Increasing Teachers' Capacity for Integrating Mathematics, Social-Emotional Learning, and Equity (*Math+SEL+E*)

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The University of Texas at Arlington (UTA; both a Hispanic Serving Institution and an Asian American Native American Pacific Islander-Serving Institution), the University of Missouri (MU), Ohio University (OU), Dallas Independent School District (DISD), Mansfield Independent School District (MISD), and Texas Instruments (TI) propose the project *Increasing Teachers' Capacity for Integrating Mathematics, Social-Emotional Learning, and Equity (Math+SEL+E)* to address **Absolute Priority 1 – Supporting Effective Teachers**, **Competitive Preference Priority 2 – Promoting Equity in Student Access to Educational Resources and Opportunities**, and **Competitive Preference Priority 3 – Meeting Student Social, Emotional, and Academic Needs**. This project addresses three pressing national needs: (1) reducing inequities in student mathematics achievement, (2) increasing students' social and emotional competencies, and (3) building equity practices in schools. It addresses these needs in the context of middle grades (6-8) mathematics, which is a gateway subject critical to students' preparation for higher level mathematics (Andrews, 2011), later enrollment in (STEM) coursework (Wang & Goldschmidt, 2003), and interest in STEM careers (Lembke & Gonzales, 2006). However, despite the importance of high-quality mathematics instruction for middle grades, teachers often lack subject-specific expertise in mathematics (Roy et al., 2017). Our goal is to increase the number of middle grades mathematics teachers who have the capacity and confidence to lead social-emotional learning (SEL), equity, and mathematics integration. **A key product will be a professional development (PD) program that integrates best practices in mathematics, SEL, and equity, that can be used by other districts across the nation.**

SEL and equity have both been pressing national needs, but have increased in urgency as

a result of the recent dual pandemics of COVID-19 and heightened racism. SEL is needed in middle grades because students experience a decline in prosocial behavior (Bergin, 2014) and a rise in bullying (Grunbaum et al., 2002; Nansel et al., 2001), as well as less school bonding, interest in school, extracurricular engagement, and lower grades (Juvonen, 2007; Skinner et al., 2008). Further, students report a decline in quality of relationships with teachers (Hughes & Cao, 2018). Teachers, in turn, in middle grades often report high levels of stress (Herman et al., 2020), partially due to increased student defiance, which is a primary cause of office discipline referrals in middle school (Spaulding et al., 2010). Teachers report feeling unprepared to respond to students' behavioral needs and support their SEL well-being (Reinke et al., 2011).

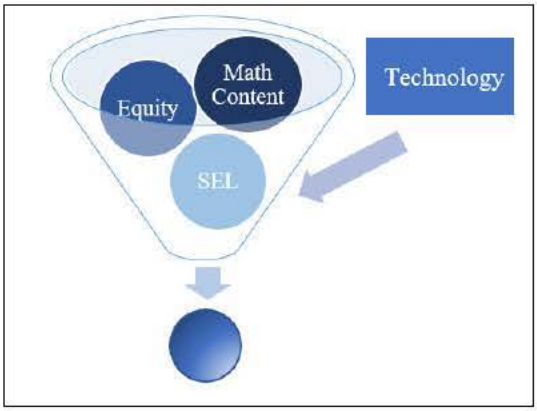
Nationally, schools' struggle with equity, which refers to all students having resources regardless of access and student characteristics (Brinegar et al., 2019). Ladson-Billings argued in her 2006 American Educational Research Association Presidential Address, "We do not have an achievement gap… I am arguing that the historical, economic, sociopolitical, and moral decisions and policies that characterize our society have created an education debt…That debt service manifests itself in the distrust and suspicion about what schools can and will do in communities serving the poor and children of color" (p. 5-9). To better serve students with marginalized identities, SEL is being integrated with equity, known as "Transformative SEL" or "T-SEL." According to Jagers et al. (2019), T-SEL aims to interrupt inequitable educational environments by attending to issues of identity, agency, and belonging, and related issues such as power, privilege, prejudice, discrimination, social justice, empowerment, and self-determination. Similarly, *Math+SEL+E* will integrate SEL and equity, while improving mathematics pedagogy.

Mathematics is a rich context for combining SEL and equity due to overall low achievement and marked inequities. In the most recent (2019) National Assessment of

Educational Progress (NAEP), only 33% of public-school students in 8th grade were at proficient levels. When disaggregated by race/ethnicity, only 11% of Black and 16% of Hispanic students were proficient (NAEP, 2022).

Math+SEL+E will provide participating teachers with (a) **professional development** that integrates best practices in technology-based mathematics, SEL, and equity, (b) a **professional learning community** focused on the integration, (c) a **Master of Education degree** from UTA, (d) TI **technology** for use in their classrooms accompanied by (e) **Teachers Teaching with Technology (T3TM)** PD and Coaching, which provides teachers with hands-on, interactive experience to integrate TI technology into their lessons. During the three-year funding period, *Math+SEL+E* will directly involve **300 middle grades teachers** and approximately **39,596 middle grades students** in both the Dallas Independent School District and the Mansfield Independent School District in the Dallas-Fort Worth Metroplex. See Figure 1.

Figure 1. Integrated *Math+SEL+E* PD



The Dallas Independent School District (DISD) in 2020-2021 enrolled 145,113 students in grades PK-12. Of these students, 85% were eligible for free or reduced priced lunch or other public assistance and only 29% were considered college ready according to the Texas Success Initiative Assessment. DISD also had approximately 10,266 teachers (full-time equivalent), 28.5% of whom hold a master's degree or higher (Texas Tribune, 2022). The Mansfield Independent School District (MISD) enrolled 35,063 students in grades K-12. Of these students, 42% were eligible for free or reduced priced lunch or other public assistance and only 50.2% were considered college ready in mathematics according to the Texas

Success Initiative Assessment. MISD also had approximately 2,274 teachers (full-time equivalent), 30% of whom hold a master's degree or higher (Texas Tribune, 2022). See **Table 1** for ethnoracial composition of students and teachers in both school districts. DISD has 38 middle schools enrolling 28,621 students. MISD has 12 middle schools enrolling 10,975 students.

Table 1. Ethnoracial Composition of Students and Teachers in Partner School Districts

	Dallas Independent School District (DISD)		Mansfield Independent School District (MSID)	
	Students (N = 145,113)	Teachers (N = 10,266)	Students (N = 35,063)	Teachers (N = 2,274)
Hispanic/Latino	71% (102,542)	3,296 (32.1%)	9,234 (26.3%)	269 (11.8%)
Black/African American	21% (30,186)	3,528 (34.4%)	10,997 (31.4%)	407 (17.9)
White	5% (7,206)	2,838 (27.6%)	10,180 (29%)	1,492 (65.6%)
Asian	1% (1,506)	322 (3.1%)	45 (2%)	6 (0.3%)
American Indian or Pacific Islander	(0.02%)	86 (0.08%)	157 (0.4%)	46 (2.0%)
Two or more races	2.36% (3,424)	195 (1.9%)	1,723 (4.9%)	54 (2.4%)

Our lead partner, the University of Texas at Arlington (UTA), is designated as both a Hispanic Serving Institution (HSI) and an Asian American Native American Pacific Islander Serving Institution (AANAPISI) by the U.S. Dept. of Education (UTA, 2022). According to U.S. News & World Reports, UTA ranks #1 in Texas and #3 nationally among universities for undergraduate ethnic diversity; #1 in Texas and #11 and #14 nationally for bachelor's and master's degrees awarded to African Americans, respectively; #17 and #11 nationally for bachelor's and master's degrees awarded to Hispanic students, respectively; and #1 in Texas and #17 nationally for master's degrees awarded to all students of color (Fort Worth Business Press, 2020; UTA, 2022)

Our partner the University of Missouri (MU) has the nation's premier prosocial education research lab and our partner Ohio University (OH) is a national leader in integrating mathematics and equity initiatives. In addition, our partner Texas Instruments (TI) is a global leader in

technology and has been supporting educators and preparing tomorrow's innovators for over 30+ years by providing hundreds of free activities for middle grades and providing free webinars and workshops for teachers. Over 19 million U.S. students use TI products. TI is the #1 recommended brand for graphing calculators among mathematics educators (TI, 2022).

QUALITY OF THE PROJECT DESIGN

A1. Professional development services of sufficient quality, intensity, and duration

Math+SEL+E has three components. First, receiving PD focused on the integration of mathematics, SEL, and equity. Second, receiving a Master of Education (M.Ed.) degree in Curriculum and Instruction with an emphasis in mathematics education from UTA. Third, receiving TI-Nspire™ technology augmented by PD and coaching from TI's *Teachers Teaching with Technology* (T³™) program. Each of these three components are discussed below.

A1.1. Duration and Intensity of PD

Teachers will participate in the program for **three years**, during which they will: 1) complete their M.Ed., 2) create, implement, and reflect on multiple lessons that integrate mathematics content, SEL, and equity, and 3) integrate TI technology in their lessons. Activities will be designed to build a peer learning community that may last beyond the project timeframe. Each summer of the three-year program, teachers will have 3 full days of in-person PD. Day 1 will focus on prosocial education (led by Co-PI [redacted] and PI [redacted] Day 2 will focus on building equitable classrooms, and interleaving prosocial education (led by Co-PI [redacted] and Co-PI [redacted] Day 3 will focus on integrating TI technology in their classrooms, and interleaving equity and prosocial education (led by T³™ coaching specialists). In addition, coaching centered on this PD will occur for **1.5 hours twice a month during the nine-month academic year** using the ECHO model (discussed below) for a total of 54 sessions across the 3

years. Coaching sessions are spaced over time to allow teachers to actively implement different strategies and technologies in their classrooms, while developing their own instructional materials (Garet et al., 2001). The **M.Ed. program** and the **T^{3TM} coaching will occur year-round**. Teachers will have access to **24-hour TI support** through TI Technical Support and will have **monthly sessions with the T^{3TM} coaches** where coaches visit the classroom to help teachers integrate their technology effectively. See **Table 2**.

Table 2. Timeline for *Math+SEL+E*

Spring 2023	Summer 2023	Fall 2023 Spring 2024	Summer 2024	Fall 2024 Spring 2025	Summer 2025	Fall 2025
• Project preparation	• M.Ed. courses • 3-Day PD in August	• Bi-monthly Math+SEL+E PD • M.Ed. courses • Monthly TI coaching	• M.Ed. courses • 3-Day PD in August	• Bi-monthly Math+SEL+E PD • M.Ed. courses • Monthly TI coaching	• M.Ed. courses • 3-Day PD in August	• Project ends

A1.2. Component 1: Quality of the Math+SEL+E Professional Development

Quality of Mathematics Pedagogy PD. Our PD is based on both the research on effective mathematics instruction, including the IES syntheses of research on mathematics education (Rittle-Johnson & Jordan, 2016), and age-appropriate guidelines provided by the National Council of Teachers of Mathematics (NCTM), which is the largest mathematics organization in the world. In doing so, we address the current research-to-practice gap. That is, teachers too often do not use research-based teaching practices despite the Department of Education's heavy investment in supporting research on best practices. Indeed, "there is evidence that educational research has not influenced . . . practice on a broad scale" (Herbel-Eisenmann et al., 2016, p. 108). IES Director [redacted] has lamented "we need to figure out **the best channels to get that information into the hands of teachers**, so that more students have teachers who are using the most effective, evidence-based methods" (Schneider, 2018). The *Math+SEL+E* project will

help address this need by providing teachers with research-based intensive PD aimed at increasing mathematics teachers' content and pedagogical knowledge that will be coupled with receiving an M.Ed. in curriculum and instruction with an emphasis in mathematics education (see **Section A1.3**).

The mathematics PD will implement teaching practices that reflect the recommendations from the NCTM Principals, Standards for School Mathematics, and the Texas Education Standards. According to these organizations, teachers need professional development opportunities to actively learn and enhance their content knowledge and pedagogy through models of effective classroom practice, collaborative activities, analysis of student thinking, reflection, and connecting experience to teachers' daily lives (Garet et al., 2001). For example, one evidence-based strategy we will implement includes having teachers reexamine their instruction, so teachers will analyze case studies of classrooms which may reveal differences between traditional mathematics instruction and alternative approaches. This will allow teachers to probe students' thinking about mathematical concepts and create a chance for discussion during the PD (Loucks-Horsley et al., 2010). The content covered in the PD will be aligned with the content courses teachers will be taking in the M.Ed. degree program (**see Table 4**) and lesson from *Middle School Mathematics Lessons to Explore, Understand, and Respond to Social Injustice* (Conway et al., 2022) that will be used for the book study (see **Table 3**).

Quality of SEL PD. Our social emotional learning (SEL) component takes a prosocial education approach, which is a particularly important type of SEL for improving student learning, social-emotional well-being, and school climate. **Prosocial education refers to school-based approaches that promote prosocial behavior in students** (Bergin, 2014). Prosocial behavior is defined as any voluntary behavior that benefits others and promotes harmonious

relationships – such as collaboration, compassion, helping, and encouraging others. Prosocial education is a distinct type of SEL program that is intentionally "other" focused (e.g., promoting others' goals and well-being) and emphasizes promoting positive behavior. In contrast, some SEL programs are more "self" focused (e.g., meeting one's own goals) and emphasize eliminating negative behavior (Domitrovich et al., 2017). Our positive focus is important because studies suggest that the **presence of prosocial behavior may better predict school success than the absence of negative behaviors** for low-income students and those at risk for low achievement (Bierman et al., 2009; Jones et al., 2015).

When students become more prosocial, there are important outcomes for both students and teachers. Prosocial students are more likely to be calm, happy, and well-liked at school (e.g., Raposa et al., 2016). They have higher academic achievement and engagement (e.g., Galindo & Fuller, 2010; Miles & Stipek, 2006). They are more likely to show interest in schoolwork, work independently, take turns, listen, and stay on task (Bierman et al., 2009; McClelland & Morrison, 2003). Further, students who have prosocial *classmates* tend to have higher grades (Griffith, 2002; Jia et al., 2009) and feel greater motivation and social support for learning (Wang et al., 2014; Wentzel, 2006). SEL programs that increase prosocial behavior also raise test scores, even when there is not an academic component to the program (Durlak et al., 2011). **Increased prosocial behavior benefits all students, but especially students with low income** (Griffith, 2002; Hoglund & Leadbeater, 2004). Furthermore, when students become more prosocial, teachers use less harsh disciplinary practices, feel more efficacious, and less burnout. In turn, the school climate improves for students and teachers (Bergin, 2018; Durlak et al., 2011).

Prosocial behavior in students is malleable; teachers can make a difference. Teachers in *Math+SEL+E* PD will learn how to promote students' prosocial behavior using three strategies:

1) Praise students' spontaneous prosocial behaviors to increase frequency. **2) Use inductive discipline to correct misbehavior,** with emphasis on "victim-centered induction." This refers to (a) pointing out how a student's misbehavior affects another, (b) asking the student to imagine being the other, and (c) suggesting acts of reparation. This teaches students to focus on others' well-being and provides practice of prosocial behavior as students make reparation (Bergin, 2014). **3) Form positive relationships with students** through being sensitive, responsive, and warm; using non-coercive discipline; and supporting students' autonomy (Bergin & Bergin, 2009). Teachers will be introduced to research on each strategy using a book titled, *Designing a Prosocial Classroom,* written for teachers (Bergin, 2018). Authentic examples and contrasting non-examples will be discussed and teachers will be asked to work in teams to role play in small groups. They will be asked to use these strategies in their classrooms and share/reflect with the group. Research indicates these three strategies are effective, yet teachers do not often use them. Our partner at the University of Missouri leads a team at the nation's premiere Prosocial Development and Education Research Lab who have extensive experience successfully delivering such prosocial education PD to practicing teachers in varied settings (**Section A.4**).

Quality of the Equity PD. Our equity component draws on Gutiérrez's (2009) four dimensions of equity in mathematics education. She identifies a **dominant axis** of equity, which includes the dimensions of *access* and *achievement* and a **critical axis**, which includes the dimensions of *identity* and *power*. *Access* includes resources as well as high quality teachers, curriculum, and "a classroom environment that invites participation" (p. 5). *Achievement* addresses student outcomes, including grades, performance on tests, participation in class, and career outcomes. *Identity* emphasizes students' opportunities to draw on their background, make connections to their culture, understand their identity relative to others' identities and

perspectives in the world, and to have their voices valued in the classroom. Finally, *power* includes the use of mathematics "as an analytic tool to critique society" and "rethinking the field of mathematics as a more humanistic enterprise" (p. 6). To address these four dimensions the *Math+SEL+E* PD will draw on three bodies of literature: complex instruction, funds of knowledge, and social justice or critical mathematics (Boaler, 2006b; Cohen & Lotan, 2014; Featherstone et al., 2011; Horn, 2012).

Complex instruction is a research-based approach to engage mixed-ability students in rich and rigorous mathematics. Teachers will learn to adapt tasks to make them "groupworthy" and specific strategies to increase participation of all students (Wood et al., 2019). This most directly addresses the *access* and *achievement* dimensions of equity because it increases participation and learning outcomes for all students (Boaler & Staples, 2008). In addition, it address's *identity* by increasing participation and respect across classmates of different genders, cultures, and races (Boaler, 2008).

Teachers will also learn how to draw on students' funds of knowledge which includes students' out-of-school interests, strengths, knowledge, and resources as well as the resources and expertise of their culture (Civil & Andrade, 2002; González et al., 2001, 2005; Moll et al., 1992). Teachers will learn how to value and build on students' ideas, consider practical examples of this work (Civil & Kahn, 2001), and complete assignments (Felton-Koestler, 2017) to support them in engaging students' funds of knowledge into the mathematics classroom. This addresses student *identities* by valuing students' backgrounds and exposing them to others' backgrounds.

Finally, teachers will learn to use social justice mathematics, which involves using mathematics to analyze and critique social issues and injustices. Teachers will make connections between mathematics and the world, and design tasks for their own contexts (Berry III et al.,

2020; Felton-Koestler et al., 2017). This addresses the *power* dimension of equity and can lead to a greater sense of student agency (Turner, 2012) and stronger identity development. For example, Harrell-Levy et al. (2016) found that black adolescents who participated in such a course experienced greater identity exploration and stronger beliefs about civic responsibility, even years after the course. Further, when teachers integrated social justice practices in their classrooms, student outcomes improved (Cochran-Smith, 2009).

Quality of Integrating Mathematics, SEL, and Equity. There is research evidence supporting the effectiveness of each PD component, as discussed above. However, this project uniquely combines these components, and we expect additive effects. In other domains, integrating evidence-based practices has resulted in additive outcomes. For example, Kroeger et al. (2009) integrated three evidence-based practices (i.e., reciprocal peer mediation, explicit practice, and self-monitoring) in middle science reading which resulted in improved student ability to comprehend paragraphs. *Math+SEL+E* will ensure each integrated mathematics lesson is: 1) grounded with a strong foundation in mathematics as the center of a social justice lesson, 2) has specific social justice and SEL goals that support students becoming more prosocial, 3) avoids trivializing content or misleading ideas, 4) is age appropriate, 5) supports school mathematics programs, and 4) uses authentic tools to deepen connections between SEL, social justice, and mathematics (Berry III, 2020).

Quality of Coaching –The ECHO Model. Our coaching approach will use the "ECHO" (Extension for Community Health Outcomes) model. ECHO is a powerful *telementoring* model, meaning that a group of practitioners and researchers **mentor each other**. This model has been used for over a decade in medicine to build capacity of physicians by democratizing specialized knowledge found at academic medical centers, making such knowledge available to practitioners

anywhere (Arora et al., 2014). It has provided **improved equitable access** to high-quality medical care in locations around the globe. ECHO has been so successful that it has received American Medical Association endorsement, legislative support, a dedicated Department of Health and Human Services grant funding stream, and was a finalist for a *MacArthur 100&Change* award.

Education is similar to the field of medicine in that there has been an explosion of research on effective teaching, but teachers may not know about or know how to implement the research. Therefore, the purpose of ECHO – to democratize knowledge and increase equitable access to high-quality, research-based practice – is well-suited to the field of education. Our project team are pioneers in using ECHO in education. Currently Co-PI [redacted] is leading an ECHO for pre-K mathematics teachers. Co-PI [redacted] is leading two ECHOS for middle and high school teachers to build their capacity to promote prosocial behavior among students. Both Co-PI [redacted] and Co-PI [redacted] have been trained by the ECHO founders in New Mexico.

To form an ECHO, a research team convenes at "the hub" (typically a university). Teachers join the hub remotely ("the spokes" of a hub-and-spoke model). One or more teachers submit an authentic, de-identified case using a standardized form before the session. Each session proceeds as outlined in the adjacent box. The primary focus is on the cases (about 75% of time), with the didactic as a brief supplement. For example, in a session on prosocial education, the didactic may be on strategies for how to build strong student-teacher relationships.

1. A case is presented.
2. Teachers ask clarifying questions.
3. Researchers ask clarifying questions. (Teachers always go first.)
4. Solutions are discussed by all. Researchers model thinking aloud and share resources.
5. Steps 1-4 may be repeated for other cases.
6. Brief didactic (typically 20 minutes) by a hub member on cutting-edge research

The ECHO motto is "***All* Learn, *All* Teach**" such that each hub becomes a learning

network of practitioners and researchers. Thus, it is deliberately not "something that researchers do to practitioners" (a concern expressed by IES Director [redacted] All ECHO Hub team members are trained to create a culture of deep respect for what *everyone* brings, using language like "did you think about" or "consider X," rather than "do this." The goal is to remove barriers between researchers and teachers so that everyone feels safe to talk of what one does not know.

As described above, ECHO sessions will be held **bi-monthly for 1.5 hours**, where one session each month will focus on SEL and mathematics and the other on equity and mathematics. The didactic elements will be aligned with a book study *Middle School Mathematics Lessons to Explore, Understand, and Respond to Social Injustice* (Conway et al., 2022) and *Designing a Prosocial Classroom* (Bergin, 2018). Two Co-PIs ([redacted] and [redacted] co-authored book chapters and [redacted] (on the advisory board) co-edited the *Middle School Mathematics* . . . book published by NCTM. The book provides mathematics lessons that are integrated with equity and social justice topics, and is aligned with standards-based mathematics instruction. *Designing a Prosocial Classroom* was authored by Co-PI [redacted] (2018) and published by Norton. It helps teachers understand how to create a prosocial classroom by providing a set of research-based strategies that all teachers can integrate into any content. **Table 3** outlines the chapters and topics that will integrate mathematics, SEL, and equity. Each of the **three years** will focus on one SEL strategy addressed in the summer PD and ECHO coaching sessions that year. The ECHO didactics build on the book study by presenting cutting-edge research with experts (Arora et al., 2014). Combining didactics and coaching can be effective in changing teacher practice (Koh & Neuman, 2009; Swan & Dixon, 2006).

Table 3. Book Chapters Aligned with SEL Strategy by Year

Year	2023-2024	2024-2025	2025-2026

SEL Strategy & Book Chapters	Effective use of Praise for Prosocial Behavior (Chapters 1-3)	Effective use of Inductive Discipline (Chapters 3-4)	Forming Positive Teacher-Student Relationships (Chapters 5-6)
Mathematics Book Chapter Names	0. Introduction and Overview to the Project	8. Smoking and Vaping: Targeting of Marginalized Communities by the Tobacco Industry	16. Gender Pay Gap
	1. Food Apartheid: Graphing and Understanding Access to Health Food	9. Health Race and Ratios	17. How Many Meals Can Minimum Wage Buy
	2. Cor(o)nor Stores and Food Apartheid	10. Health Inequalities: COVID and Other Health Conditions	18. Map Projections
	3. Billionaire Power	11. Gerrymandering of Voting Districts	19. 3D Modeling for Water
	4. Middle School Math to Explore People Represented in Our World and Community	12. National Team Pay Investigation	20. Water is Life
	5. Hey Google, Who's a Mathematician	13. The Black Vote in America: Impact of the 1965 Voting Rights Act	21. Accessible Playground
	6. The True Cost of that $29 T-shirt in the Store Window	14. Playing with Data	22. Investigating Areas to Determine Fairness
	7. Majority and Power	15. The Mathematics of Toxic Air	

A1.3. Component 2: Quality of the M.Ed. Degree

The second component is providing teachers with a M.Ed. Degree in Curriculum and Instruction with emphasis in mathematics from UTA. Holding a master's degree is considered by some as an indicator of teacher quality. Indeed, there is evidence that teachers with master's degrees tend to have students with higher achievement in grades 1-7 (Ferguson, 1991) and tend to have high school students who perform better, although it is not clear whether master's degrees *cause* increases in student achievement (Goldhaber & Brewer, 1997). Furthermore, teachers with a master's degree may have lower rates of student absenteeism in middle school

(Ladd & Sorensen, 2015). However, not all master's degrees are of high quality (Goldhaber & Brewer, 1997).

The master's degree program at UTA is a *high quality*, established, accelerated online, non-thesis program specifically designed for working teachers who wish to complete advanced coursework in mathematics education. The **U.S. News & World Report ranked this program as #20 in best online master's degrees** in curriculum and instruction in 2020 and 2021. Intelligent.com ranked **UTA's Master's in Education degree programs as #2 in the U.S.** (UTA, 2022). Further, UTA was ranked **#1 in Texas and #17 nationally for master's degrees awarded to students of color** (Fort Worth Business Press, 2020; UTA, 2022)

The program consists of 10 courses for a total of 30 credit hours (see **Table 4**). Each course is seven weeks long with a focus on team-based, problem-based, inquiry-based teaching strategies that model best practices for teaching mathematics. This program already integrates some SEL and equity in the core required curriculum (see **Table 4),** which will complement learning from the *Math+SEL+E* professional development. The M.Ed. program has the capacity to accommodate project participants. Co-PI [redacted] coordinates the M.Ed. degree and both Co-PI [redacted] and PI [redacted] teach in this program.

Table 4. Courses in the M.Ed. Degree in Curriculum and Instruction

Core Required Curriculum (12 Credit Hours)		
Course Number	**Course Name**	**Brief Course Description**
EDUC 5305	Effective Teaching and Learning for 21st Century Early Childhood-12 Students	Students develop knowledge of state and national standards and apply these standards vertically and horizontally in preparing high quality teaching and learning experiences. Students also learn to construct and test instructional models using activities that focus attention on **diversity**, authentic assessments, intellectual, **social and emotional development**, interdisciplinary connections, and **technology**.
EDUC 5309	Advanced Teaching Models for	Students engage in the advanced study and design of curriculum models with an understanding of cognitive development, pedagogical content knowledge, and learning progressions. Students learn

	Diverse Learners	**culturally responsive teaching practices** and gain skill in developing learning experiences that attend to **teaching diverse learners**.
EDUC 5394	Understanding and Designing Classroom Research	Students learn about different types of educational research methods and study designs that can be applied to real-world settings. Students will also learn how to write measurable research questions, ethically collect data, and be introduced to qualitative, quantitative, and mixed methods study designs.
EDUC 5397	Implementing and Disseminating Classroom Research	Students learn how to collect, analyze, and interpret different types of data grounded in a variety of educational research methods. The course is split into three sections focused on quantitative data analyses/interpretations, qualitative data analyses/interpretations, and mixed methods data analyses/interpretations.
Support Area/Concentration (18 Credit Hours)		
Course Number	**Course Name**	**Brief Course Description**
MAED 5351	Whole Numbers, Rational Numbers and Operations	Students engage in activities and problem solving on concepted related to whole numbers, rational numbers, and operations. Students in the course will learn to utilize research-based, problem-based teaching methods to promote **K-12 student understanding** and promote strategies on how to teach K-12 students about **numbers, number systems, operations and algorithms, quantitative reasoning, and technology**.
MAED 5352	Patterns and Algebra	Students engage in problem-based teaching and curriculum development to help children learn problem solving and critical thinking with an emphasis on **patterns, relations, functions, algebraic reasoning, analysis, and technology**.
MAED 5353	Probability and Statistics	Students engage in learning experiences and readily useable curricula for teaching K-12 students concepts of **probability and statistics, their applications, and technology**. Students examine research-based practices that will help them understand how **different mathematical concepts will promote the development of K-12 student probabilistic reasoning abilities**.
MAED 5354	Problem Solving	Students experience and practice **innovative curricula** for **teaching and learning problem solving**. Students engage in hands-on activities and apply various problem-solving techniques, using mathematical processes to **reason mathematically,** to **solve mathematical problems**, to make **mathematical connections**, and to **communicate mathematically.**
MAED 5355	Conceptual Geometry	Students experience and incorporate active learning curricula that utilizes a variety of **manipulative materials**, **diagrams, models, and pictures to study geometry and spatial reasoning.**
MAED 5356	Measurement	Students learn concepts of measurement including **units of measure, standardization, and error**. Students will learn to use teaching techniques that will promote K-12 students' understanding as well as the **application of measurement** concepts to other subjects and to everyday life experiences.

Teachers will take one course in the fall and spring and two courses each summer (see **Table 5**). This sequence was purposefully selected to ensure that teachers were not overburdened during the academic year while they are teaching.

Table 5. Course Schedule for the M.Ed. Degree

Year 1				Year 2				Year 3			
Spring 2023	Summer 2023		Fall 2023	Spring 2024	Summer 2024		Fall 2024	Spring 2025	Summer 2025		Fall 2025
Recruitment	EDUC 5305	EDUC 5303	MAED 5331	MAED 5352	MAED 5353	EDUC 5394	MAED 5354	MAED 5355	MAED 5356	EDUC 5397	Data Analysis

A1.4. Component 3: Quality of the TI Technology and T3TM Program

Our third component is TI technology, specifically classroom sets of TI-Nspire™ CX graphing calculators, and PD/coaching to use the technology. Use of such technology increases students' computational thinking, critical thinking, and academic achievement. For example, in a meta-analysis of 54 studies, students' operational and problem-solving skills improved when graphing calculators were integrated into both classroom instruction and testing (Ellington, 2003). Students who used graphing calculators had significantly more positive attitudes towards mathematics (effect size of .49 across 8 studies) than comparison students (Ellington, 2003). Ruthven (2009) found that calculators were especially beneficial when students were introduced to the calculator for mathematical purposes (e.g., why the calculator created a straight line instead of an expected curved line when the order of operations is not followed), pre-structured lesson tasks were provided, and there were appropriate levels of support.

Extending this research, our project will use TI-Nspire™ Technology in tandem with receiving T³™ coaching, a TI program developed to: 1) enhance the pedagogical skills and content knowledge of STEM educators, 2) assist teachers in increasing achievement for all students and to motivate the pursuit of higher-level math courses, and 3) help teachers stay informed by introducing them to different TI technologies (TI, 2022). In multiple studies, the

T^{3TM} program has increased student test scores on statewide tests. For example, in one study 328 students in Florida whose teachers had received T^{3TM} PD had significantly higher scores compared to students of control teachers (Laumakis & Herman, 2008). TI-Nspire^{TM} Technology has also been effective in increasing students' understanding and attitudes towards math. In a randomized controlled trial, students who received the TI-Nspire^{TM} Technology demonstrated deeper understanding and greater abilities in drawing inferences. **Student with low achievement made the greatest gains** (O'Mahony et al., 2008). Teachers will receive classroom sets of TI Nspire^{TM} Technology that they will be able to keep at the conclusion of this project

A2. Building Capacity in Urban, Suburban & Rural Areas

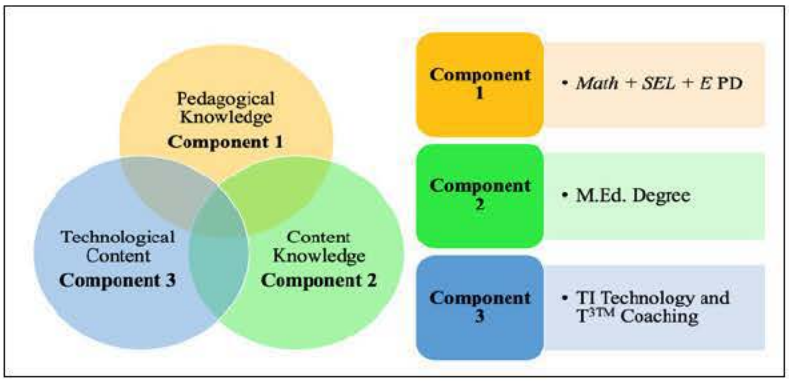
The *Math+SEL+E* project was designed to build teaching capacity that will yield results well beyond the grant period. Each component of *Math+SEL+E* is scalable and replicable anywhere, including urban, suburban, or rural areas. The integrated mathematics, SEL, and equity **PD materials** will be freely available to districts nationwide. These materials will include topics covered, sample didactic lessons, and example discussions, among other resources. These PD materials will be available on the project's website (**Section B.4**). The **Master's Degree** program is accessible anywhere because it is asynchronous, online, and designed for busy working teachers. Although tuition may represent a barrier to some teachers, the tuition is reasonable ($8,200 for the entire degree) compared to other programs. The **TI technology** will continue to be available within our partner districts, and available for purchase from TI for other districts ($168/TI Nspire^{TM} calculator). Although the **T^{3TM} coaching** may not be scalable beyond Texas, this service is easily replicated by using technology designed for remote coaching in live classrooms (e.g., software connected to robotic cameras). Through such technology, coaches from anywhere in the world can provide support that replicates the services T^{3TM} coaching

provides. Organizations such as IRIS Connect have over a decade's experience providing such technology globally, and organizations such as eMINTs can train technology-support coaches. In addition, teachers who participate in this project will have a fund of knowledge that their successive students will benefit from in perpetuity.

A3. Conceptual Framework

We use the evidence-based Technological Pedagogical And Content Knowledge (TPACK) framework (Mishra & Koehler, 2009). See Figure 2. According to this framework, teachers need to *understand, blend, and integrate* three specific types of knowledge: 1) pedagogical, 2) content, and 3) technological. First, pedagogical knowledge refers different techniques or methods used in the classroom. Deep pedagogical knowledge facilitates teachers' understanding of how students construct knowledge, acquire skills, and develop positive dispositions towards learning (Mishra & Koehler, 2009). Second, content knowledge is critical.

Figure 2. TPACK Conceptual Framework



When teachers do not have the correct content knowledge, students can develop misconceptions and receive incorrect information (Pfundt & Duit, 2000). Third, technological knowledge, as defined by the Committee of Information Technology Literacy of the National Research Council (NRC, 2000), refers to mastery of information technology for information processing, communication, and problem solving (Mishra & Koehler, 2009). *Math+SEL+E* teachers will acquire pedagogical knowledge as they learn about mathematics, SEL, and equity through PD. Furthermore, the M.Ed. coursework will build mathematics content knowledge. The

TI technology and the T^{3TM} coaching will build technology knowledge. Each of the three components are necessary and mutually influence one another to build teachers' capacity.

A4. Collaboration of Appropriate Partners

The *Math+SEL+E* team includes a PI and Co-PI from the University of Texas at Arlington (UTA), a Co-PI from the University of Missouri (MU), a Co-PI from Ohio University (OU), an external evaluation team at Education Program Research and Evaluation Consulting (EPRE Consulting), two UTA research assistants, and one project director at UTA. In addition, our team includes Texas Instruments (TI) T^{3TM} coaching personnel, an experienced advisory board, and the established UTA Project ECHO® for Education for early childhood mathematics teachers. Qualifications of key personnel follow (see **Key Personnel Attachment for resumes**).

PI [redacted] (Ph.D., University of Missouri) is an Assistant Professor of Measurement and Statistics in the Learning Sciences Program at UTA. As an applied quantitative methodologist, she has led and consulted on multiple funded grant projects including the effectiveness of curriculum-wide transformations and classroom interventions. Her research interests are in school climate, equity, and SEL, with specific interest in how to develop strong teacher-student relationships for students of color. She is currently the Co-PI on multiple grants totaling over $1.32 million from NSF, AERA, the Meadows Foundation, and Academic Partnerships. [redacted] will oversee all aspects of the grant, with specific contributions to the SEL component of the integrated PD and the dissemination of results. She will be contributing 0.25 FTE.

Co-PI [redacted] (Ph.D., The Ohio State University) is an Assistant Professor of Mathematics Education at UTA. She has experience as a PI, project director, and researcher on numerous funded projects. For example, on the IES-funded, *Evaluating the Efficacy of Learning*

Trajectories (LT) in Early Mathematics project ([redacted], PI), [redacted] directed a research team of over 30 people to conduct cluster-randomized trial experiments for eight LT efficacy tests. She has extensive experience training teachers throughout the U.S. [redacted] is the director and PI of *UTA Project ECHO for Education*, Program Coordinator of the Master of Education in Curriculum and Instruction with emphases in Mathematics or Science Education degree, and Program Coordinator of STEM Education at UTA. [redacted] has extensive training in TI products and has previously hosted T3 workshops for educators and researchers. She will be contributing 0.25 FTE.

Co-PI [redacted] (Ph.D., Stanford University) is Associate Dean for Research & Innovation in the College of Education and Human Development at the University of Missouri. She is experienced in coordinating complex, multi-year research projects, having received with colleagues over $50 million in external grants from DHHS, CDC, NSF, ED and other agencies. She has conducted 24 program evaluations including field based randomized control trials. She is a leading expert on prosocial education. [redacted] is currently Co-PI on an EIR-funded $3.99M grant (*Prosocial and Active Learning Classrooms;* CFDA 84.411C) to deliver prosocial education to 36 school districts in Missouri using an RCT. She is PI on two $2M IES grants – one to use the ECHO model to support teachers in using prosocial education in middle schools, and one to develop a video game-based measure of prosocial behavior. She is PI on a funded study of *The Leader in Me* SEL program intended to promote prosocial behavior in students and teachers. She authored a chapter on prosocial education in an AERA award-winning book ([redacted] 2014) and has written a book, *Designing a Prosocial Classroom*, for teachers (2018; published by Norton). She is co-founder of the *Network for Educator Effectiveness*, a consortium of 295 school districts in which over 2,460 administrators are trained annually to coach effective

teaching with 35,683 teachers (nee.missouri.edu). [redacted] will contribute 15% FTE on the project, overseeing the prosocial education component and helping disseminate results.

Co-PI, [redacted] (Ph.D., University of Wisconsin-Madison) is an Associate Professor in the Department of Teacher Education at Ohio University. His research focuses on equity, diversity, and social justice in mathematics teacher education. He also studies mathematical modeling, especially of students' out-of-school interests and of social justice issues, and Complex Instruction in mathematics education. He is currently PI of the NSF-funded project *Collaborative Research: Connecting Elementary Mathematics Teaching to Real-World Issues*. [redacted] will contribute 17% FTE, overseeing the integrated equity and mathematics components of the project.

T^{3TM} coaches will help teachers integrate TI technology in their classrooms. The T^{3TM} instructor and coaching model has been recognized by the Institute for the Advancement of Research in Education (AEL) for integrating key strategies in professional development such as addressing student learning needs, incorporating hands-on technology use, applying technology to specific STEM curricula, and addressing specific knowledge and beliefs (AEL, 2004).

A **project director** will be hired who has expertise in both mathematics education and teacher professional development in K-12 settings, and experience leading federally funded projects. Preference will be given to individuals with SEL and equity experience.

Two research assistants will be hired to help with data collection and coding classroom observation videos. Preference will be given to individuals with classroom and research experience.

External Evaluator, [redacted] (Ph.D., University of Washington), Principal Consultant at EPRE Consulting LLC, an evaluation and research firm. [redacted] is currently

lead external evaluator of eight projects including an NSF Noyce Track 3 Master Teacher Fellows program for middle grades mathematics teachers, four other NSF-funded science and mathematics education grants, an ED-funded Teacher Quality Partnership, among others.

The **advisory board** will consist of (1) [redacted] (Ph.D., University of Virginia), who is an expert in applied quantitative methods specializing in program (impact) evaluation, multilevel-modeling, regression, and data management. He has received over 15 grants totaling over $29M. He will provide expertise in the program evaluation. (2) [redacted] (Ph.D. Auburn University), is an expert in the integration of equity and mathematics. (3) [redacted] (Ph.D., University of Florida) is an expert in SEL through a culturally responsive lens and former chair of the SEL SIG at AERA. The advisory board will meet with the research team **twice a year** for each of the **three years** to provide advice and support in their expertise. See **Appendix D** for letters of support.

A5. Appropriateness and Success in Addressing the Needs of the Target Population

Educators in the Dallas-Fort Worth Metroplex have expressed the need to integrate social justice and SEL as they increase student mathematics achievement in the middle grades, as well as retain equity-minded, effective teachers who feel supported and prepared to stay in schools with highly diverse students**.** *Math+SEL+E* addresses these needs, as described next.

A5.1. The Math+SEL+E PD Addresses the Needs of the Target Population. For teachers the *Math+SEL+E* project is aligned with evidence-based practices, provides intensive PD and coaching, and is sustained over time, aligning with recommendations from Darling-Hammond et al. (2017) to meet teachers' needs. The project will also meet the needs of students by giving teachers research-based strategies to support students' SEL and increase behaviors that

support equity in the classroom. This will help increase students' prosocial behaviors and academic achievement, while improving the school climate for both students and teachers.

A5.2. The M.Ed. Degree Addresses the Needs of the Target Population. UTA's College of Education is well equipped to address the needs of teachers and has the capacity to do so. As discussed above, the M.Ed. program is designed to accommodate busy teachers (**Section A1.3**), while providing a high-quality education at a reasonable price (**Section A2**). It has successfully served highly diverse teachers (**Section A1.3**). The M.Ed. degree program will build teachers' pedagogical and content knowledge (**Section A1.3**), and use of evidence-based practices that they can integrate into their classrooms. As they do so, we expect their students will experience higher levels of achievement and interest in mathematics (**Section A1.3**).

A5.3. The TI Technology and T3TM Coaching Addresses the Needs of the Target Population. Technology can improve student learning in mathematics (**Section A1.4**). Yet our partner school districts need support to appropriately use technology for teaching and learning. The TI technology and T^{3TM} coaching will provide equitable access to technology and coaching on how to integrate their TI technology, including 24-hour support helplines (**Section A2**).

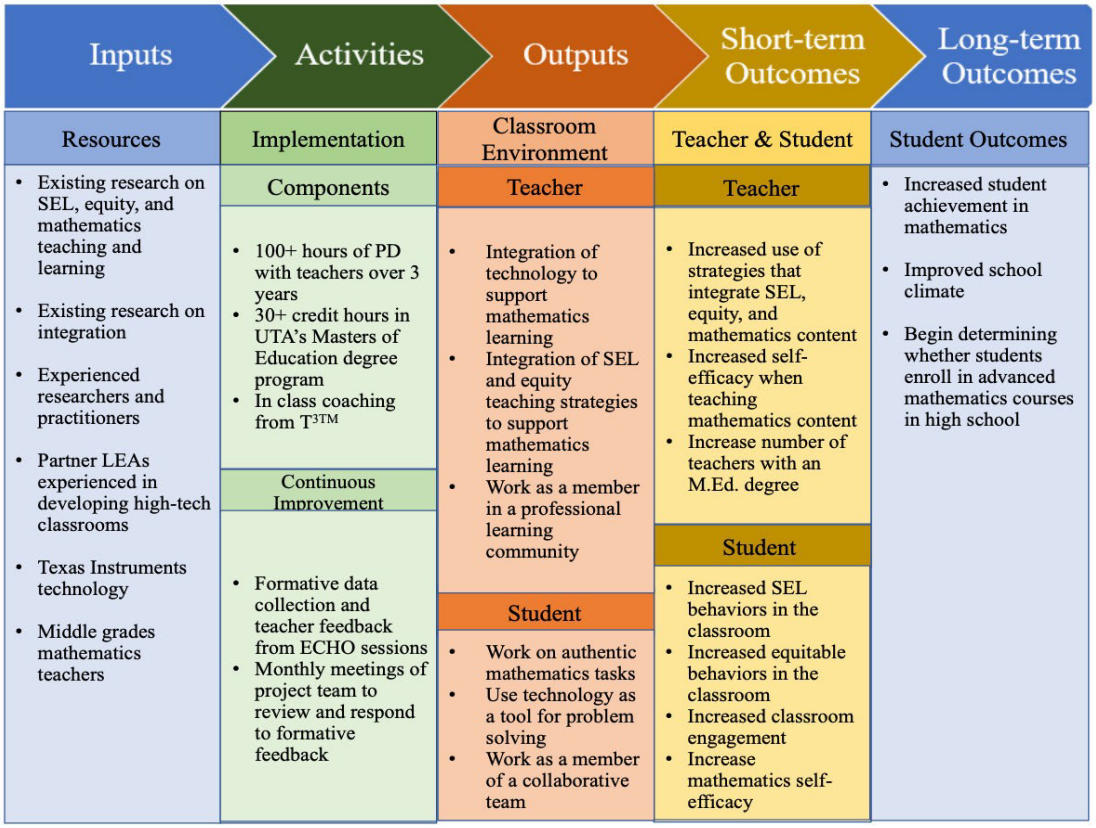
SIGNIFICANCE

B1. Importance and Magnitude of Outcomes Likely to be Attained by Math+SEL+E

Approximately **300 middle grades teachers** and their current **39,596 diverse, high-need students** from Dallas ISD and Mansfield ISD (where 95% and 70%, respectively, identify as students of color) will benefit from *Math+SEL+E*. Over time, substantially more students will benefit as participating teachers affect upwards of 10,000 new students each year, and may share their expertise with peer teachers. **Section A2** discusses how the program could be scaled after project funding ends.

Participating teachers will receive: 1) intensive summer face-to-face PD and bi-weekly coaching using the successful ECHO model on how to integrate mathematics content, SEL, specifically prosocial education, and equity training in their classrooms, 2) and M.Ed. degree from the UTA, and 3) TI Nspire™ technology and T³™ coaching. Each of these three components has a research base demonstrating improved teaching and student outcomes (**Sections A1.2, A1.3, and A1.4**). Our logic model (Figure 3) summarizes important outcomes from *Math+SEL+E.* In the short-term teachers will implement strategies that incorporate mathematics content, SEL, and equity in their classrooms, and students will exhibit more prosocial and equity-based behavior. This will lead to long-term increases in student achievement, improved school climate, and higher enrollment in advanced mathematics courses in high school.

Figure 3. Logic Model of Expected Outcomes



The *Math+SEL+E* project will use a randomized controlled trial (RCT) evaluation that is designed to meet the What Works Clearinghouse Evidence Standards without reservations, assuming low or uniform attrition. The research design will allow potential causal claims to demonstrate the effectiveness of the project. We expect low attrition because participating teachers will receive an M.Ed. degree, TI technology, and high-quality PD within a community of peer teachers. Control group teachers will receive these benefits at the end of the project period, in addition to a stipend during the project for providing data. Attrition due to teachers moving out of the district (or leaving the teaching profession) will be mitigated by agreements between DISD, MISD, and their teachers to allow participation in *Math+SEL+E*.

B2. Costs are Reasonable Relative to Number of Persons Served and Anticipated Results.

Accounting for all project expenses across three years, *including both the cost of services and research*, the average cost per teacher is about $18,000. Recall, control group teachers will be compensated during the RCT and will receive services following the RCT. This is vital for the success of an RCT where a challenge is retaining the control group over time. For the cost of about $18,000, approximately **300** teachers will receive an M.Ed. degree, professional development, TI technology for their classrooms, and support from T^{3TM} coaches. Traditional PD can often cost between $1,000 to $5,000 per day, not including travel costs or substitute teachers, while one classroom set of TI-Nspire^{TM} graphing calculators can cost approximately $3,360 ($168/calculator * 20 students/classroom), and TI coaching can cost upwards of $2,500 per six hours of on-site or virtual workshops. Thus, services teachers and students receive through this project are reasonable at an average of $18,000 per teacher, including the cost of conducting research on the project.

B3. Potential for Project to Be Incorporated into the Organization after Federal Funding

There is potential for the project to be sustained within the Dallas ISD and Mansfield ISD school districts after the end of federal funding. Because these districts have deep interest in increasing mathematics, SEL, and equity initiatives, we expect *Math+SEL+E* to be sustained. As the project develops teacher capacity, partnering schools can capitalize on this capacity to tap participants as teacher leaders. Most districts use "in-house" personnel to provide PD because it is cost-effective. UTA can continue to provide support as it has strong relationships with Dallas ISD and Mansfield ISD due to previous research collaborations and pre-service teacher placements. UTA and Texas Instruments also have an existing relationship and share many common networks in the Dallas-Fort Worth STEM community.

There is also potential for the project to be sustained at the partner universities after the end of federal funding. UTA will incorporate SEL and equity into its existing, successful M.Ed. program in Curriculum and Instruction with emphasis in mathematics (**Section A1.3**) which Co-PI [redacted] coordinates, in ongoing consultation with Co-PI [redacted] The program will also collaborate with Co-PI [redacted] research laboratory for prosocial education to ensure it incorporates ongoing research in SEL.

B4. Dissemination of Results to Enable Others to Use Math+SEL+E

We expect to include other districts across Texas and nationally due to the scalability of *Math+SEL+E* (discussed in **Section A2**). We will use positive results to advocate for additional public and private support of *Math+SEL+E*. Co-PI [redacted] has success in both obtaining such support, and entrepreneurship in building self-sustaining revenue-generating products at reasonable costs that school districts seek out (**Section A4**). She has won an innovation award for her success in scaling the *Network for Educator Effectiveness* to its current (growing) size of 295

school districts across three states (see https://neeadvantage.com). Co-PI [redacted] has relationships with organizations that could help with scaling *Math+SEL+E* and will lead scaling efforts. In addition, we will create a project website to support learning communities on SEL, equity, and mathematics integration. This website will be linked to the UTA, MU, and OU College of Education websites, serving as a media hub for our communication efforts. Further, our research team has a significant social media reach on sites used by teachers via Twitter, Facebook, and LinkedIn. The UTA, MU and OU communications offices will disseminate project results through new releases, a promotional video, and direct contacts at state education agencies.

Further, this project will generate rich data that will be disseminated through reports, conferences, books, and both practitioner and peer reviewed journals. We will target audiences, such as American Educational Research Association, the NCTM, and the International Society for Technology in Education conferences and journals with foci on teacher PD, mathematics education, SEL, equity, and technology education, prioritizing those without a paywall (e.g., *AERA Open*). Publications links will be placed our project website.

QUALITY OF THE MANAGEMENT PLAN

C1. Goals, Objectives, and Outcomes are Clearly Specified and Measurable

Table 6 outlines the four goals of *Math+SEL+E* and accompanying objectives, measures and expected outcomes. Outcomes compare intervention with control groups.

Table 6. Project Goals, Objectives, Measures and Outcomes

Goal 1 - Provide professional development that integrates best practices in technology-based mathematics, SEL and equity		
Sub Goal 1 – Increase Teacher and Student Equity-Based Behaviors in the Classroom		
Objectives	**Measures**	**Expected Outcomes**

1.1 Intervention teachers increase use of strategies that promote students' equity-based behaviors as indicated by an effect of ≥ .20 SD on quantitative measures.	-Equity Mindsets Scale (Littenberg-Tobias et al., 2021) -Classroom observations -Teacher classroom logs	Teachers increase use of strategies that promote students' equity-based behaviors.
1.2 Students with a teacher in the intervention increase their equity-based behaviors as indicated by classroom observations.	-T-SEL Rubric -Classroom observations	Students increase equity-based behaviors
Sub Goal 2: Increase Teacher Prosocial Strategies and Student Prosocial Behavior in the Classroom		
Objectives	**Measures**	**Outcomes**
1.3 Intervention teachers increase their use of strategies that promote students' prosocial behavior indicated by an effect of ≥.40 SD on quantitative measures.	-Self-report teacher survey -Student survey -Classroom observations -Teacher classroom logs	Teachers increase their use of strategies that promote students' prosocial behavior
1.4 Intervention students increase their prosocial behavior, indicated by ≥.30 SD on the PBS.	-Prosocial Behavior Scale (peer report) -Classroom observations	Students increase prosocial behavior in the classroom
Goal 2: Obtain an M.Ed. degree in Education from UTA		
Sub Goal 1 – Increase Student Mathematics Achievement and Motivation		
Objectives	**Measures**	**Outcomes**
2.1 Intervention teachers increase their Conceptual, pedagogical, and mathematics content knowledge.	-DTAMS -MCOP[2]	Teachers increase their conceptual, pedagogical and mathematics content knowledge
2.2 Intervention students increase mathematics raw achievement scores as indicated by an effect of ≥.20 on the STAAR assessment.	-STAAR-mathematics Percentage of students with a C or better in their class	Students increase their mathematics achievement
2.3 Intervention students increase their interest in advanced mathematics	-Number of students and type of mathematics class enrolled in at high school	Students increase their interest in advanced mathematics
2.4 Intervention students increase their self-efficacy in mathematics as indicated by an effect of ≥.15.	-S-STEM-Middle School	Students increase their self-efficacy in mathematics
Goal 3: Provide TI Technology to teacher participants along with T^{3TM} coaching and 24-hour technical support		
Goal 3 – Increase Teacher Use and Integration of Technology in the Classroom		
Objectives	**Measures**	**Outcomes**
3.1 Intervention teachers increase their use and integration of technology in the classroom as indicated by the number of lessons that have integrated technology components.	-Kolb's Triple E Framework -Self-report teacher survey -Teacher classroom logs	Teachers increase their use of technology in the classroom

Note: DTAMS is the Diagnostic Teacher Assessment of Mathematics and Science, $MCOP^2$ is the Mathematics Classroom Observation Protocol for Practices, STAAR is the State of Texas Assessments of Academic Readiness, and S-STEM is Student Attitudes Toward STEM.

C2. Adequacy of Management Plan to Achieve Objectives on Time and Within Budget

Math+SEL+E will occur over **three** calendar years. This allows for a planning period and providing intervention teachers virtual monthly PD, TI coaching/PD, and an M.Ed. from UTA as outlined in **Table 7**. The control teachers will be recruited in Year 1 but will experience business as usual throughout the project.

Table 7. Project Timeline

Spring 2023	Summer 2023	Fall 2023 Spring 2024	Summer 2024	Fall 2024 Spring 2025	Summer 2025	Fall 2025 Spring 2026
• Planning and development • Recruitment • Baseline data collection	• Courses: EDUC 5305, EDUC 5303 • 3-Day f2f PD	• ECHO monthly PD August-May • Courses: Fall MAED 5331, Spring MAED 535 • TI Coaching	• Courses: MAED 5353, EDUC 5394 • 3-Day f2f PD	• ECHO monthly PD August-May • Courses: Fall MAED 5354, Spring MAED 5355 • TI Coaching	• Courses: MAED 5356, EDUC 5397 • 3-Day f2f PD	• Final Data analysis & sharing of results **Control group teachers** • Receive TI technology • Receive voucher for M.Ed. from UTA
	Data collection, analysis, and reporting					

A management team of PIs and Co-PIs from UTA, MU, and OU, and representatives from DISD, MISD, TI, and EPRE Consulting will oversee all aspects of the project. They will all be involved in semi-annual consultation with the advisory board. Several collaborators have successfully managed cross-organization projects and research supported by Federal grants, with similar components and scopes of work (**Section A4**). Further, all participating organizations have stable human and fiscal resources to ensure the success of *Math+SEL+E*. TI is serving as

our corporate partner providing **the 25% match for all three years of the grant** (see **Appendix F** for letter of commitment).

PI [redacted] will be responsible for ensuring that each phase of the project is completed on time and on budget and will oversee the project. In Year 1, she (with [redacted] will be responsible for hiring the project director and aligning the TI component with the M.Ed. (with TI and project director) and coordinating the M.Ed. coursework (with [redacted] and project director). Each of the three years of the grant, the Co-PIs will oversee specific components of the integrated PD. Co-PI [redacted] will oversee the SEL prosocial education, Co-PI [redacted] will oversee mathematics pedagogy and ECHO, and Co-PI [redacted] will oversee mathematics and equity components. All Co-PIs will collaborate on the creation of the integrated PD, the bi-weekly ECHO coaching sessions, and the dissemination of results. The project director will be responsible for scheduling meetings, tracking expenses and key personnel time, team communications and managing the project's technology (e.g., the learning management system for the M.Ed. course, procuring/distributing TI technology, maintaining the project website) ensuring data are collected on time, scheduling PD and T^{3TM} coaching and other duties as necessary. The project director in collaboration with PI [redacted] will ensure that the project remains on budget through weekly project meetings. TI representatives will be responsible for summer PD on technology and monthly T^{3TM} coaching. EPRE Consulting will be responsible for the project evaluation (**Section D**).

QUALITY OF THE PROGRAM EVALUATION

EPRE Consulting will conduct an external evaluation. EPRE will provide the PI/Co-PI team with formative assessment information in monthly meetings to ensure timely feedback to assist the program in meeting the defined objectives on time. EPRE will also provide bi-annual

reports for dissemination to appropriate audiences (**Section D.2**). EPRE will address both process and outcome questions that are aligned with the logic model in **Section B1**, as seen below in **Table 8 and Table 9.**

Table 8: Evaluation Questions

EQ1	What aspects of the project were implemented as planned? What unexpected challenges were encountered and how did the project adapt?
EQ2	Do *Math+SEL+E* components (i.e., the mathematics content, SEL, and equity integration PD, Master's in Education program, and TI technology), individually and in combination, predict expected (a) teacher outcomes and (b) student outcomes? (See **Table 6**).
EQ3	Is fidelity of implementation related to teacher and student outcomes?
EQ4	In addition to expected outcomes, what other impacts on participating teachers, students, and partner schools were identified, if any?
EQ5	What has been learned regarding the integration of mathematics instruction, SEL, equity, and technology in middle grades mathematics classrooms that can be sustained in the partner schools after the project is concluded, and that can be implemented elsewhere? **Table 9** displays the data collection timeline

Table 9: Map of Evaluation Strategies and Timeline

Evaluation Strategies	Evaluation Research Questions					Data Collection Timeline								
						Year 1			Year 2			Year 3		
	EQ1	EQ2	EQ3	EQ4	EQ5	Su	Fa	Sp	Su	Fa	Sp	Su	Fa	Sp
A Bi-annual Implementation Review Meeting with PI, Co-PIs, and Other Stakeholders	•	•	•	•	•									
Teacher Level Measures														
B DTAMS Assessment of Teacher Content Knowledge		•			•									
C Equity Mindsets Scale		•			•									
D Classroom Observations Including the Triple E Framework and MCOP2	•	•	•	•	•									
E Teacher Academic Achievement		•			•									
F Teacher Baseline Survey	•			•	•									
G Teacher Satisfaction Survey	•			•	•									
Student Level Measures														
H Prosocial Behavior Scale		•			•									
I T-SEL Rubric of Developmental Indicators		•			•									
J Analysis of STAAR Mathematics Assessment		•			•									
K Student Attitudes Towards STEM		•			•									
L Student Mathematics Trajectories Survey		•			•									
M Student Academic Achievement		•			•									

D1. Evidence of Project's Effectiveness

A randomized controlled trial (RCT) that is designed to meet What Works Clearinghouse (WWC) standards without reservations will be implemented. To examine the efficacy of the *Math+SEL+E* project on teacher and student outcomes, EPRE Consulting will randomly assign the 38 DISD and 12 MISD middle schools to either the control or treatment group (meaning there will be approximately 25 schools in the treatment and 25 schools in the control group). Because we are using school-level assignment, we expect only minimal risks from contamination or other treatment crossover effects. It is possible that some participant students may move (leave or enter). Therefore, after randomization, we will ask participants to not share their treatment status with others outside the study, minimizing student mobility that is related to treatment status.

To determine sample size, a power analysis was conducted using PowerUp! (Dong & Maynard, 2013). Results suggest that a teacher sample size of 300 would be large enough to detect a minimum effect of 0.08 standard deviations when accounting for 5% attrition. The assumptions for the power analysis are based on using a two-level model (students nested within teachers) with student- and teacher-level covariates. We assumed five to six middle grades mathematics teachers per school (n = 300 teachers) and 60 students per teacher (3 classes of 20 students since middle grades teachers teach multiple classes). We also assumed a level-2 intraclass correlation of .15 (as recommended by Hedges and Hedberg, 2007), 80% power, alpha level of 0.05, a level-1 R^2 of 0.70 (using preintervention measures of student achievement and demographic indicators) and a level-2 R^2 of 0.70 (using preintervention school-level student achievement outcomes and demographic characteristics).

Based on conversations with partnering districts, we believe there will be interest in participating in the *Math+SEL+E* project. If more than 300 teachers are interested, a selection criterion will be implemented. The criteria will be created in collaboration with partnering districts and will emphasize including teachers who work in schools with high rates of free and reduced priced lunch and students of color.

D2. Evaluation Methods will Provide Performance and Progress Feedback

EPRE will use a variety of methodologies to capture *Math+SEL+E's* progress towards implementation. Formative data is necessary for quality improvement and will help investigate the degree to which the project is being implemented as expected. It will also help determine which parts of the implementation are critical for sustaining the *Math+SEL+E* project. The following data collection activities will help produce ongoing formative data to help guide this project.

Baseline Surveys will be administered at the beginning of each academic year to ask teachers information about their current school and district and their reasons for wanting to participate in *Math+SEL+E*, in addition to their goals and academic/professional background. EPRE will administer the surveys to help: 1) determine teacher's perceived usefulness of the *Math+SEL+E* project, 2) evaluate current supports teachers have from their schools, and 3) ask for suggestions to help improve experiences in the program.

Teacher Satisfaction Surveys will be administered at the end of each academic year. Specifically, participating teachers will be asked to complete a satisfaction and preferences survey which will also include demographic questions. This survey will allow the participants to provide feedback and share perceptions about their experience with the master's degree program, their TI technology, their T^{3TM} coaching, and the mathematics content, SEL, and equity PD. This

important feedback will allow the PI/Co-PI leadership team to ensure participants are satisfied, have their current needs met, and are making progress towards the intended goals of the *Math+SEL+E* project. All surveys will be anonymous and administered electronically through UTA's QuestionPro survey software. These data will be extracted and analyzed by the external evaluator, written in a report, and shared with the PI/Co-PI team. These written reports will ensure that the PI/Co-PI team have the appropriate information to reflect, make improvements/iteratives changes, and determine how implementation is impacting the intended outcomes.

D3. Objective Performance Measures

EPRE will use multiple data sources to measure and track *Math+SEL+E's* performance measures and outcomes based on the project goals identified in **Table 10**.

Table 10: Performance Measures and Target Data Based on Project Goals

Goal 1: Provide professional development that integrates best practices in technology-based mathematics, SEL and equity	
Performance Measure	**Target Data**
Teachers will attend *Math+SEL+E* PD	18 sessions/year for the three years of the grant captured by ECHO attendance logs
Teachers will actively participate in the PD by preparing cases or sharing during a session	2 PD sessions/year for the three years of the grant captured by ECHO participation logs
Teachers will attend summer face-to-face PD	2 days/summer for the three years of the grant captured by daily attendance
Goal 2: Obtain a M.Ed. degree in Education from UTA	
Performance Measure	**Target Data**
Enroll teacher participants into the M.Ed. degree program	150 teachers enroll in Year 1 and 150 teachers enroll at the conclusion of Year 3 captured by UTA registrar
Teachers will participate in their M.Ed. degree courses	Participate bi-weekly/per course for all 10 of the degree courses captured by course attendance
Teachers will successfully complete all degree courses	Completion of 10/10 degree courses with a C average or above captured by UTA program coordinator

Goal 3: Provide TI technology to teacher participants, along with T^{3TM} coaching, and 24-hour technical support	
Performance Measure	**Target Data**
Distribute classroom sets of TI technology to teachers	150 teachers receive classroom sets of TI products in Year 1 and 150 teachers receive classroom sets at the conclusion of Year 3.
Teachers will attend TI summer face-to-face PD	1 day/summer for the three years of the grant captured by PD attendance
Teachers will receive coaching from T^{3TM} coaches	9 days/academic year for the three years of the grant captured by T^{3TM} coaching logs

In addition to the performance goals outlines in **Table 10**, teachers will also be submitting self-report teacher logs to indicate the number of lessons that integrated best practices in technology-mathematics, SEL, and equity strategies used in the classroom and TI^{3TM} will be submitting coaching logs to indicate content covered and feedback for teachers. To ensure that all teachers are completing the M.Ed. degree, academic advisors will be notified if teacher attendance and/or academic performance drops. In addition to these performance measures, the *Math+SEL+E* project will include the use reliable and valid outcome measures described in **Section D4**.

D4. Reliable and Valid Outcome Measures

Outcomes for both teachers and students will be measured as outlined in **Table 6**. Measures are elaborated on in this section.

D4.1. Teacher Measures

Diagnostic Teacher Assessment of Mathematics and Science (DTAMS) will be used to determine whether participating teachers have increased their content knowledge in mathematics. DTAMS was developed for middle school teachers to measure mathematics content knowledge in four unique areas (number/computation, $\alpha = .87$; geometry/measurement, $\alpha = .87$; probability/statistics, $\alpha = .90$; and algebraic ideas, $\alpha = .87$) across four different types of

knowledge (memorized knowledge, conceptual understanding, problem solving/reasoning, and pedagogical content knowledge). DTAMS has been validated for use in the assessment of teacher content knowledge (Saderholm et al., 2010) and is commonly used in peer reviewed studies (Cady & Rearden, 2009; Lim & Guerra, 2013; McGatha et al., 2009).

The Equity Mindset Scale was validated with K-12 educators by Littenberg-Tobias et al. (2021). This instrument contains five scales that includes: 1) equality-equity (5 items, α=0.85), 2) assets-deficit (6 items, α=0.61), 3) avoidant-aware (5 items, α=0.78), 4) context-neutral and context-specific (6 items, α=0.91), and 5) equity-promoting behavior (5 items, α=0.82). This instrument has internal consistency and strong concurrent validity. It helps reveal whether teachers are aware of their biases/privileges, can create a classroom that is safe, affirmative, and student-centered, and whether teachers can use identity-affirming strategies to create a healthy environment for their students.

The Triple E Framework (extend, enhance, and engage) was developed in 2011 by Kolb, at the University of Michigan to measure whether technology is being integrated in classrooms with current evidence-based practices about good teaching and pedagogical knowledge. This measure has been validated using 6th-8th grade teachers and was found to have strong content validity and concurrent validity. There was also strong inter-rater reliability, where two raters scored written lesson plans and recorded observations. Correlational analyses were statistically significant and supported agreement between the two raters (Schatzke, 2019).

Mathematics Classroom Observation Protocol for Practices (MCOP^2) was developed and validated by Gleason et al. (2017). This instrument measures the degree of alignment of K-16 mathematics classrooms with various practice standards developed by national organizations such as the Mathematical Association of America and the National Council of Teachers of

Mathematics, among others. MCOP^2 is divided into two scales, 1) student engagement (9 items, α=0.90) and 2) teacher facilitation (7 items, α=0.85).

Classroom Observations. To measure program fidelity, 20% of teachers participating in the intervention will be randomly selected twice a year (once in the spring and once in the fall) to record a 30-minute mathematics lesson using Swivl technology. The Swivl robotic camera allows the research team to track teachers as they walk around the classroom teaching and engaging with students. PI [redacted] and Co-PI [redacted] have experience successfully using this technology in other ED-funded and foundation funded projects to analyze teaching practices. Videos will be analyzed by the research team using the MCOP^2 and the Triple E Framework.

In addition, teachers will be observed and supported by TI T^{3TM} coaches. TI T^{3TM} coaches are specially trained instructors who: 1) provide support with TI technology integration and lesson planning, 2) work side-by-side with teachers to leverage TI technology and model instructional practices designed to increase student understanding, 3) enhance teacher content knowledge and pedagogy, and 4) meet with the teacher to discuss curriculum alignment and pacing (Texas Instruments, 2020). Each teacher and the external evaluator will receive a report that includes strengths, observations, and recommendations for improvement, from their T^{3TM} coach summarizing each classroom visit.

Teacher Academic Achievement will be collected from their course grades for each class in the M.Ed. degree program. Course grades will be used to determine how well teachers understand mathematics content and pedagogical knowledge.

D4.2. Student Level Measures

The Prosocial Behavior Scale was developed by the Bergin et al. (2011). It is a 10-item student-level questionnaire that measures sharing, helping, complimenting, encouraging, and

cooperating. Students will rate their classmates' social skills on a 10-item scale ranging from 1 (never) to 5 (daily). This scale has test-retest reliability (.89) and stability (.58) in ratings of individual students in grades 5-8 (Holdcroft et al., 2003).

The T-SEL Rubric of Developmental Indicators was developed by the Social and Emotional Learning Team at the California Department of Education and is meant to be used by either K-12 educators or students (California Department of Education, 2022). This rubric has five developmental indicators: 1) self-awareness, 2) self-management, 3) social awareness, 4) relationship skills, and 5) responsible decision making and each developmental indicator has three competencies, 1) agency, 2) belonging, and 3) agency. This rubric also provides indicators that are specific to middle school students.

The STAAR Mathematics Assessment measures what students are learning and whether they are ready for the next grade level using state curriculum standards in core subjects such as reading, writing, mathematics, science, and social studies. These exams are required for all public-school students in grades 3-8. For the *Math+SEL+E* project, we will use raw scores on the STAAR mathematics exam (Texas Education Agency, 2022).

The Student Attitudes Towards STEM (S-STEM) scale was validated by the Friday Institute for Educational Innovation (2012). It contains three constructs, 1) math attitudes (8 items, α=0.90), 2) science attitudes (9 items, α=0.89), 3) engineering and technology attitudes (9 items, α=0.90), and 4) 21st century learning attitudes (11 items, α=0.92). Differential item functioning was used to assess the internal validity of the survey.

The Student Mathematics Trajectories Survey will be developed by the research team to track whether students enroll in advanced high school mathematics courses upon graduation from middle school.

The Student Academic Achievement will be collected from middle school students in the form of their course grades in their mathematics classes.

D4.3. Analysis Plan

As seen above in **Section D4**, the *Math+SEL+E* has robust measures designed to meet the project objectives and outcomes. To periodically assess the influence of our performance measures on achieving the intended outcomes of the *Math+SEL+E* project, we have designed an impact evaluation analysis plan. The impact analysis plan, designed to determine causal results, will analyze mean differences for both within and between teacher groups using both t-tests and repeated measures ANOVAs.

We will also conduct a non-impact analysis, that uses analyses not necessarily designed to find causal results. These analyses (such as multilevel modeling, which is based on correlational analyses) will account for nesting/clustering (students nested within teachers within schools) to measure associations between measures of interest and student- and teacher-level demographic variables.

D5. Information to Guide Possible Replication

The design for implementing and evaluating the proposed project will be conducted in a systematic way that will result in information to guide the replication of project activities. The evaluation has been designed to demonstrate effectiveness of *Math+SEL+E* so that other districts may choose whether it suits their needs. All project materials supporting integrated mathematics, SEL, and equity PD, will be freely available using our project website (**Section B.4**). All components of the *Math+SEL+E* project are replicable and scalable (**Section A.2**). Further, all measures used in this evaluation are freely available, therefore, our evaluation plan would be fully replicable by other organizations.

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