with school colleagues outside the mentor relationship were related to their engagement and psychological safety during practicum. Schools may therefore need to think about how preservice teachers are brought into grade-level teams, PLCs, planning meetings, and other professional spaces rather than assuming that attendance alone makes them feel like participants. The difference between classroom confidence and hesitation in larger professional conversations suggests that opportunities for participation depend partly on how school colleagues recognize and invite preservice teachers' contributions.

This does not mean that preservice teachers should be treated as though they have the same experience or responsibility as practicing teachers. It does suggest that schools can provide clearer opportunities for them to begin participating in professional conversations. Asking a preservice teacher what they noticed, including them in a conversation about student learning, or inviting them to explain their reasoning gives them a way to participate without pretending that differences in experience do not exist. This also fits with the larger finding of the study that professional voice did not seem to develop through confidence alone. Mackie (2020) argues that professional voice is shaped by role positioning, perceived expertise, and established authority within mentoring relationships. Because established teachers help shape these conversations, schools could encourage teams to make space for preservice teachers to contribute during meetings already taking place, without creating additional meetings or responsibilities for individual mentors. The important distinction is not just whether preservice teachers attend professional meetings, but whether their observations and instructional reasoning are invited into the discussion. That distinction may help preservice teachers begin developing a professional voice outside of the individual mentor's classroom.

Schools and districts also influence which instructional opportunities are available within a placement. In this study, mathematics provided repeated opportunities to discuss student work and instructional decisions, while access to science varied depending on how instruction was organized. School partners and teacher preparation programs could review these opportunities together, particularly when a placement provides limited access to one STEM subject. This could include identifying when preservice teachers will have opportunities to plan, teach, assess, and discuss mathematics and science instruction with an experienced teacher. When those opportunities are not available within a particular placement, schools and preparation programs could consider how those experiences might be provided elsewhere in the teacher preparation program. The findings do not establish that schools valued one subject over another, but they do show why access to content-specific instruction deserves attention alongside the mentoring relationship.

## Implications for Reciprocal and Reverse Mentoring

Reciprocal and reverse mentoring require a more cautious implication from this study. This study did not implement or test a formal reverse mentoring model, so the findings do not provide evidence that teacher preparation programs should immediately adopt one. Research does show that preservice teachers can contribute useful knowledge within more intentional reverse mentoring structures (Bertram et al., 2023; Porras et al., 2018; Raberger et al., 2024). However, this study identified opportunities for reciprocal learning within traditional mentoring relationships, although the evidence of mentor learning differed between the two pairs. Robert described more specific examples of reconsidering his own instruction, while Elisabeth described being open to learning from preservice teachers. Across the two complete pairs, opportunities to collaborate were described in situations where preservice teachers had meaningful responsibility,

mentors were open to their ideas, the relationship allowed preservice teachers to contribute, and the mentor and preservice teacher had something specific to work through together. This emphasis on trust, openness, and opportunities to exchange knowledge also reflects reverse mentoring research that identifies dialogue and role negotiation as important conditions for reciprocal learning (Porras et al., 2018). These findings suggest that teacher preparation programs may first want to support opportunities for shared instructional decisions within existing mentoring relationships before creating a more formal reverse mentoring structure. Meaningful responsibility, relational trust, mentor openness, repeated opportunities to work together, and real instructional problems may all help create space for preservice teachers to become contributors while they are still learning. Future research could then examine whether making that reciprocity more intentional changes the mentoring experience.

## Recommendations for Future Research

Future research could build on this study by including more complete mentor and preservice teacher pairs. Only two relationships in this study included interviews from both members of the mentoring pair, which limited how often the preservice teacher's description of an interaction could be compared with the mentor's perspective. Following more complete pairs across a full placement could show how responsibility, authority, and reciprocal learning changed over time and whether both members understood those changes similarly. Research in additional schools and programs could examine which patterns appear across contexts and which depend on particular placement conditions. Parker et al. (2022) also support attention to mentoring relationships over time rather than treating one point as representative of the whole experience. These designs could test the pattern described here as asymmetrical reciprocal learning across a broader range of relationships.

Additional data sources would help researchers examine mentoring interactions as they happen. This study relied on participant interviews and could compare both members' accounts in only two pairs; it did not directly observe planning conversations, feedback, or classroom decisions. Future studies could combine repeated interviews with observations of mentoring conversations, classroom intervention, team meetings, and the negotiation of instructional responsibility. Written records made during the placement could also provide points of comparison between the beginning and end interviews. Observation-based mentoring research demonstrates the value of examining discussion around evidence from practice (Goldshaft & Sjølie, 2024). Researchers could also compare mathematics and science opportunities to see how scheduling, curriculum, and access to teaching shape the kinds of instructional conversations available to preservice teachers.

Future research should examine how mentor authority and school structures shape whose ideas are heard in classrooms and professional meetings. Future studies could look more closely at how authority shifts during planning, teaching, feedback, and professional meetings rather than assuming it operates the same way in every situation. Ethan's and Nicole's accounts suggest that opportunities to speak with a mentor may differ from opportunities to contribute in a PLC or team meeting (Mackie, 2020; Merket, 2022). A related study could place identity development at the center rather than treating participants' reported confidence or belonging as a direct measure of professional identity. Izadinia (2016) provides a mentoring-focused point of departure, and Gee's (2000) account of identity could offer a lens for examining how preservice teachers are recognized differently across classroom and school settings. A longitudinal mixed methods study might also pair interviews with a suitable preservice elementary science teaching self-efficacy instrument, such as the measure developed by Enochs and Riggs (1990), while examining

reciprocal learning and mentor influence over time. That would allow researchers to ask whether changes in reported teaching efficacy accompany changes in participation without assuming that this interview study measured either efficacy or identity development directly.

Research could examine how different mentor communication styles and school structures affect whether preservice teachers feel able to ask questions, offer a different interpretation, suggest an idea, or contribute their own instructional reasoning. Researchers could also consider mentors' years of classroom experience, previous mentoring experience, and instructional approaches to see how these relate to the ways they share responsibility and respond to preservice teacher ideas. The pattern described in this study as asymmetrical reciprocal learning also needs to be examined in additional mentoring relationships to determine whether the pattern appears in other contexts and what conditions support or limit it. Future studies could explore whether mentor preparation changes these dynamics and whether specific practices create more opportunities for learning to move in both directions. Research on reverse mentoring provides one possible direction for testing more intentional forms of reciprocal learning after naturally occurring reciprocity is better understood (Bertram et al., 2023; Porras et al., 2018).

## Limitations

Several limitations should be considered when interpreting the findings of this study. The study included five preservice teachers and two mentor teachers, and only two mentoring relationships were represented by interviews from both members of a matched pair. Four preservice teachers completed both interviews, while Michael completed only the initial interview, so his experience could not be used to describe change across the full placement. Because interviews occurred near the beginning and end of the semester, they provided two points of reference rather than a continuous record of participants' mentoring experiences.

Because only two mentor teachers participated, the mentor findings represent the experiences of Elisabeth and Robert rather than the range of approaches mentors may use across teacher preparation settings. These limitations were important for Research Question 3 because claims about reciprocal learning were strongest when both members of the relationship could describe the same interactions. Participation was also voluntary, so students or mentors who chose not to participate may have described their mentoring experiences differently. The findings therefore provide an in-depth look at these particular mentoring experiences rather than a pattern that should be assumed to represent all elementary STEM mentoring relationships.

The data sources created another limitation. Findings were based on participant interviews and therefore reflect how participants remembered, understood, and described their mentoring experiences. Written reflections were expected in the original data collection plan, and I followed up by email, but no participants completed them. More accounts recorded between the beginning and end interviews could have helped show how participants interpreted events closer to the time they occurred and provided additional points of comparison with their later accounts. The study also did not include direct observations of mentoring conversations or classroom interactions, so I could not observe feedback, shared decisions, or negotiations of authority as they occurred. Comparing the two partners' accounts where both were interviewed helped identify agreements and differences, but this was possible for only two pairs and did not replace the missing reflections or observations. Because no additional participant data source was available, I could not use methodological triangulation across different types of data. To strengthen credibility within the interview data, I compared initial and follow-up accounts, returned to transcripts during coding and theme development, and invited participants review summaries of their interviews. Five of the seven participants responded without identifying

inaccuracies, although those responses did not mean they approved the final themes. These steps gave me additional ways to question my interpretations, but they did not replace the missing written reflections or direct observations. The findings should be read as participants' accounts of their experiences rather than direct records of every mentoring interaction (Merriam & Tisdell, 2016).

The context of the placements also limits how broadly the findings can be applied. Participants worked in different grade-levels and classroom settings and experienced different curricula, schedules, classroom structures, and opportunities to teach STEM content. Mathematics was consistently available across the placements, while access to science varied considerably depending on how science was organized within the school and classroom. These differences became part of the findings, but they also make it difficult to separate the mentoring relationship from the opportunities created by the placement itself. The descriptions of participants and their settings help readers consider whether the findings may be useful in comparable contexts, a consideration related to transferability in qualitative research (Lincoln & Guba, 1985). They do not establish that all elementary STEM mentoring relationships operate in the same way.

My position as a program lead was another consideration when interpreting the interviews. Although I did not supervise or evaluate the participating students, they could still have viewed me as someone with authority within their teacher preparation program. This may have influenced what participants felt comfortable sharing, and my own experience in teacher education may have shaped what I noticed during analysis. I used a reflexive journal, analytic memos, and repeated transcript review to question my assumptions and check my interpretations

against participants' accounts. These steps helped me examine my influence on the research, but they could not remove it entirely.

## Conclusions

This study examined how preservice teachers and mentor teachers experienced mentoring within elementary STEM field placements and where opportunities for reciprocal or collaborative learning appeared within those relationships. Across the findings, mentoring became most meaningful when preservice teachers moved beyond observing or completing assigned lessons and began participating in the actual decisions and responsibilities of teaching. Relationships mattered because trust, mentor fit, and feedback affected whether preservice teachers felt able to ask questions, try something different, make mistakes, and contribute ideas. Meaningful responsibility was connected to confidence and instructional judgment because preservice teachers increasingly had to decide what students needed and what should happen next. At the same time, becoming more confident in the classroom did not automatically mean feeling like a full member of every professional setting. Together, these findings are consistent with research connecting learning and professional identity to participation in authentic practice and mentoring relationships (Izadinia, 2016; Lave & Wenger, 1991). Preservice teacher learning was shaped by the responsibility they were given and the professional settings where they were expected to participate.

Mentor responsibility did not disappear as preservice teachers became more independent. Mentors remained responsible for their students and classrooms while deciding when to provide guidance, correction, intervention, or greater independence. Their authority continued to shape participation as mentors maintained classroom responsibility while making room for preservice teachers to make decisions and act on their own ideas. This helps explain why stepping back

could sometimes be just as intentional as stepping in. Mentoring was not just a gradual transfer of more lessons from one person to another. It involved ongoing decisions about readiness, student needs, professional responsibility, and how much support a preservice teacher needed at a specific moment. This supports mentoring research showing that authority remains part of the relationship even as preservice teachers gain responsibility and that the way mentors use that authority shapes access to participation and professional voice (Mackie, 2020; Merket, 2022).

The larger conclusion from this study is that mentoring relationships do not have to become equal for learning to move in both directions. Preservice teachers could remain learners while also becoming contributors, and mentors could remain the more experienced and responsible teachers while still learning from the ideas, observations, and teaching of their preservice teachers. This is consistent with research showing that reciprocal influence can occur even when mentor and preservice teacher roles remain unequal (Ambrosetti & Dekkers, 2010; Hudson, 2013). Meaningful participation gave preservice teachers experiences from which they could develop something useful to contribute, while trust and mentor openness helped determine whether those contributions became part of the shared work. This pattern brought together the four ideas in the conceptual framework: participation, identity formation, negotiated authority, and shared learning. In this study, opportunities for reciprocal learning emerged through the actual work of teaching rather than through a formal reversal of roles. Programs may not need to make mentoring relationships equal in order to create more opportunities for reciprocal learning. Taken together, these findings suggest that understanding mentoring requires looking beyond how much preservice teachers teach to consider whose ideas are heard, how instructional decisions are shared, and where opportunities for learning together develop.

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# Appendix A - Interview Protocols (Preservice Teacher)

**Introduction Script**

Thank you for taking time to meet with me. I want to learn about your experiences in this STEM placement and how mentoring has looked and felt for you. There are no right or wrong answers. I am interested in your perspective. Your responses will be kept confidential, and you may skip any question. I would like to audio record this conversation with your permission.

**Placement Context and Experience**

1. Can you tell me about your placement so far? (sub questions added in case the participant needs help getting started)
    a. What stands out about the classroom or grade level?
    b. What has been smooth?
    c. What has been challenging

**Mentoring Relationship**

2. How would you describe your relationship with your mentor teacher?
    a. How did it begin?
    b. Has it changed over time?
3. Can you describe a time when you felt supported by your mentor?
4. Can you describe a time when you felt unsure or less supported?

**Participation and Responsibility in STEM**

5. What kinds of things do you usually do during STEM lessons?
    a. Before the lesson?
    b. During the lesson?

    c. After the lesson?

6. Can you walk me through a specific STEM lesson where you had more responsibility?
7. Have there been times when you wanted to take on more responsibility?
    a. What happened?

**Learning and Identity**

8. What have you learned about teaching STEM through this placement?
9. How do you see yourself as a STM teacher at this point in the placement?
10. How has your confidence changed during this experience?

**Power, Voice, and Decision Making**

11. How are decisions about STEM teaching usually made in this placement?
12. Have there been times when you hesitated to share an idea or question?
    a. What made you hesitate?

**Reciprocal Learning**

13. Can you think of a time when you felt your mentor learned something from you?
14. Have there been moments when you and your mentor learned together?
15. Have you brought in ideas from courses, last semester, or technology experiences?

**Closing**

16. What do you think is most important for me to understand about mentoring in this placement?
17. Is there anything we did not talk about that you would like to share?

# Appendix B - Interview Protocols (Mentor Teacher)

**Introduction Script**

Thank you for taking time to meet with me. I am interested in your experience as a mentor teacher in this placement. There are no right or wrong answers. I want to learn from your perspective. Your responses will be kept confidential, and you may skip any question. I would like to audio record this conversation with your permission.

**Placement Context and Experience**

1. Can you tell me about your teaching and your role as a mentor? (sub questions added in case the participant needs help getting started).
2. How would you describe this placement so far?
    a. What has gone well?
    b. What has been challenging?

**Mentoring Approach**

3. How do you see your role as a mentor teacher?
4. Can you describe a time when you felt you supported your preservice teacher well?
5. Can you describe a time when mentoring felt more complicated?

**Participation and Responsibility in STEM**

6. What responsibilities does your preservice teacher usually take on during STEM lessons?
7. Can you describe a specific STEM lesson where they took a more central role?
    a. How did you decide what they would do?
8. How do you decide when to step in or step back during STEM lessons?

**Learning and Identity**

9. In what ways have you seen your preservice teacher grow?
10. Has mentoring influenced your own thinking about STEM teaching?
    a. In what ways?

**Power, Voice, and Decision Making**

11. How are decisions about STEM teaching usually made in your classroom?
12. Can you share a time when your preservice teacher brought in an idea or strategy?
    a. How did you respond?
13. Have you noticed times when your preservice teacher seems unsure about speaking up?
    a. What do you notice?
    b. How do you respond?

**Reciprocal Learning**

14. Can you think of a time when you felt you were learning from your preservice teacher?
15. Have there been moments when both of you are learning together?
16. What would make mentoring in STEM feel more reciprocal (shared)?

**Closing**

17. What feels most important for others to understand about mentoring a preservice teacher?
18. Is there anything we did not talk about that you would like to share?

# Appendix C - Follow Up Interview Protocols (Preservice Teacher)

*Note. This protocol was developed when written reflections were part of the data collection plan. The introductory script refers to reviewing written reflections. No participants completed written reflections, and no such reflections were reviewed before the follow-up interviews. The researcher reviewed participants' initial interviews before conducting the follow-up interviews.*

**Introduction Script**

Thank you for meeting with me again. I have reviewed your first interview and your written reflections. This second conversation will help me understand your experiences in more depth. There are no right or wrong answers. I am interested in your perspective. Your responses will be kept confidential, and you may skip any question. I would like to audio record this conversation with your permission.

**Placement Context and Experience**

1. Now that you have been in the placement longer, how would you describe your experience at this point in the semester?
    a. What feels the most meaningful?
    b. What feels different from when we first spoke?
2. When you think about your day-to-day role now, what stands out to you?
    a. What has stayed the same?
    b. What has changed?

**Mentoring Relationship**

3. How would you describe the mentoring relationship now compared to the first interview?
    a. Has it become stronger, more complicated, or stayed the same?

    b. What shaped that change?

4. Can you tell me about a recent movement that showed you something important about your relationship with your mentor?
    a. What did it show you about how the two of you work together?

**Participation and Responsibility in STEM**

5. You described your level of responsibility in STEM lessons in the previous interview.
    a. How has your participation changed since then?
    b. What kinds of tasks or instructional moments are you taking on now?
6. Think about a STEM lesson from the second half of the placement that felt important.
    a. Walk me through what happened.
    b. What did this lesson show you about your own development?
    c. What did it show you about the mentoring relationship?
7. Are there times when you still want to take on more responsibility?
    a. What influences those moments?

**Learning and Identity**

8. How do you see yourself as a STEM teacher now compared to earlier in the placement?
    a. What experiences shaped this?
9. How has your confidence developed over time?
    a. What helped your confidence grow?
    b. What still feels uncertain?
10. How do you think this mentoring relationship has shaped how you see yourself as a teacher more generally?

**Power, Voice, and Decision Making**

11. Since we last talked, what has your role been in decisions about STEM instruction?
    a. Can you think of a time when you contributed to a decision?
    b. Can you think of a time when you wanted to contribute but did not?
12. What helps you speak up or share ideas with your mentor?
    a. What makes it more difficult?

**Reciprocal Learning**

13. Think about any recent moments when you felt your mentor learned something from you.
    a. What happened?
    b. What made that possible?
14. Are there times when the two of you seemed to figure something out together?
    a. What led to that shared learning?
15. Have you brought in any new strategies, tools, or ideas into the placement recently?
    a. How did your mentor respond?
    b. What did that experience mean to you?

**Closing**

16. When you look back at the entire placement, what stands out as the most important part of the mentoring experience?
17. What would you want other preservice teachers to understand about mentoring in STEM placements?
18. Is there anything we did not talk about that you would like to share to help me understand your experience better?

# Appendix D - Follow Up Interview Protocols (Mentor Teacher)

*Note. This protocol was developed when written reflections were part of the data collection plan. The introductory script refers to reviewing written reflections. No participants completed written reflections, and no such reflections were reviewed before the follow-up interviews. The researcher reviewed participants' initial interviews before conducting the follow-up interviews.*

**Introduction Script**

Thank you for meeting with me again. I have reviewed your first interview and your written reflections. This second conversation will help me understand your experiences in more depth. There are no right or wrong answers. I want to learn from your perspective. Your responses will be kept confidential, and you may skip any question. I would like to audio record this conversation with your permission.

**Placement Context and Experience**

1. Now that the placement has progressed, how would you describe your experience as a mentor at this point?
    a. What feels meaningful?
    b. What feels different from when we first spoke?
2. Thinking about day-to-day work, what stands out about how the placement has unfolded?

**Mentoring Approach**

3. How would you describe the mentoring relationship now compared to the earlier part of the semester?
    a. What has shaped that change?

4. Can you describe a recent moment that helped you understand something important about your relationship with the preservice teacher?

**Participation and Responsibility in STEM**

5. Since our first conversation, how has the preservice teacher's level of responsibility changed in STEM lessons?
6. Think about a recent STEM lesson where they played an important role.
    a. Walk me through what happened.
    b. What did this lesson show you about their development?
    c. What did it show you about the mentoring process?
7. How do you make decisions now about when to step in or step back?
    a. Has your approach changed?

**Learning and Identity**

8. What new growth have you seen in your preservice teacher since we last talked?
    a. Instructional growth
    b. Confidence
    c. Professional growth
9. Has mentoring influenced your own thinking about STEM instruction recently?
    a. What has shifted for you?

**Power, Voice, and Decision Making**

10. How are decisions about STEM teaching being made at this point in the placement?
11. Can you think of a time when your preservice teacher brought in an idea, resource, or strategy to you recently?
    a. How did you respond?

b. What influenced that response?

12. Are there moments when you sense they are still hesitant to speak up?
    a. What makes you aware of that?
    b. How do you try to support them?

**Reciprocal Learning**

13. Have there been times recently when you felt you learned something from your preservice teacher?
    a. What made that possible?
14. Have there been moments when the two of you learned together?
    a. What did that look like?
15. Do you see any opportunities for more reciprocal learning in STEM mentoring?
    a. What would support that?

**Closing**

16. When you reflect on the whole mentoring experience, what stands out as most important?
17. What advice would you offer to another mentor teacher working with a preservice teacher?
18. Is there anything we did not talk about that you would like to share that would help me understand your experience more fully?

# Appendix E - Informed Consent Form (entered in Qualtrics)

**Purpose of the Study**

You are invited to take part in a research study that examines how mentoring works in elementary field placements. The study explores how mentor teachers and preservice teachers describe their roles, their experiences, and moments when they support or learn from one another.

**What You Will Be Asked To Do**

If you choose to participate, you may be asked to complete the following:

1. Two individual interviews
    a. About forty-five to 60 minutes each
    b. Conducted in person or on zoom
    c. Audio recorded with your permission
2. Short written reflections
    a. Submitted electronically through Qualtrics
    b. Describe recent mentoring interactions, challenges, successes, or moments that stood out

Participation takes place outside of your required classroom responsibilities

**Voluntary Participation**

Your participation is completely voluntary. You may stop participating at any time without any penalty or impact on your program, placement, or evaluation.

**Risks**

There are no known risks beyond those of everyday conversation.

You may skip any questions that make you feel uncomfortable.

**Benefits**

You may not receive any direct benefit. However, reflecting on your experiences may help deepen your understanding of mentoring, and your insights may help improve future field placements.

**Confidentiality**

Your information will be kept confidential

- You will be given a pseudonym in all transcripts and reports.
- Audio files and reflections will be stored on a secure, password protected device.
- Only the researcher will have access to the data.
- Any identifying details will be removed before analysis or publication.

No one at your school or university program will see your individual responses.

**Data Storage and Security**

All data will be stored securely for up to five years after the study and then destroyed.

**Compensation**

There is no compensation for taking part in this study.

**Questions**

If you have questions about the study:

Researcher: Meghan Shave

Email: mshave@ksu.edu

Faculty Advisor: Dr. Michael Lawson

Email: mlawson1@ksu.edu

If you have questions about your rights as a participant, contact the Kansas State University Institutional Review Board at comply@ksu.edu

Consent to Participate

By clicking “I Agree” and proceeding with this survey, you acknowledge that you have read and understood the information above and voluntarily consent to participate in this study.

I Agree

I Do Not Agree

# Appendix F - Reflection Prompts (Preservice Teacher)

These reflections will give preservice teachers a chance to describe their experiences in real time during their STEM field placement. Each prompt is open ended and designed to help them share moments that stand out, questions they are thinking about, and ways they are growing.

Participants will be invited to complete one reflection every two weeks.

**Reflection Prompt 1: First Impressions**

As you begin your STEM placement, describe your first impressions of your mentor teacher and the classroom environment.

- What have you noticed about how your mentor teaches, interacts with students, or manages the classroom?
- What are you hoping to learn from them?
- What questions or uncertainties are you experiencing so far?

**Reflection Prompt 2: Collaboration**

Think about the ways you and your mentor have started to work together.

- What kinds of support have you received from your mentor?
- How have you been involved in planning or instruction so far?
- Describe any moments that helped you feel more confident or moments that left you unsure.

**Reflection Prompt 3: Teaching STEM**

Focus on any STEM lessons, activities, or instructional tasks you have taken part in.

- How comfortable have you felt teaching STEM content?
- What guidance or encouragement has your mentor provided during STEM instruction?
- Describe any challenges, surprises, or moments of growth.

**Reflection Prompt 4: Learning**

Reflect on any moments where you and your mentor exchanged ideas or learned from each other.

- Have there been times when you offered a new idea, tool, or strategy?
- How did your mentor respond?
- What did these moments teach you about collaboration or shared learning?

**Reflection Prompt 5: Growth**

Think about how this mentoring experience is shaping how you see yourself as a future teacher.

- What strengths are you beginning to notice in yourself?
- Where do you still feel unsure?
- How has the mentoring relationship influenced your confidence in teaching STEM?

**Reflection Prompt 6: Overall Experience**

As you look back over your placement, describe the mentoring experiences that stand out most to you.

- What were the most meaningful interactions with your mentor?
- What do you hope to carry forward into your teaching career?
- Is there anything you wish had been different?

# Appendix G - Reflection Prompts (Mentor Teacher)

These reflections will give mentor teachers a chance to describe their experiences as they support a preservice teacher in an elementary STEM field placement. Each prompt is open ended and designed to help them share moments that stand out, decisions, challenges, and insights as the semester progresses.

Participants will be invited to complete one reflection every two weeks.

**Reflection Prompt 1: First Impressions**

As the placement begins, think about your initial expectations and about the first few days of the semester.

- What were your first impressions of your preservice teacher?
- How have you started to introduce them to your classroom routines?
- What goal do you have for your mentoring this semester?

**Reflection Prompt 2: Collaboration**

Think about ways you have supported your preservice teacher so far.

- What types of guidance or feedback have you offered?
- What moments have felt especially helpful or meaningful?
- Are there areas where you feel the preservice teacher still needs more support?

**Reflection Prompt 3: STEM Instruction**

Consider your experiences mentoring within STEM instruction.

- How comfortable have you felt supporting your preservice teacher in science, technology, engineering, or math lessons?
- What challenges or success have emerged in STEM teaching?
- What factors have influenced how you guide them during STEM activities?

**Reflection Prompt 4: Shared Work and Collaboration**

Think about how you and the preservice teacher have planned, taught, or reflected together.

- What collaborative moments stand out?
- How are you deciding when to give them more responsibility?
- What has helped or complicated that process?

**Reflection Prompt 5: Reciprocal Learning**

Reflect on any moments when you found yourself learning from your preservice teacher.

- Have they introduced ideas, tools, strategies, or perspectives that influenced your thinking or teaching?
- What do these experiences suggest about how learning can move in both directions during mentoring?

**Reflection Prompt 6: Overall Experience**

As you look back over the placement, consider what has stood out most about your mentoring experience.

- What has gone well?
- What has been challenging?
- What do you hope to continue, adjust, or approach differently in future mentoring relationships?

# Appendix H - Original Planned Data Collection Timeline

The following timeline outlines the data collection procedures originally planned for this study. It is included to document the initial research design and should not be interpreted as the sequence of activities that was ultimately completed. The original plan included initial interviews, written reflections throughout the placement, and additional interviews when clarification was needed. In the completed study, seven participants completed initial interviews, and six completed follow-up interviews during the Spring 2026 semester. All 13 interviews were conducted through Zoom, and no participants completed written reflections. The actual recruitment, interview, and analysis sequence is presented in Table 3.2 in Chapter Three.

| **Preservice Placement (8-16 weeks)** | |
|---|---|
| **Timeframe** | **Activity** |
| Week 0 | Recruitment and consent. Email invitations will be sent to preservice teachers once placements are finalized. After preservice teachers express interest, mentor teachers will receive their own invitation. Both groups will receive detailed information about the study, voluntary participation, and confidentiality. Consent will be collected electronically before any data collection begins. |
| Weeks 1-3 | Initial interviews. Individual semi-structured interviews will be conducted with preservice teachers and mentor teachers. These interviews will focus on expectations, perceptions of roles, and initial experiences in STEM instruction. Interviews will last approximately 60 minutes and be conducted in person or by Zoom. Memos will be written immediately after each interview. |

| | |
|---|---|
| Weeks 3-8 | Ongoing written reflections. Preservice teachers and mentor teachers will submit short written reflections every two weeks. Prompts will focus on recent mentoring interactions, STEM lessons, classroom responsibilities, challenges, and moments of growth. Reflections will be submitted securely through a Qualtrics link. These reflections will help capture experiences that might not appear in interviews. |
| Weeks 6-8 | Follow up interviews as needed. Brief follow up conversations will be scheduled if early analysis reveals areas needing clarification. This will allow participants to elaborate on emerging themes or offer examples they did not think about during interviews. |
| Weeks 8-16 | Transcription and early coding. Interviews will be transcribed word for word. Pseudonyms will be assigned. Written reflections will be organized and integrated with interview transcripts. Early coding will begin during this time. Researcher memos will guide early code development and note questions or patterns across sources. |

# Appendix I - Methodological Decisions and Boundaries of the Analysis

**Purpose of this memo**

This Memo documents how I am organizing the analysis and where I need to be careful about the claims I make. The study includes different amounts and types of data across participants, so the research questions cannot all be answered using the same group of participants.

**Organization by research question**

RQ1 includes all five interns: AT, GB, AR, BD, and KD. All five cases can be used to describe mentoring experiences, relationships, feedback, early responsibility, math or science learning, idea sharing, and collaboration from The Intern perspective.

Only AT, GB, AR, and BD completed the second interview. claims about change over time, increased confidence, full takeover, or growth from the beginning to the end of the placement must be based on those four interns. KD's first interview remains important because it shows the effect of a mentor change, early mentor fit, and the beginning of increased teaching responsibility. However, his case cannot support conclusions about growth across the full placement.

RQ2 includes only CH and DD. These are the only Mentor teachers who completed interviews, so findings about how mentors understand their roles must remain grounded in their accounts. I should not treat intern descriptions of their mentors as substitutes for the mentor data.

RQ3 relies most strongly on the two complete pairs: ch/at and dd/gb. These cases allow me to compare both perspectives within the same mentoring relationship. ar, bd, and KD can provide

evidence that interns experienced collaboration or shared ideas, but their cases cannot confirm that their mentors learned from them.

**Decisions about themes**

The themes should not be treated as experiences that every participant described in exactly the same way. A theme represents a meaningful pattern across cases, but the difference and complications within that pattern are also important.

For RQ1, the patterns remain organized around mentor fit and relational trust, authentic responsibility, feedback and support, mathematics as an instructional learning space, and the development of professional voice. These patterns appeared across the intern cases, although their form and intensity differed by placement.

For RQ2, the findings remain organized around how mentors established expectations, modeled teaching, provided feedback, protected student learning, and gradually released responsibility. Mentoring also involved relational, emotional, and reflective work.
For RQ3, I combined my original 7 findings into three broader themes. Shared analysis of student needs, intern observations contributing to decisions, and collaboration around student problems were combined because they all show how mentors and interns used firsthand knowledge and student evidence to make instructional decisions. Intern instructional ideas and mentor reflection were combined because together they show reciprocal influence. Mentor authority and curriculum structure were combined because both shaped the possibilities and limits of reciprocal learning.

The three broader RQ3 themes are:

1. Shared analysis of student needs created opportunities for collaboration
2. Intern ideas and teaching influenced mentor thinking and practice
3. Reciprocal learning was asymmetrical and shaped by classroom structures

The themes do not suggest that mentors and interns contributed equally to every decision. Instead, the data show that the person with the most direct knowledge of a particular lesson,

student, or problem could make an important contribution. The mentor generally had more experience, but the intern sometimes had firsthand knowledge from teaching the lesson, observing a student, or examining student work.

**Negative cases and complications to preserve**

I need to avoid presenting the data as if all mentoring relationships follow the same smooth progression. gb's experience shows that productive mentoring can involve discomfort and difficult feedback. KD's case shows that changing mentors can substantially change the intern's sense of safety and participation. BD's case shows that a Supportive relationship can still include a desire for more detailed feedback. AR and BDS hesitation and larger team settings shows that being comfortable with one Mentor does not automatically create an equal voice within the larger professional community.

I also need to preserve the difference between mentor reflection and confirmed instructional change. A mentor saying that she learns from interns is evidence of an orientation toward reciprocity, but it is not the same as identifying a particular change in practice. DD offered more concrete examples of reconsidering instruction than CH did.

**My interpretation of the overall analysis**

Across the three research questions, I keep returning to responsibility, trust, shared analysis, and the structures surrounding the placement. Interns developed confidence when they were given meaningful responsibility rather than only observing and assisting. Trust affected whether they felt comfortable asking questions, sharing ideas, and making instructional decisions.

Reciprocal and Collaborative Learning became most visible when the mentor and intern were focused on a specific student need or instructional problem. Student work, misconceptions, behavior concerns, and classroom observations gave both participants something concrete to examine. Although the mentor usually had more experience, the intern could contribute important first-hand knowledge because she had talked about the lesson, observed a particular

student, or worked directly with a group. I understand this as the reciprocal nature of observation. The mentor and intern occupied different positions in the classroom, so each could notice something the other did not.

Reciprocity was also visible when intern ideas entered classroom practice and when intern teaching prompted mentors to reflect on their own instructional choices. These are connected processes. The intern contributed an idea material observation or teaching approach and the mentor considered used or reflected on that contribution this shows that interns were not only receiving knowledge from their mentors.

Authority remained present throughout these relationships. Mentors were responsible for students, curriculum, classroom expectations, and final decisions. For that reason I described the finding as asymmetrical reciprocal learning. Learning moved in both directions, but authority, experience, and responsibility were not equally shared.

Curriculum and classroom structures also affected reciprocal learning. Some structures created repeated opportunities for mentors and interns to analyze student learning and make decisions together. Mathematics was especially important because it provided opportunities to examine misconceptions, use manipulatives, adjust groups, reteach concepts, and determine instructional next steps. Other structures including tightly prescribed curriculum, established routines, scheduling, and uneven access to science, limited the amount of space available for intern decision making and shared learning.

**Boundaries of the Conclusions**

The analysis supports claims about the experiences of these participants in these Elementary field placement contexts. It does not support a claim that all pre-service teachers are Mentor teachers experience mentoring in the same way.

The findings are also shaped by the local structure of each placement. grade level, curriculum, departmentalization, access to science instruction, mentor experience, and classroom routines affected what the interns could teach and how the mentoring relationships developed.

**The strongest claims I can make are:**

1. Pre-service teachers described mentoring as a movement toward greater responsibility, confidence, and classroom ownership.
2. Mentor teachers described their roles as balancing expectations, support, feedback, student needs, and gradual release.
3. Shared analysis of student needs and instructional problems created opportunities for collaboration between mentors and interns.
4. Intern observations, instructional ideas, and teaching contributed to mentor decision making, reflection, and classroom practice
5. Reciprocal learning remained asymmetrical because mentors retained greater authority and final responsibility.
6. Curriculum and classroom structures could either create or limit opportunities for reciprocal and collaborative learning
7. Mathematics was the most consistent space for instructional learning and collaborative reasoning across the cases.