

**Can You Hear Me Now?!: Development of Teacher Voice during Co-Teaching Cycle**

A Signature Honors Project Presented to the Honors College

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by

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## **Abstract**

The development of teacher voice and authority is a critical aspect of a teacher's identity, yet can be easily overlooked by teacher preparation programs. The co-teaching cycle has emerged as a collaborative instructional model that not only benefits student learning, but also provides a special space for preservice teachers to develop the facets that make up their teacher voice. This study used surveys (i.e., P-STMI, Perceptions of Co-Teaching) and transcribed audio recorded co-planning and co-reflection sessions to examine how engaging in the co-teaching cycle impacted the development of my teacher's voice and identity.

Findings showed notable growth of my personal teacher voice. That growth was focused primarily in belonging to a community, self-efficacy, enthusiasm, well-being, and transitioning between student and teacher thinking. Co-teaching provided opportunities to engage in pedagogical synergy, instructional decision-making, adapting to student needs, and fostering confidence within the classroom environment. Additionally, survey results indicated the preservice teachers (PSTs) in the course generally perceived the co-teaching model positively, particularly valuing access to diverse perspectives, individualized support, and authentic modeling of collaboration whilst expressing neutral views on the direct impact to their personal learning outcomes.

Overall, this study suggests that the co-teaching cycle can serve as a powerful mechanism for preservice teacher (co-teacher) voice development and intentional use of collaborative structures in undergraduate mathematics education courses may enhance all parties, across the board. Enhancing connection to modern student thinking for mentor teachers, teacher preparation for all PSTs involved, and student engagement for PSTs in the course. Implications for practice and suggestions for future research as also discussed.

## Introduction

The development of teacher voice and authority is a crucial facet of teacher identity, but remains an underexplored aspect of teacher preparation and professional growth. As preservice teachers begin the transition from students to educators they must develop content knowledge, instructional skills, and foster confidence in the value and ability of their voice in the classroom and school. A model that has been piloted across the nation as a means to support this development is co-teaching. Co-teaching is a method of pedagogical synergy that cultivates shared responsibility and mentorship.

As education continually evolves it is vital we investigate collaborative instructional models' ability to develop both experienced and emerging teachers. Over the last decade research around these models' ability to foster voice development is lacking but not absent. Research around the topic of co-teaching tends to focus on special education teachers in general education classrooms (Friend, Cook, Hurley- Chamberlain, & Shamberger , 2010) and have now begun looking at the impacts of the co-teaching model in teacher preparation programs (Bacharach, Heck, & Dahlberg, 2010). Within teacher preparation, the co-teaching cycle (i.e., co-planning, co-instruction, co-assessment, and co-reflection) evidently provides an organized framework for specifically pre-service teacher growth, with co-planning serving as a critical phase where instructional decisions, pedagogical discourse, and teacher identity formation takes place. To address the development of teacher voice, this study will examine the following research questions:

- 1) How does the use of co-planning/co-teaching in an undergraduate content pedagogy course focused on algebra and function influence the development of teacher voice/identity for the co-teacher?

2) What are PSTs' perceptions of co-planning/co-teaching in an undergraduate content pedagogy course focused on algebra and function?

### **Background Research**

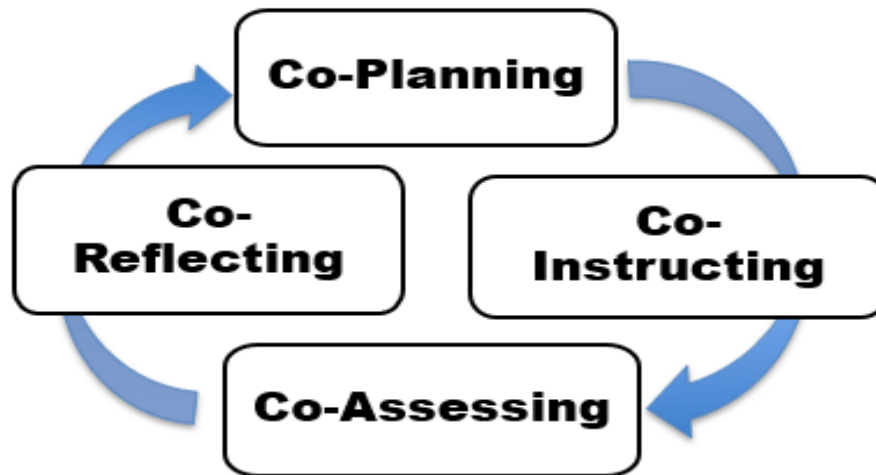
Since I am investigating the co-teaching cycle as a vehicle for preservice teacher voice development and teacher identity, I will be reviewing research on the co-teaching cycle and existing frameworks for teacher voice development to investigate how collaboration in education and reflective practice contribute to the emergence of teacher identity.

### **Co-Teaching Cycle**

The co-teaching cycle consists of four components: co-planning, co-instruction, co-assessment, and co-reflection (see Figure 1). Each co-teaching cycle begins with co-teachers working together to co-plan instruction prior to implementing co-instruction to enact the co-planned lesson. During co-instruction, co-teachers use formative and summative strategies to co-assess students' understanding and progress toward the learning goals. After co-instruction, co-teachers spend time debriefing the enactment of the lesson, including data gathered through co-assessment. This co-reflection process serves as the final stage of one co-teaching cycle and informs the beginning of the next cycle, which starts over with co-planning.

### **Figure 1**

*The Co-Teaching Cycle*



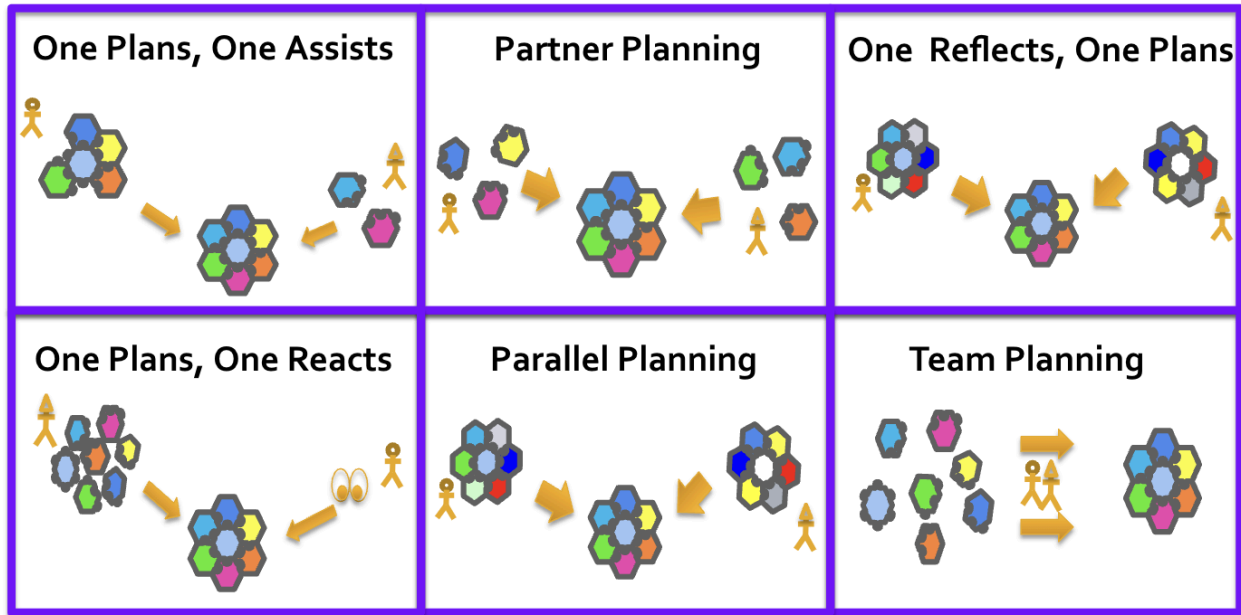
### *Co-Planning*

Co-planning is the foundational stage of the co-teaching process, in which teachers design course goals, create lesson plans, structure instructional strategies, and plan assessment. This stage is vital to ensuring that educators are aligned in both objective and approach to ensure a shared sense of responsibility in the classroom. Outside of just coordinating the classroom, co-planning is a platform for professional growth where both teachers can engage in meaningful discourse about content and pedagogical strategies to best support student learning (Bacharach, Heck, & Dahlberg, 2010; Mascall & Rolheiser, 2007). For preservice teachers, this collaboration is even more beneficial as it serves as an early opportunity to work through instructional ideas and build identity. It is through structured partnership that teachers can refine their instructional decision making, articulate instructional reasoning, and develop a confidence in their seat at the table. For preservice teachers, co-planning is particularly valuable as it offers a low-stakes environment to engage in content discussion, test instructional ideas, and receive feedback from experienced educators while offering new perspectives. Several research-based co-planning strategies support the collaborative process I have outlined, this includes One Plans, One Assists; Partner Planning; One Reflects, One Plans; One Plans, One Reacts; Parallel Planning; and Team

Planning (see Figure 2) (Cayton & Grady, 2024). Utilizing these strategies allows flexibility in how responsibility is shared, whether that is dividing lesson components or working together for instructional plans. The intentional use of these strategies help both teachers contribute to student learning while clarifying roles. Thus co-planning can help reduce isolation that is often felt by a BT (beginning teacher) and offer professional development in a realistic setting (Berry, Daughtrey, & Wieder, 2009). Furthermore, the Association Public and Land Grant Universities research emphasizes that co-planning acts as an essential form of professional development, particularly for new and emerging educators (APLU, 2016). Through co-planning, preservice teachers gain exposure to the realities of the classroom and specifically learn to articulate their perspectives in a professional setting (Grady, Cayton, Preston, & Sinicrope, 2019). This environment fosters pedagogical synergy in which combined expertise and perspectives of educators leads to copious lesson development and a more equitable dynamic within the classroom. Instead of passively adopting seasoned teachers' lessons and methods, preservice teachers who engage in co-planning take ownership of their decision making as a key step in shaping their teacher identity (Cayton & Grady, 2024).

## **Figure 2**

### *Co-Planning Strategies*



The co-planning phase also plays a key role in supporting preservice teachers' ability to balance their voice and authority within a joint educational environment. BTs tend to struggle with asserting their decisions and authority, as well as managing a classroom. However, research does suggest that engaging in structured co-planning discussion can reduce uncertainty which allows preservice teachers to build confidence in instructional decisions (Murawski & Spencer, 2011). Through collaborative decision-making, joint responsibilities, and reflective discussions, co-planning enables emerging educators to better develop their teaching philosophy in a low stakes, high impact dynamic (APLU, 2016).

Beyond professional and personal development, effective co-planning contributes to enhanced instructional delivery and student engagement. When teachers are collaborating, they are better equipped to meet the needs of individual learners. Thus being equipped to anticipate student misconceptions, integrate diverse teaching strategies, and create a more engaging learning experience for all students (Murwaski & Spencer, 2011). Co-planning impacts both

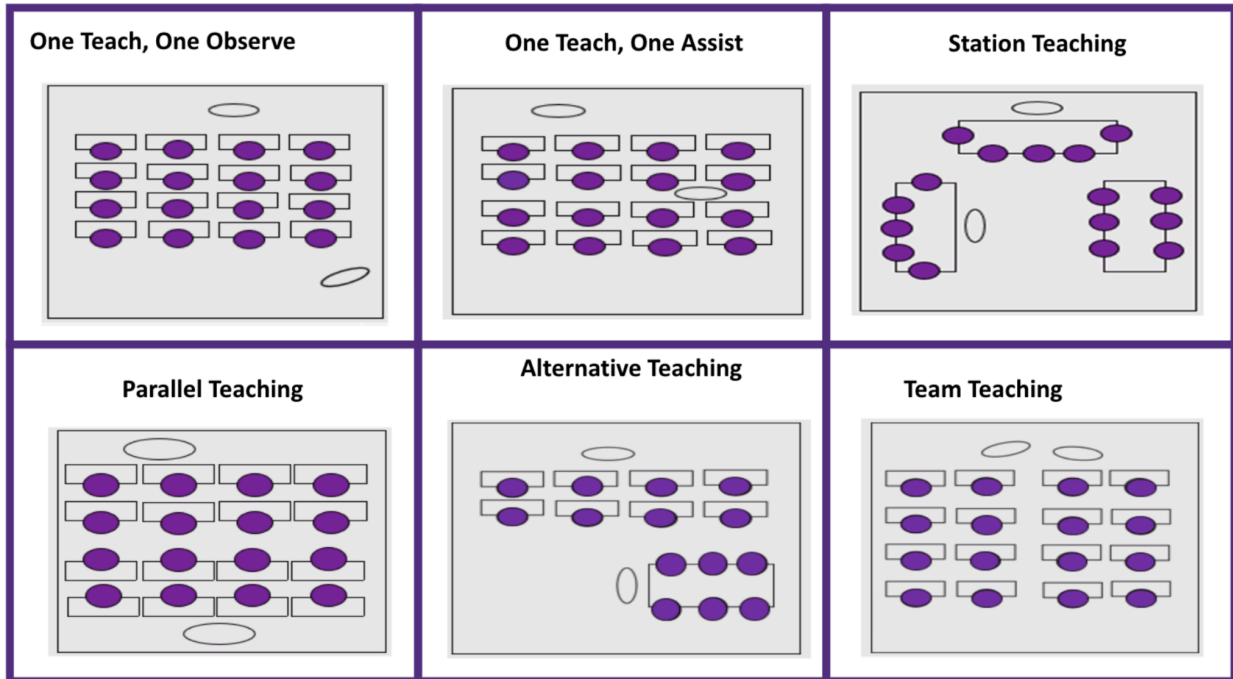
teacher effectiveness and student learning outcomes to reinforce the importance of intentional and effective implementation.

### ***Co-Instruction***

The co-instruction phase of the co-teaching model is where educators actively engage in the delivery, facilitation, and management of instructions and decisions made in the co-planning process. This stage promotes a shared responsibility in the learning process and exposes students to multiple instructional perspectives. Various models exist within co-instruction and have been adapted over time. For the purpose of this research I have focused on the adapted co-instruction strategies (see Figure 3) , including One Teach, One Assist; One Teach, One Observe; Station Teaching; Parallel Teaching; Team Teaching; and Alternative Teaching (Cayton & Grady, 2024). Each model varies in the degree of direct instruction involvement but all give both teachers a clear role in the delivery of the lesson emphasizing a collaborative nature of instruction.

### **Figure 3**

*Adapted Co-Instruction Strategies*



Research indicates that in traditional co-teaching models, a dominant-subordinate dynamic often emerges in which one teacher assumes the primary role while the other plays a supportive role (Scruggs, Mastropieri, & McDuffie, 2007). Effective co-instruction challenges this research by ensuring that both teachers actively participate in instruction to allow for equal contributions to student learning and educator growth (Murawski & Dieker, 2013). Co-instruction has been linked to increased student engagement as well as increased student comprehension and success. This is attributed to having two educators in the room, even if they are both general education teachers, as it allows for differentiated instruction and more immediate academic support (Grady et al., 2019). The exchange of differing styles, techniques, and strategies aids in fostering a more dynamic learning environment with the goal of promoting procedural fluency, conceptual understanding, and reasoning and problem solving skills for all students.

***Co-Assessing***

Co-assessment is the next stop in the co-teaching cycle. Co-assessment is the process of collaboratively evaluating student learning, focusing not only on traditional grading but also on analyzing student engagement, participation, and overall conceptual understanding. This differs from traditional assessment methods that rely on summative evaluations because co-assessment allows co-teachers to engage in ongoing discussions about student progress and make real-time instructional adjustments (Murwaski & Spencer, 2011).

Research implies that co-assessment plays a crucial role in ensuring a student-centered approach through prioritizing formative and informative assessment with a special emphasis on formative evaluation techniques like classroom observations, student questioning techniques, and reflective discussion (Black & William, 1998). Taking the time to engage in collaborative analysis of students and their work helps co-teachers refine their methods to ensure that lessons successfully meet students needs (Cayton & Grady, 2024). Co-assessment also provides preservice teachers with the opportunity to develop assessment skills like interpreting learning and mistake patterns and applying data-driven decision-making in their instruction.

### ***Co-Reflecting***

Co-reflecting is the final and one of the most crucial phases of the co-teaching model, where educators engage in structured discussions about their practices, student learning outcomes, and overall experiences. This phase provides co-teachers with a dedicated space to critically analyze teaching strategies which offers opportunities for both personal and professional growth (Schon, 1983).

Reflection has long been recognized as an essential component of teacher identity formation and professional learning (Murawski & Spencer, 2011). Through co-reflection, teachers have the opportunity to analyze what instruction strategies were effective, identify areas

for improvement, check their well-being, and refine their teaching methods as co-teachers (Cayton & Grady, 2024). Research suggests that structured reflection allows preservice teachers to process their teaching experiences, develop self-efficacy, and gain confidence in their classroom decision-making (Berry et al., 2009). Furthermore, co-reflection allows preservice teachers an opportunity to express their insights, engage in constructive feedback discussions, and recognize their growth throughout the co-teaching process.

### **Teacher Voice**

Teacher voice plays a critical role in shaping instructional decisions, fostering student engagement, and retention of teachers. Research shows that teachers who develop a strong professional voice are more effective in advocating their instruction beliefs, adapting to diverse classroom needs, and influencing educational practices (Souto-Manning & Martell, 2020). Additionally, the formation of this teacher identity has been linked to job satisfaction, retention, and overall effectiveness in the classroom (Fiesen & Besley, 2013).

To analyze the development of teacher voice within the co-teaching model, this study defines teacher identity through the framework of the Teachers of Mathematics Identity (ToMI) Scale. This framework breaks it down further into six facets: Belonging to a Community, Self-Efficacy, Enthusiasm, Well-Being, Network Size, Professional Development (Willis et al., 2023). The remainder of this section will explore each facet and literature around it, providing insights into how co-teaching influences both the emergence and strengthening of teacher voice.

Belonging to a Community is the first component of teacher identity. This aspect of teacher voice shapes how teachers view themselves within the broad community and engage in professional learning. Research suggests that developing this identity requires defining and acknowledging what it entails to be a part of the mathematics education community, comparing

themselves to the community standards, and advocating within that community (Beauchamp & Thomas, 2009). This social dimension of identity influences professional interactions, collaboration, and instructional confidence. Beyond inclusion, belonging reflects a teacher's professional growth over time, acknowledging that there is always room for improvement. A strong sense of belonging is linked to engagement in professional learning, persistence in the field, and confidence in instruction (Willis et al., 2023). This facet summarizes to be not just feeling you are a part of a larger community but to the extent of being willing to grow and advocate within that community. It's feeling supported, valued, and connected to others with a passion for education and having confidence to advocate on a larger scale.

Self-efficacy refers to a teacher's confidence in their ability to effectively teach mathematics, including explaining, adjusting, and managing within the classroom. It is considered a critical psychological process in teacher identity development, influencing both instructional effectiveness and professional growth (Hanna, Oostdam, Severiens, & Zijlstra, 2019). A strong sense of self-efficacy allows teachers to adapt to student needs, navigate challenges, and take ownership of their instructional decisions. Research emphasizes that mathematics teachers should feel both confident and competent in their ability to teach, and advocate for what they are teaching, rather than being simply comfortable in their role. Within co-teaching, self-efficacy develops as preservice teachers try differing instructional practices, receive feedback, and refine their teaching to reinforce professional identity (Murawski & Spencer, 2011).

A third category, enthusiasm, addresses more of a teacher's passion and emotional investment towards teaching math. Enthusiasm is important as it impacts how motivated a teacher is to engage students, improve teaching practices, and remain invested in mathematics

education. A teacher's enthusiasm rolls over to students. If you are excited that doesn't necessarily mean students get excited but if you are not passionate, students will notice, and they won't see its value (Kunter et al., 2011). A closely related element of teacher voice is well-being. This category speaks to the emotional and psychological state of teachers while teaching math. Well-being is critical for sustaining passion, preventing burnout, and maintaining a positive and effective teaching environment (Day & Gu, 2009).

Two final components of teacher voice are network size and professional learning. Network size is the number of math teachers a teacher communicates with regarding teacher practice, and professional learning is based on ongoing development, engaging in PD to improve instruction strategies, stay up to date of research, and refine their identity (Kurniawati, Annia, Juniati, & Abadi, 2023).

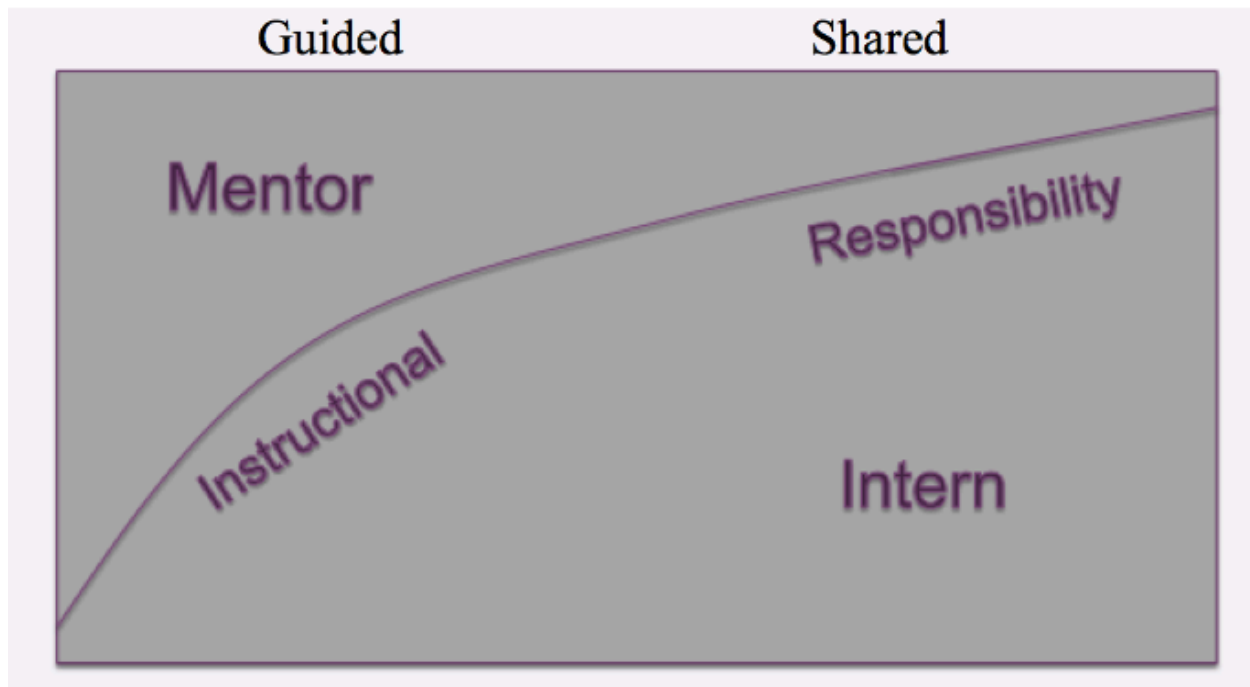
## **Methods**

### **Conceptual Framework**

Lave's theory of situated learning posits that learning is naturally social and contextual. Learning occurs through participating in genuine tasks within a community of practice. This theory and Lave argues that learning is impacted by the environment that it is occurring in and interactions between novices and veterans instead of viewing learning as a passive transfer of conceptual knowledge (Lave & Wenger, 1991). Therefore, in this framework, learners develop knowledge and identity when they engage in a shared practice transitioning their responsibility throughout from observing to leading. This framework led to a preservice teacher, math education student, working side by side with an experienced mentor, a seasoned math education professor, gaining knowledge of the profession and gradually increasing responsibility. This research plan follows an apprenticeship model (Brosnan et al., 2014; see Figure 4).

**Figure 4**

*Apprenticeship Model*



**Context & Participants**

This study was conducted at East Carolina University (ECU) in the Math Education program of the Math, Science, and Instructional Technology Education department. The research was conducted in MATE 1267: Functional Relationships, which is a content and pedagogy course focused on grades 6 - 12 algebra and function content. Course content relied on algebra and function content standards from the North Carolina Standards Course of Study (North Carolina Department of Public Instruction, 2017), Mathematics Teacher Preparation Standards (Association of Mathematics Teacher Education, 2017), and materials from Preparing to Teach Mathematics with Technology - Examining Student Practices (PTMT-ESP) (PTMT Project, 2011). The course included six units, 1) What is a Function?, 2) How do we Represent Functions?, 3) Noticing Student Thinking in Technology Mediated Environments, 4) Linear Functions, 5) Exponential Functions, and 6) Quadratic Functions. The content unit utilized

during this study focused on the quadratic functions unit which is a critical component in understanding function families within secondary mathematics. This course was composed of nine pre-service teachers (PSTs) in either middle grades mathematics (n=4) or high school mathematics (n=5). There were five female and four male PSTs, with six classified as freshmen and three classified as sophomores. The instructor of record for the course was Dr. Charity Cayton, an Associate Professor with 11 years of experience at ECU.

The co-teaching model that was implemented in this study incorporated a unique partnership between Dr. Charity Cayton, an experienced faculty member, and myself, a junior in the high school mathematics program who had successfully completed the course a year prior. This dynamic pairing brought us together in distinct stages of our educational careers and learning journeys. With one of us having extensive teaching experience but dedicated to constantly improving teaching practices and staying connected to the perspective I offered, a recent student lens with a longing to improve her teaching practices as she prepared to enter an internship. This synergy bridged the gap between student and teacher understanding as it enabled us both to contribute in a meaningful way to the teaching and learning processes.

The course and our pedagogical synergy provided an idiosyncratic opportunity to explore the development of teacher voice, with a primary focus on components of teacher voice derived from the Teachers of Mathematics Identity (ToMI) research in a shared educational environment (Willis et al., 2023). These components of voice development are primarily focused on belonging to a community, self-efficacy, enthusiasm, and well-being. Together, we aimed to engage in every phase of the co-teaching cycle – co-planning, co-instruction, co-assessing, and co-reflecting – to place an emphasis on my growth as an emerging educator, vital to my commitment to constantly be a learner in the classroom and improve practices for the betterment

of my classroom. Also, the co-teaching model allowed for an investigation into how this methodology influenced both teacher identity and student engagement for all parties involved. It is vital to recall that at the time this study was conducted I was a pre-service teacher as well.

### **Research Questions**

This study's main goal was to explore how utilizing the co-teaching cycle influences the development of teacher voice and identity in a content pedagogy context. It also aimed to see how usage of the model would influence pre-service teachers and identify benefits or limitations of it. In order to investigate this, the following research questions were developed:

1. How does the use of the co-teaching cycle in an undergraduate content pedagogy course focused on algebra and functions influence the development of teacher voice and identity for the co-teacher?

This question is key to understanding how the process impacts the growth and confidence of a co-teacher, focusing specifically on the facets of voice development. It aimed to examine how active engagement would contribute to a shift in each component that makes up the teacher voice, aforementioned. This question is very specific to myself and analyzing my data throughout this process with a specific focus of the Pre-Service Teachers Mathematics Identity Scale and Teachers of Mathematics Identity Scale, that I took both before and after the process as well as voice recordings between the co-teacher and myself.

2. What are PSTs perceptions of the co-teaching cycle in an undergraduate content pedagogy course focused on algebra and functions?

This question focuses on understanding how PSTs view the co-teaching model as a pedagogical model, perceptions of being taught by a peer, and the overall impact on the learning experience when compared to units the model was not used. Exploring these ideas will provide insight into

the influence on understanding, impact on students, and classroom dynamics. This question will allow analysis of both the PSTs and myself. See Appendix A for research questions, data sources, and analysis.

### **Data Sources & Analysis**

This study used a variety of data sources to investigate the development of teacher voice and teacher identity through a co-teaching model, as well as overall perceptions and other impact of the model on pre-service teachers. Each data source was analyzed to provide distinctive insights into different aspects of the co-teaching process. There were three data sources most vital to highlight based on their profound perspectives into my own growth, student perceptions, and classroom dynamics.

For the first research question, this study used the P-STMI to compare the researcher/co-teacher's pre and post responses, as well as audio recordings and transcripts of co-planning and co-reflection sessions. The P-STMI is an instrument for measuring development of pre-service teachers' mathematics identity (see Appendix B). This instrument serves a purpose to reveal mathematical identity regarding learning and teaching mathematics (Kurniawati et al., 2023). This identity scale/instrument is employed to measure identity through a likert scale and will be measured both pre and post the co-planned and co-taught unit for both the students and I to capture changes in identity. The PSTMI is a validate instrument composed of 18 close-ended items across five components, as displayed in table 1 below. The instrument has an overall Cronbach's alpha of 0.91 displaying its strong content validity and reliability (Kurniawati et al., 2023). This pre and post will be analyzed using non-parametric methods and open coding. In compliance with IRB protocols student responses are anonymized and labeled to maintain student/peer confidentiality.

Audio recordings and transcripts of co-planning and co-reflection sessions served as the primary data source for analysis of my voice development. These sessions totaled almost 600 minutes of data across approximately 15 sessions documenting discussions about lesson planning, classroom experiences/co-instruction, student work, and personal reflections. The sessions focused on co-planning and co-reflecting of all aspects of the model, most lacking co-assessing. These transcripts offered rich data to analyze the growth of my teacher's voice and perception of the co-teaching model. These recordings and their corresponding transcripts were analyzed using open coding which allowed themes to emerge organically. The qualitative analysis focused on identifying moments and categorizing primarily based on the categories obtained from the ToMI. The ToMI categories focused on were belonging to a community, self-efficacy, enthusiasm, and well-being. A fifth category that emerged during data analysis was transition in thinking and speaking from student to teacher and the importance of being able to seamlessly do both. This category also provided insights into Dr. Cayton's reflections and contributions, highlighting the collaborative nature of the co-teaching process. Each of these five categories represent themes that were important to my development of teacher voice.

For the second research question, perceptions and impact of the co-teaching model, a survey (see Appendix C) was created/adapted for PSTs to compare and contrast and provide overall perceptions for co-teaching units and non-co-teaching units using a likert scale and short response to cover any gaps the other data measurement tools might leave and to allow those tools to be more centered to their respective category. The survey contains 13 close-ended questions and 3 open-ended questions. The close-ended questions were adapted from another co-teaching perceptions survey. Analysis includes the numeric ratings, as well as open coding for qualitative data. This comprehensive survey aimed to provide feedback on the co-teaching experience to

evaluate the overall effectiveness of the model and its impact on PSTs. This is important because this model is heavily supported by East Carolina and is the model PSTs follow in their internship senior year. As well as we aim to encourage teachers to use this instructional strategy more and more in their classrooms. The survey also provides valuable information on the benefits and challenges of implementing this model in a secondary mathematics context and allows actionable suggestions.

## **Results**

Three data sources contributed perspectives into my own growth, student perceptions, and classroom dynamics. This section organizes findings from these data sources within the research questions that guided the study.

### **Research Question 1: Development of Teacher Voice and Identity for the Co-teacher**

The P-STMI served as the first data source to examine shifts in my teacher identity as part of my co-teaching experience. My P-STMI revealed no noteworthy shifts in numerical scores regarding teacher identity. Indicating that my identity components such as interest, recognition, competence, and beliefs, were already relatively high and remained stable throughout the experience. The qualitative data that follows in this section will suggest deeper personal growth that numbers could not capture. The other data source to examine shifts in my teacher identity as part of my co-teaching experience was the ToMI. This was analyzed across six major dimensions of teacher identity: belonging to a community, self-efficacy, enthusiasm, well-being, network size, and professional learning. Analysis of pre and post reflections revealed growth across several of these dimensions. At the beginning, I expressed uncertainty regarding my belonging to a broader community noting “I have my classmates... but outside of peers and professors, not sure I could wholeheartedly say I am part of a mathematics community.”

However my post co-teaching reflections showed a shift in confidence and engagement within the community. Through lesson planning, co-instruction, and reflection with my mentor, I increasingly viewed myself as a more active contributor. Self-efficacy also showed significant development. Pre-ToMI responses revealed hesitation and self-doubt such as “What if I don't know how to do some of these things?” As the experience ended, I demonstrated greater confidence across the board and more of a willingness to receive feedback. This shift reflects a deepened sense of self-efficacy essential for real-world classrooms.

My enthusiasm for teaching mathematics, which was already high in the pre-survey, remained strong and became even more deeply rooted post-experience. This direct impact of my passion fueled my commitment to bring energy to future classrooms. Finally, my identification as a “teacher of mathematics” strengthened. I recognized that this identity remains a work in progress. Initially, I stated, "I'm technically not a teacher of mathematics yet but I will be soon," and through the experience I moved closer to embracing that identity and took ownership in my abilities. In summary, the analysis of the data indicated growth in my sense of belonging, self-efficacy, and professional identity, while confirming consistency in my enthusiasm.

Transcripts from audio recordings of co-planning and co-reflection sessions documented transitions in my teacher's voice related to several a priori codes derived from the ToMI including: belonging to a community, self-efficacy, enthusiasm, and well-being. An additional code emerged during the open coding process that highlighted my transition from student to teacher.

### ***Belonging to a Community***

Belonging to a community is defined as how teacher voice shapes teachers' view of themselves within the broad community and engage in professional learning (Beauchamp &

Thomas, 2009). At the beginning of the study, I felt uncertain about my place within this community and struggled with feelings of imposter syndrome. Although I was actively participating in the co-planning and preparation, I questioned whether my contributions were meaningful compared to my mentor's expertise. This uncertainty is reflected in transcript 2, at the start of the process when I stated, "“This imposter syndrome, understanding that co-teaching puts us at equals which I'm grappling with, you have a PhD and I'm an undergrad, how am I the same, how can I offer something of value?” Initially, I viewed myself as more of a student being allowed into a teacher space rather than an emerging teacher myself whose voice carried weight. Throughout the process, I found that my sense of belonging to the professional community grew steadily. Regular and consistent participation in co-planning, engagement in reflection, and the trust between my co-teacher and I helped me realize that my insights were valuable and my desire to share them grew greatly regarding decisions and student learning outcomes. This shift was evident in transcript 9, where I was reflecting on a lesson. I acknowledge the challenges of the lesson but also recognize my competence and responsiveness to student needs. I stated at first that it was “another day of not meeting the full plan and I don't know that the discussion about the math went the way I expected.” Dr. Cayton responded with “I thought you did good, the only thing I want to push you on is your academic language... I think it went really well, good conversations, lots of great questions... Seriously, I have taught this class four times and you get asked more questions than I do, so that tells me something.” To that I responded “It never has anything to do with the math which is the question I feel more prepared for, but I am always like hey, I can answer this.” Dr. Cayton pointed out that students were actively asking me meaningful questions in discussion showing that my voice mattered to their place in the community while growing my confidence that I did indeed belong to this community

and my voice was not only valued but desired. This helped me question my place less and embrace my role as a contributing educator as the process progressed.

### ***Self-Efficacy***

Self-efficacy is defined as a teacher's confidence in their ability to effectively teach mathematics, including explaining, adjusting, and managing within the classroom. It is considered a critical psychological process in teacher identity development, influencing both instructional effectiveness and professional growth (Hanna et al., 2019). At the beginning of the study, I felt fairly neutral about my capabilities as a teacher. I questioned whether or not I was truly prepared to teach a content pedagogy at the college level as someone still in college. I was worried my lack of experience would make me less successful and make my contributions less valuable to students. This initial uncertainty is evident in transcript 4, still early in the process, where I expressed "What if I don't know how to do some of these things that you do -" Dr. Cayton cut me off to inform me that was the purpose of engaging in the co-teaching model. I later in the same transcript admitted that "I'm just nervous, I don't get it, I didn't think I would feel pressure. I just feel like I won't know what to do in instruction and I'm going to crash and burn up there." Although I was excited about the opportunity to co-teach, I initially feared my lack of experience would cause me to falter when faced with real-time instructional challenges. Throughout the co-teaching process, my self-efficacy steadily improved as I engaged in co-planning especially, received targeted feedback, and was given increasing responsibility in instruction. Supportive co-reflection were critical in helping me reframe challenges as a natural part of teaching rather than an indicator of failure. This growth was revealed in transcript 10, in which, after discussing performance goals and collaboratively doing instructional planning, I stated with a new confidence, "okay, yes, I can do this, I'm ready." By the end of the study, I

demonstrated a much stronger assurance in both planning and delivery of instruction. This indicated a strong shift from nervousness to confidence in helping lead a classroom. This development contributed in a large way to strengthening my teacher voice which has been even more evident as I have transitioned into other co-teaching experiences.

### ***Enthusiasm***

Enthusiasm addresses more of a teacher's passion and emotional investment towards teaching math. Enthusiasm is important as it impacts how motivated a teacher is to engage students, improve teaching practices, and remain invested in mathematics education and continual growth (Willis et al., 2021) A teacher's enthusiasm sets the tone for the classroom. Being excited about math content does not always guarantee students will mirror that excitement but students will notice a lack of passion and thus impact how they value the material. At the beginning of the study I struggled balancing my enthusiasm with my self-confidence. I wanted so badly for each of the PSTs to buy into the lessons and see the value of what we were doing. Unfortunately, my own insecurities often impacted how I perceived their reactions which led to my enthusiasm taking a hit. This was reflected in transcript 5 when I shared in a co-reflecting session, "I so desperately want them to buy in but then I feel like I've talked so much and their faces show I either distracted them or they didn't listen to a word I said. Which bothers me. Their facial expressions bother me and I get so worked up about talking too much, I over-explain more." This statement highlights the emotional investment I had in my teaching but also how uncertainty in self-efficacy made it difficult for me to effectively channel my enthusiasm. Throughout the process my enthusiasm became more refined and sustained especially as my confidence grew. There was no direct quote I could attribute to recognizing this growth but reflections in my post-session journals highlighted a clear shift. I became more comfortable

recognizing that not all students, even mathematics educators, nerd out and fall in love with math in the way I did but my passion still mattered. I realized that enthusiasm is not all about demanding excitement from students or panicking if body language is lacking from one tired college student but it's more about consistently modeling passion even when engagement fluctuates. This shift was evident in how I maintained energy during instruction. Addressing their excitement in their questions to help engagement when students struggled to value the material. My enthusiasm shifted to being enthusiastic about students valuing material which stemmed from my enthusiasm about the material. These shifts allowed for me to advocate in co-planning sessions to ensure that was evident. I learned to celebrate the little victories, correct misconceptions in a positive way filled with excitement over frustration, and trust that modeling enthusiasm would build an environment where these PSTs would value learning. Over the process, the growing passion fed into my broader teacher voice and confirmed that enthusiasm is more than just surface level but vital to effective teaching and advocacy.

### ***Well-Being***

Well-being refers to the emotional and psychological state of teachers while teaching (Acton & Glasgow, 2015; Willis et al., 2021). It encompasses how teachers manage stress and sustain emotional resilience in the classroom. While teaching is demanding, supporting teacher well-being is critical for preventing burnout and help with long-term love for the profession. At the start of the study, I struggled with feelings of anxiety and overwhelming pressure related to my instructional role. In transcript 4, I shared, “I feel or not intimidated, more nervous. I feel like I don't know it as well as I need to know it to teach it. But at the same time, I don't feel like there's enough time in the day for me to spend all this extra time making sure I know it and practicing a million times. And so then it's kind of like, I don't know, maybe making myself a

little bit more motivated. This honors project makes me want to crawl in a hole and cry.” Little dramatic, I will admit, but this quote does capture the emotional weight I placed on myself in the early days of the co-teaching process. I was grappling with perfectionism and a fear of inadequacy which had the potential to crush me and my love for teaching early into my actual career. Throughout the experience though, my well-being evolved significantly as I gained experience, strategies, and a sense of community. I came to realize that teaching would always have challenges but those challenges did not define my worth or capability. I learned, on some days, to appreciate and focus on the eight students instead of being bothered by the one. Dr. Cayton played a large role in helping me develop healthier coping strategies. Over time, I transitioned from feeling paralyzed by fear of failure to actively seeking feedback and approaching obstacles with a different mindset. This growth was further evident in later co-reflection sessions, where I engaged in proactive conversations such as, those in which I approached Dr. Cayton in the following way, “Dr. C (as I throw the gel fidget that sticks to the ceiling), we need to talk...[insert situation with obstacle/challenge → this is what I felt/wanted to do-say → this is what I actually did-said → status/next steps]” or another “Dr. C (as I read the marker written on my hand)...[we have done → which helped with → could we also → would really help me/us feel...].” These informal yet action oriented interactions showed that I shifted towards humor and solution driven thinking, which is evident of my well-being at its peak. My field experiences beyond this project further reinforced this growth. I approached new teaching experiences with more emotional stability and less stress, using feedback to refine my instruction rather than allow anxiety to derail my progress. In my future classroom, I recognize the stress I will face but I have a stronger network and mindset of well being to navigate those challenges. I have learned that well-being is not the lack of stress but rather the ability to productively manage

it and the co-teaching process was instrumental in that realization which strongly benefits my voice.

### ***Transition in Thinking and Speaking as a Student to an Educator***

Transitions in thinking and speaking as a student to an educator refer to the development of an educator's ability to navigate seamlessly between the student perspective, and that's not just myself as a student but diverse student perspectives, and the teacher perspective and utilizing it to make instructional decisions. This theme emerged throughout our research and engagement in the study and was not a facet of literature that I reviewed. While not an original priori code, this reflected one of the most significant areas of my growth. At the start of the study, my thinking was primarily influenced by my own experiences as a student, often viewing instruction through a lens of what I personally would have wanted out of instruction rather than considering diverse needs of all students. This mindset is captured early in transcript 1, where I stated, "It may be hard for me, like me as a student I just want to do notes and a worksheet. But like I know I tuned you out sometimes. So I just need to figure out facilitating a conversation and anticipating their thoughts or lack of." Similarly, in Transcript 4, I reflected, "I can't just think about teaching to myself. I like to bring up 'when I was in y'all's seats' but in this process I'm already realizing how much I missed because of pride or this fortunate math brain I had because all I would want is a formula and done." These early statements show that while I was beginning to recognize the need for better instructional thinking, I was still primarily anchored in my experiences and desires. Throughout the process I developed a more complex and flexible ability to anticipate student needs, scaffold instruction, and frame lessons such that it was accessible to a variety of learners. Instead of considering how I would have processed as a student, I became more attuned to others abilities and ways of thinking. This growth was evident in transcript 8, in

which we were having a reflective discussion about solving quadratics through different representations, I shared, “It’s interesting. I hate to say it, I blame the TI-84. We were all solving quadratics with a table and never realized. Like so many of the students I feel won’t know how to solve with a table or think you can’t, but they literally did it every time they graphed to solve. I really want to spend time emphasizing why we show all the representations even if they think it’s pointless because I missed that.” This quote demonstrates that critical shift. I was advocating for learning styles other than my own and thinking about how students might experience the concepts. The development in this category has supported my voice and my teaching overall. It has enhanced my ability to know the things I have to do as a teacher, and think about those teaching decisions like a variety of different students. This intentionality has helped me create a more inclusive classroom and solidified my belief that high quality educators must constantly shift perspectives. Thinking not just as an expert or an authority figure in the room but through the lens of a learner thus producing better learning experiences for ALL students and myself.

### **Research Question 2: Pre-service Teachers Perceptions of Co-teaching**

Preservice teachers completed a Likert-scale survey, CPCT Perceptions, designed to gauge their perceptions of the co-teaching of this course. PSTs were asked to rate statements from 1 to 5 in which a 1 represented strongly disagreeing with the statement and a 5 represented strongly agreeing with the statement. PSTs were then given the opportunity to provide open-ended comments regarding their scoring and the survey closed with three open-ended reflection questions.

Survey results, both quantitatively and qualitatively, indicated that PSTs generally perceived the co-teaching model positively (see Table 1). The highest-rated item was “It is helpful for students to see their instructors work as a team,” (Avg = 4.44) and this was closely

followed by “I enjoy having two teachers in the class” (Avg = 4.33). These ratings suggested that co-teaching was viewed as fairly enjoyable and beneficial in terms of modeling collaboration and supporting the students/PSTs. Enjoying having two teachers and acknowledging the necessity of having two teachers, analyzed by “I wish more classes had two teachers,” was noted by many. PST 2 stated “It was cool to get taught by two teachers but I don’t feel it is necessary.” PSTs also appeared to agree that the co-teaching relationship felt comfortable, specifically “The two teachers seem comfortable sharing responsibilities when they are teaching together,” (M = 4.33). Although enjoyment was high, the perceptions of the direct learning impact were more moderate. The average response for “I learn more when I am in this class with two teachers,” was 3.22 and “I learn better with two teachers,” was 3.11 meaning PSTs fell more neutral or indifferent towards that impact with a slight lean towards agreement. This suggests that although the process was seen as enjoyable and/or supportive it was not viewed across the board as a strong driver for increased learning for all students. Concerns about confusion were minimal, with the average score for “Co-teaching creates confusion” being lower at 2.11. The average score on “It is hard to have two teachers at the same time,” was also relatively low at 2.22. Indicating that despite the two voices and perspectives, PSTs did not feel overwhelmed by the process. Many students actually noted the benefits of the different perspectives offered by co-teaching rather than confusion. For example, PST4 stated in one of their scoring comments that “Getting different perspectives was advantageous.” Interestingly, PSTs averaged a 3.78 on desire for more classes with two teachers and a 3 on preferring classes with one teacher. This indicated some sort of split on whether they preferred one or two teachers. They seemed to like it but some may still be used to or prefer a traditional structure. While there was general agreement that co-teaching helped critical thinking, indicated by the average being 3.56, it isn’t a strong highlight in the overall data

when compared to other data. Overall, the quantitative data suggests that PSTs found the usage of the co-teaching model enjoyable and reflected positively on the collaborative dynamic of Dr. Cayton and I worked together, they perceived only a moderate impact on personal learning gains and critical thinking development. Furthermore, while the overall logistical challenges were minimal, preferences for a single teacher versus the co-teacher model remained mixed amongst participants.

**Table 1**

*Pre-service teachers perceptions of co-teaching results*

Survey Item	Average
I wish more classes had two teachers.	3.78
I enjoyed having two teachers in this class.	4.33
It is hard to have two teachers at the same time.	2.22
I learn more when I am in this class with two teachers.	3.22
Co-teaching creates confusion.	2.11
Co-taught classes are more enjoyable.	3.33
In a co-taught class, students develop critical thinking skills.	3.56
The two teachers seem comfortable sharing responsibilities when they are teaching together.	4.33
I would rather learn with only one teacher in the classroom.	3
Co-taught classes are more valuable.	3.22
It is helpful for students to see their instructors work as a team.	4.44
I learn better with two teachers.	3.11
Co-teaching is helpful for students.	3.56

In addition to the Likert-scale responses, aforementioned, the CPCT Perceptions Survey included three open-ended reflection questions designed to summatively capture PSTs perceptions of the co-teaching model. Qualitative data was gathered from these responses utilizing an open coding method such that patterns, key points, and repeated attitudes were noted

and organized into major themes. In this process, five overarching themes emerged from the PST comments regarding their experiences and perceptions of the co-teaching model, specifically within this course. The themes are as follows: access to multiple perspectives, increased support and individualized attention, modeling real-world pedagogical synergy, potential challenges, and conditional views on co-teaching impact.

The first prominent theme was the value of hearing multiple perspectives throughout instruction. PST 2, 4, 8, and 9 emphasized that having two instructors provided varied explanations and instructional style which aided in deepening understanding. One PST described it as “having another teacher provided a second way of explaining material that sometimes helped clear up confusion.” Another PST, PST 9 stated, “Having two teachers present in the classroom allows for more view points to be seen. It allows students to get two different perspectives that both reach toward the same point. When asking questions both teachers may have input on the subject, these may be different of agreeing and stacking upon each other. Either way the options are enhanced upon with two teachers. With having two teachers things can be explained and elaborated on in different ways allowing students to better understand a topic as well as seeing 2 different ways to approach it.” The access that was offered through diverse point of views, one of which was someone who sat in their seats not long before and the other a seasoned professor was something the PSTs values and aided in their ability to see adapting instruction approaches which could be utilized in their future classrooms.

PST 3, 6, and 9 were the most crucial in the emergence of the next theme, availability of additional support. These students indicated that having the two instructors allowed students to be more comfortable asking questions, and actually just ask more questions without feeling as though they were interrupting instruction. Thus the individualized support this offered was

perceived as enhancing engagement, comfortability in the classroom, and somewhat understanding of content.

Many PSTs also appreciated the opportunity to see co-teaching modeled authentically, seeing pedagogical synergy at work. Multiple PSTs specifically mentioned that observing co-teaching dynamics helped them better envision collaboration in the real-world classroom and even more so from someone who was actively learning that process. Many PSTs noted our usage of co-instructing strategies, indicated by their responses on the survey. This highlighted that the experience served some professional development purposes, boosting students' confidence as they enter co-teaching experiences as a co-teacher.

The feedback was largely positive, some PSTs identified challenges associated with co-teaching and what was modeled to them. These included slight pacing inconsistencies between groups, rambling by the more inexperienced co-teacher, and moments when side conversations interrupted the instructional flow, despite being a benefit to co-teaching. These observations all revealed the importance of clarity, coordination, and pacing as factors to address in these environments offering students the ability to grow when they enter their own co-teaching environment in internship.

The final theme noted was neutral views regarding the impact of co-teaching on their learning outcomes, something that is typically easier for the instructors to see rather than the PSTs. Some indicated that although the two teachers may have been, overall, engaging and, at times, helpful, they did not feel it affected their understanding especially when compared to traditional classroom structure. In summary, the qualitative analysis of the CPCT Perceptions survey mostly revealed similar results to the quantitative, that PSTs generally perceived the

experience as positive and a supportive structure for learning and professional growth, whilst also recognizing challenges and varied preferences amongst PSTs.

### **Discussion**

The purpose of this study was to investigate how participating in the co-teaching cycle supported the development of teacher voice and identity in myself, the researcher and a preservice mathematics teacher, as well as how the model was perceived by PSTs in a content pedagogy class within the ECU Mathematics Education program. Through a mixed-methods design that combined surveys, both pre and post, audio recorded co-planning and reflection sections, and some open ended feedback surveys, the findings have revealed that co-teaching contributed meaningfully to the development of voice in each facet. PSTs in the course generally viewed the model positively, mentioning the benefits like exposure to multiple perspectives and increased support. However, they reported only moderate perceptions of direct impact on learning outcomes. Put together, these findings contribute to understanding how the co-teaching model can be strategically leveraged to support both student learning and emerging teacher identity development.

The results of this study reveal the complex ways that the co-teaching cycle supported the development of teacher voice and identity. Co-planning and co-reflecting emerged as critical phases in which the co-teacher was able to contribute meaningfully to instructional design conversation, articulate instructional reasoning, and gradually gain confidence in instructional decision making. This mirrors existing research that frames co-planning as a space for preservice teachers to move from passive recipients of plans to active instructional collaborators (Mascall et al., 2008; APLU, 2016; Cayton & Grady, 2024). Through engagement in co-planning, I began to

view myself as a professional whose ideas and insights mattered and were valued, supporting my sense of belonging to the professional mathematics education community.

Co-instruction also played a pivotal role in shaping teacher identity and voice. By participating in varied co-instruction models like team teaching, parallel teaching, station teaching and one teach/one assist, I was able to gradually take on a larger responsibility for lesson delivery, classroom management, and student engagement. The presence of two different yet incredibly collaborative teacher voices modeled real-world pedagogical synergy, which students noted positively in their responses. However, the data also revealed that although co-teaching was perceived as supportive and positive, impart due to my peer relationships with students, it did not always directly translate to students feeling as though they had learning gains. At times, the student development was something easier for Dr. Cayton and I to notice, rather than the students. Their growth in the classroom was not necessarily evident in grades, as they would expect, but things that were evident in our co-reflecting sessions like body language, engagement, and questioning improved. This intricate finding aligns with previous research as well indicating that co-teaching may enhance classroom environment and engagement without automatically increasing perceived academic performance (Scruggs et al., 2007).

The co-assessment and co-reflection stages were critical to personal growth in self-efficacy and confidence. Through ongoing feedback conversations and reflective discussions, I was able to critically examine my instructional choices, recognize areas for improvement, and join in celebration over areas of strength. These structured opportunities for reflection facilitated growth across multiple areas of the ToMI framework, particularly enhancing my self-efficacy, enthusiasm, and well-being. The transition from thinking and speaking primarily as a student to adopting the stance of a teacher and having to seamlessly navigate

through the two perspectives was especially evident during co-reflection. Something I came to do very well that is evident in my teaching field experiences. I have increasingly advocated for student learning needs and engaged in professional discourse with my mentor.

Additionally, PST survey results revealed that having two instructors was perceived as valuable primarily for providing multiple perspectives and individualized attention. Students valued the diversity of instructional approaches and the ability to receive additional support, confirming the idea that co-teaching can create a richer, more responsive classroom environment when implemented thoughtfully. With that being said, minor challenges like pacing inconsistencies and occasional conversational overlap were noted. This was normal not due to poor co-planning more due to passion for what we were speaking about. This still underscored the importance of clear coordination and communication between co-teachers as it is something students key into. Overall, the findings have suggested that the co-teaching model serves as a powerful tool for cultivating teacher voice and professional identity development. Even more so when PSTs are engaged as active partners throughout all stages of the teaching cycle.

Several unexpected findings emerged throughout the course of our research. While many preservice teachers in the course reported enjoying the co-teaching model and appreciated the exposure to multiple instructional perspectives, their perceptions of co- teachings impact on their personal learning gains were more moderate than anticipated. Despite the collaborative and dynamic classroom environment, PSTs did not uniformly feel that having two instructors led to significant improvements in their own understanding of content. This realization contrasts somewhat with earlier assumptions that co-teaching may improve the experience, it does not guarantee increased content mastery from the students' perspective.

Another notable surprise was the degree to which minor logistical factors, such as pacing inconsistencies or brief moments of conversational overlap between instructors, were noticed and mentioned by students. Although these disruptions were relatively minor and infrequent, they highlighted the heightened awareness PSTs had regarding the nuances of co-instruction. This attention to detail suggests that PSTs are attuned not only to instructional content but also to classroom management and instructional delivery styles, an important consideration for modeling best practices in future co-teaching environments.

Another surprise to note was the magnitude of which minor logistical factors were noticed and mentioned by students. Although these “disruptions” were minor and infrequent, they highlighted the heightened awareness of future teachers and how they viewed it as a flaw of co-instruction. This attention to detail suggests that PSTs, probably more so than your typical student, are attuned to the instructional content and classroom management and instructional delivery styles. This is a good consideration as they will have to model best practices in future co-teaching environments like their senior student teaching internship.

Finally, a positive and somewhat unexpected finding was the significant personal growth I saw in myself. This occurred across the board in every category but especially the category that emerged, transitioning from student thinking to teacher thinking. I thought this would be something extremely difficult especially considering my peers were in the course. I was proven wrong to the utmost degree. Throughout co-reflection sessions, there was a clear and steady progression in how I conceptualized instructional goals, engaged in professional discourse, and advocating for student needs. These are things I have continued to do and grow in throughout my internship. My success and growth in my internship was noted as “unprecedented”, and I believe that to be in part due to this study and research. I had experience and was better able to make that

connection between student and teacher. Some growth in teacher voice was anticipated but the depth of my transition that was evident in shifts in language use, self-efficacy, enthusiasm, and ownership of decision making, far exceeded initial expectation and points to the power of structured co-teaching experiences in early teaching development.

### ***Limitations***

While this study provides valuable insights into the development of teacher voice through the co-teaching cycle, several limitations must be acknowledged. First, the small sample size of just nine preservice teachers in the course limits the findings. As the course was a single section at one university, the results reflect a very specific context that may not fully represent broader preservice teacher populations. Additionally the study was conducted in the framework of only one course within the education department, focused specifically on the co-teaching of two units rather than the entirety of the course curriculum. While this allowed for an ease in and direct comparison between co-taught and traditionally taught units, it also introduced potential variability in how students perceived the overall impact of the co-teaching process. Students' reflections and experiences in the course could have been influenced by the particular content or timing of the units rather than the model alone. Furthermore, the co-teaching partnership itself, consisting of an undergraduate teaching assistant and faculty member, presented a unique dynamic that may differ from your typical co-teaching teams composed of two certified teachers or an intern/student teacher and clinical/cooperating teacher. Also, me being a peer of the students in the course, having taken courses with some of them prior may have affected their perception of me as a true equal in the classroom. Furthermore, the strong relationship that existed before beginning the study between Dr. Cayton, and I with our naturally strong relationship and teacher and student connection, might have affected our collaborative dynamic

that could not as easily be replicated in other contexts. Finally, the study primarily relied on self-reported perceptions gathered through surveys and transcripts. These data sources do provide important insights, they are inherently subjective and may be influenced by factors like bias or interpretations of questions. Despite these limitations, the findings contribute great perspectives on how structured co-teaching models can support PSTs development and offer crucial considerations for future research and practice.

### ***Implications and Conclusions***

The findings of this study offer some important implications and suggestions for both teacher education programs and the broader field. First, when implemented thoughtfully across all stages, the co-teaching cycle can serve as a powerful tool for supporting preservice teacher development at all levels whether they are the co-teacher or the students. Co-planning, co-instruction, co-assessment, and co-reflection each provided structured opportunities for myself, an emerging teacher, to practice articulating instructional decisions, reflect critically on my practice and norms, and build confidence in my teacher voice. Teacher education programs may benefit from embedding co-teaching models into content pedagogy courses to expose students and allow the dynamic to be modeled for them rather than reserve these experiences solely for later internship placements. Early, low-stakes opportunities to co-teach can provide preservice teachers with a scaffolded environment for developing professional identities before being thrown into the craziness that is student teaching. It greatly impacts all parties involved. Instructors practice what they preach, connect to more current student thinking processes, and grow in their ability to educate those who will educate. Co-teachers apply their knowledge from a course to shift perspectives, learn more one on one from a seasoned education professor, and have exposure to the model before internship PST students are modeled pedagogical synergy in

this environment, learn what that implementation may look like for them when they co-teach, and better access the content.

Additionally, the importance of fostering a sense of belonging to a professional community cannot be missed. Through authentic engagement in co-planning and co-reflection, I developed instructional competence and a deeper confidence in my place within the field. Supporting PSTs in building these communities early may contribute to higher self-efficacy, increased persistence, and greater growth and support, all key factors that can influence teacher retention. Sense of belonging can also make us, as educators, better advocates which is vital to our ability to be high-quality teachers.

As for classroom practice, the findings suggest that co-teaching offers significant benefits for student engagement and access to multiple perspectives. However it is important potential challenges are addressed to ensure that students are best able to learn. Teacher preparation programs should provide explicit instruction and support around strategies to help future educators navigate dynamics effectively. Truly implementation of programs similar to our study is implementation of a student centered approach to creating better educators.

In conclusion, participating in the cycle deeply influenced my development of teacher voice, helping me transition from thinking and speaking like a student to confidently advocating for student learning as a teacher. Growing my enthusiasm for the profession, confidence in my abilities, and knowledge of a support system for growth as I fully enter the profession. The structured collaboration fostered growth across multiple facets of my teacher identity. While the path did not lack challenges, it demonstrated that intentional and reflective strong partnerships can serve as a powerful motivator for professional growth. Moving forward, the findings encourage institutions and educators to explore innovative and supportive models that put

teacher voice development at the forefront before entering internship and that foster thriving communities of educators.

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## Appendices

### Appendix A

#### Research Question and Data Analysis Matrix

<b>Research Question</b>	<b>Data Used</b>	<b>Data Analysis</b>
How does the use of co-planning/co-teaching in an undergraduate content pedagogy course focused on algebra and function influence the development of teacher voice/identity for the co-teacher?	<ol style="list-style-type: none"><li>1. P-STMI (Pre/Post)</li><li>2. Audio/video of planning sessions and classes</li></ol>	<ol style="list-style-type: none"><li>1. Compare pre/post results</li><li>2. Open coding</li></ol>
What are PSTs' perceptions of co-planning/co-teaching in an undergraduate content pedagogy course focused on algebra and function?	Survey to compare/contrast perceptions for CT and non-CT (e.g., Likert and short response)	<ol style="list-style-type: none"><li>1. Numeric ratings</li><li>2. Open coding</li></ol>

## Appendix B

### P-STMI

<i>Pre-Service Teachers Mathematics Identity Scale</i>						
Rate each of the following on a scale of 1-5 with 1 being “strongly disagree” and 5 being “strongly agree”						
	<b>1 - Strongly Disagree</b>	<b>2 - Disagree</b>	<b>3 - Neutral</b>	<b>4 - Agree</b>	<b>5 - Strongly Agree</b>	<b>Explain your rating</b>
	<b>Interest</b>					
I am interested in learning math.						
I want to teach math to other people.						
When studying mathematics, I want to know the material more deeply.						
I want to know how to teach math to other people.						
I enjoy learning math.						
I enjoy when I teach math to other people.						
	<b>Recognition</b>					
My parents see me as good at math.						
Lecturers see that I have good ability in mathematics.						
My friends see that I have good ability in math.						
I see myself as having good ability in math.						

<b>Competence</b>						
I believe I understand the mathematics given.						
I believe I understand how to teach math to others.						
When I encounter a problem, I keep trying and persevering in studying mathematics.						
When teaching mathematics, I still try to be persistent in teaching the material well even though I encounter problems.						
<b>Performance</b>						
I complete math assignments well.						
My math work/grades are satisfactory.						
<b>Beliefs about the Nature of Mathematics</b>						
Mathematics is not just the science of numbers and formulas.						
Mathematics is used by humans in everyday life.						

## Appendix C

### *Students' Perceptions of Co-teaching Survey*

	1 - Strongly Disagree	2 - Disagree	3 - Neutral	4 - Agree	5 - Strongly Agree	Comments
I wish more classes had two teachers.						
I enjoyed having two teachers in this class.						
It is hard to have two teachers at the same time.						
I learn more when I am in this class with two teachers.						
Co-teaching creates confusion.						
Co-taught classes are more enjoyable.						
In a co-taught class, students develop critical thinking skills.						
The two teachers seem comfortable sharing responsibilities when they are teaching together.						
I would rather learn with only one teacher in the classroom.						
Co-taught classes are more valuable.						
It is helpful for students to see their instructors work as a team.						
I learn better with two teachers.						
Co-teaching is helpful for students.						
Adapted from King-Sears, Brawand, Jenkins, & Preston-Smith, 2014; King-Sears & Vasilis, 2020; Seymour & Seymour 2014						
<b>OPEN ENDED</b>						
In what ways did having a second, student instructor enhance the class?						
In what ways were having a second, student instructor less than helpful?						
If we were to try this again, what suggestions do you have for improving the experience?						