JOURNAL OF THE NATIONAL ORGANIZATION FOR STUDENT SUCCESS

Volume 2, Issue 2 Fall 2025

Teaching for Engaged Development: Reframing Postsecondary Developmental and Introductory Mathematics

Amy Lawrence-Wallquist
Texas State University

Emily K. Suh
Texas State University

Abstract

Many students enrolled in introductory postsecondary mathematics courses require additional support to master course content. Reforms focused on increasing students' college persistence and retention have condensed developmental mathematics course sequences without simultaneously attending to how material is taught in these courses. Yet the mathematics faculty teaching developmental mathematics lack pedagogical training. This paper draws from education studies and developmental education scholarship to present Teaching for Engaged Development, a pedagogical framework that emphasizes students' development as mathematical thinkers and members of the academic community. In particular, the framework centralizes rigorous instruction in mathematical content, supports general academic (i.e., non-mathematics disciplinary) skills for college success, and positions students and instructors as collaborators in student success. The TED framework facilitates incorporating academic development opportunities and equitable teaching into the course structure of postsecondary developmental and introductory mathematics courses to strengthen faculty's application of engaged asset-based pedagogies in their mathematics classrooms and better support students' engagement in the course and help them learn the skills that will serve them in future coursework.

Keywords: developmental mathematics, active learning, equitable teaching practices, self-regulated learning

Recommended Citation

Lawrence-Wallquist, A., & Suh, E. K. (2025). Teaching for engaged development: Reframing postsecondary developmental and introductory mathematics. *Journal of the National Organization for Student Success*, *2*(2), 45-61. https://doi.org/10.61617/jnoss.59

Developmental education reform rhetoric largely emphasizes increasing enrollment (i.e., access) rather than increasing support for students' persistence through their college courses (i.e., success). Such narratives have proliferated a view of developmental mathematics courses as stalling students' postsecondary progression (Brathwaite et al., 2020). Importantly, however, structural reforms targeting course sequences have not taken up the equally necessary work of pedagogical or curricular reform. While researchers have illuminated the systemic failure of institutions and instructors to support traditionally marginalized students' persistence and success in the developmental mathematics classroom and beyond (Bickerstaff et al., 2022; Chen, 2016), ongoing developmental mathematics reforms have offered little direction on how the subject of mathematics and the students within the mathematics classroom are taught (Ariovich & Walker, 2014; Brower et al., 2018; Jaggars & Bickerstaff, 2018). Although these reforms seek to address the structural obstacles our students face, they have failed to significantly advance equitable student success through mathematics courses. Studies in Tennessee and Texas have demonstrated some short term success with the states' legislated co-requisite model passing college level mathematics; however, degree attainment after three years has failed to show the same positive results (Meiselman & Schudde, 2022; Ran & Lin, 2022). Acceleration, corequisite courses, and other equity initiatives that increase the number of students in credit-level mathematics courses require a commensurate increase in mathematics faculty's understanding of developmental education principles and practices to benefit both individual students and the institution as a whole.

Just as course sequences must be redesigned, so too must we address the way students are taught in these courses. Within the broader context of ongoing developmental education reform and equity work, developmental mathematics reform cannot simply end with redesigned course sequences—it must also include a reform of *how we teach* students in these courses. In short, additional reforms are needed to eliminate persisting equity gaps and to help improve persistence to graduation rates. Within these newly redesigned course sequences, developmental mathematics instruction, in particular, requires an explicit refocusing that integrates the wisdom from theories of active social learning, equity practices, and developmental education, such as self-regulated learning theory (Zimmerman, 1995) which we focus on with this article.

Increasingly developmental mathematics content is now delivered through co-requisite approaches in which students are concurrently enrolled in a developmental support course along with a transfer-level credit-bearing course such as college algebra, statistics, or a mathematics survey course for non-STEM majors (Hodges et al., 2020). The corequisite model creates space for students to review and practice content knowledge through "just-in-time" learning in the developmental course while also experiencing the increased rigor of the college-level course and earning college credit in their first term in college. As such, the developmental course must support students' content mastery as well as their developing academic skills through teaching approaches that engage students from a range of backgrounds, interests, and experiences. In addition to supporting mathematical content knowledge growth, developmental mathematics educators are expected to create learning environments that foster students' academic identity development in equitable, culturally relevant, and mathematically rigorous ways. These educators must also be prepared to facilitate equity-oriented learning activities that increase students' preparation for success in all of their coursework and in their future careers.

This work can be daunting to mathematics faculty who have limited training in education studies or asset-based pedagogies and to their program administrators with graduate preparation in mathematics but not in teaching or faculty development. In response to these challenges, we present Teaching for Engaged Development (TED), a pedagogical framework that emphasizes students' development as mathematical thinkers and members of the academic community. The TED framework strengthens faculty's application of engaged asset-based pedagogies in their mathematics classrooms by incorporating academic development opportunities and equitable teaching practices into instruction and course structure. Programs and individual faculty can use the framework to centralize rigorous instruction in mathematical content, support general academic (i.e., non-mathematics disciplinary) skills for college success, and position students and instructors as collaborators in student success. The framework draws from self-regulation theory (Boekaerts, 1995; Zimmerman, 1995)–a major focus of developmental education research and practice–because many developmental courses are now paired with college-level courses; as such, the TED framework offers an integrated approach that is relevant to teaching first-year students in any mathematics course. As we presented at the 2025 National Organization of Student Success (NOSS) conference in New Orleans, Louisiana, the framework combines active social learning, equitable practices for teaching mathematics, and self-regulated learning practices from developmental education pedagogies. We see the framework's intersecting pedagogical approaches as especially relevant in access-oriented institutions.

In our 2025 NOSS conference presentation, we presented examples of how the TED framework supports incorporating essential non-content-based skills, such as academic goal setting and self-regulated learning, into content-based activities to support students' mastery of both content and non-content-based skills in first-year mathematics contexts. Adding these developmental learning aspects to mathematics teachers' existing knowledge base is essential to helping students broaden their skills and thus increase their likelihood of college success. In this paper, we extend our call to integrate the three aspects of TED into individual classroom learning activities and to also restructure math courses using the TED framework. Such restructuring will support rigorous mathematics instruction as well as explicitly address students' academic development with an equal focus on equitable teaching practices. As we articulate below, structuring developmental and introductory mathematics courses around the TED framework creates classroom conditions to positively impact success in students' mathematics courses—and in their broader postsecondary experiences.

Author Positionality

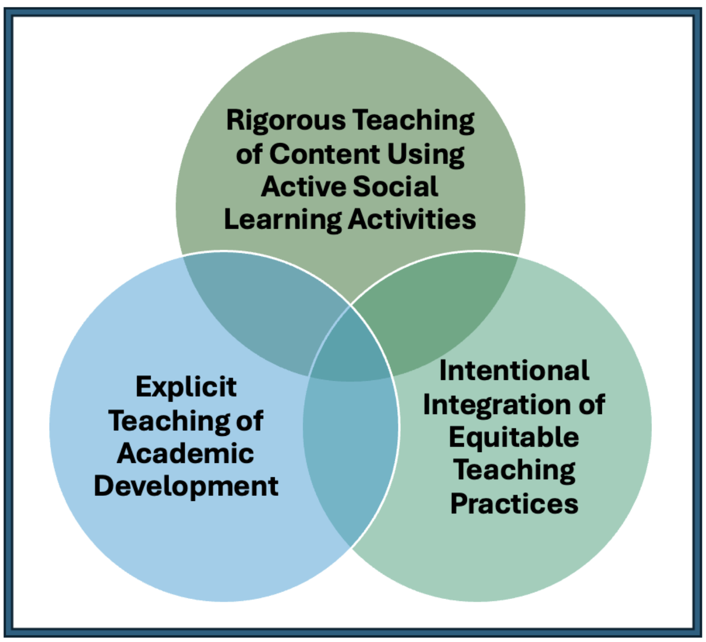
Amy is a developmental mathematics instructor and a doctoral student in postsecondary student success. Emily is faculty in a graduate program in postsecondary student success and a developmental literacy program coordinator who regularly provides training and support to postsecondary mathematics faculty. Our individual and collective experiences have led us to question the effectiveness of the traditional instructional approaches applied in developmental mathematics classrooms. For example, although mathematics education emphasizes the benefits of collaborative, cooperative learning opportunities, our review of developmental mathematics course syllabi from several institutions uncovered that traditional developmental mathematics classes often remain focused on working to "fill the gaps" in mathematical content using online or written homework, quizzes, and tests. Little time is left for exploring mathematics, much less developing non-content-based skills that many first-time-in-college students need to practice and master. Our experiences have led us to believe that students need the opportunity to practice so that these skills can become part of their problem-solving toolbox in mathematics and non-mathematics classes alike. Students also need support to develop skills that transcend the mathematics discipline. However, we recognize that this perspective of our students and instruction is one that mathematics faculty are seldom trained to develop.

Teaching for Engaged Development: A Theoretically Informed Framework for Developmental Mathematics Instruction

We believe that all students enter college with academic capital, or knowledge about how to engage and learn in a classroom, relevant to their mathematical learning and broader college success. In this article, we argue that developmental mathematics instruction best leverages students' academic capital by attending to three overarching theoretical influences, the whole of which represents Teaching for Engaged Development (Figure 1).

Figure 1

The Three Aspects of TED



First, instructors must continue to provide rigorous instruction in the mathematical content of the course to support students' mathematics preparation for their field of study. Research supports claims that active learning opportunities provide improved outcomes as compared to lecture alone (Freeman et al., 2014). Second, instructors must support students' development of general academic (i.e., non-mathematics) skills for college success; we focus on self-regulated learning in particular (Boekaerts, 1995; Zimmerman, 1995, 2002). Third, instructors must collaborate with students to co-create inclusive, engaged learning environments that support all students' success through an equity lens. When instructors work to combine all three pedagogical theories into our practice—seen when looking at the entirety of the Venn diagram in Figure 1—they are Teaching for Engaged Development. We recognize the novelty of this approach: active social learning, self-regulated learning, and equitable teaching practices for mathematics originate in distinct fields of knowledge which have not previously been considered in combination with each other in (developmental) mathematics, although they share an emphasis on supporting the goals and developing abilities of the learner. TED does not require integrating all three of the framework's aspects into every activity, lecture, and assignment. Instead, we see the framework as strengthening our practice by interweaving these pedagogical approaches into our overall course design and being explicit in their inclusion.

TED emphasizes a student-centered perspective that positions learners' goals, interests, and abilities at the heart of classroom practice. Below, we introduce each of the pedagogical theories guiding our framework. Importantly, our framework is not meant to be exclusive as if to suggest that TED—and thus supporting students in introductory-level mathematics classes—requires only three elements. Instead, we introduce our framework as a model of how instruction in the developmental mathematics classroom can combine scholarly expertise from a range of disciplines in order to present an integrated pedagogical approach to supporting student learning in first-year mathematics contexts.

Table 1

Equity Practices and Self-Regulated Learning Components

Equity Practices	Self-Regulated Learning Components								
	Pre-Action		Action					Post-Action	
	A. Affect	B. Goal Setting	C. Motivation	D. Self-Efficacy	E. Planning	F. Performance	G. Self-Monitoring	H. Learning Outcome	I. Affect
1. Draws on Funds of Knowledge									
2. Established Classroom Norms for Participation									
3. Position Students as Capable									
4. Monitor How Students Position Each Other									
5. Attend Explicitly to Culture & Race									
6. Recognize Multiple Forms of Discourse and Language as Resource									
7. Press for Academic Success									
8. Attend to Students' Mathematical Thinking									
9. Support the Development of a Social Justice Disposition									
10. Make the Implicit Explicit									

Note. Equity Practices 1-9: Bartell et al. (2017), 10: Herbel-Eisenmann and Otten (2011). SRL components: Zimmerman (2002) and Bandura (1997).

Table 1 includes a list of equity practices that have been extensively researched and can be found in the literature. Bartell et al. (2017) compiled this list based on the work of many scholars whose work is focused on equity, including Civil (2007), Gay (2002), Ladson-Billings (1995), and others. (Interested readers can find the full list of references on pages 11-12 of Bartell and colleagues' article.) The last row in Table 1 is based on the work of Herbel-

Eisenmann and Otten (2011). The headings across the top include components of self-regulated learning based on the work of Zimmerman (2002) and Bandura (1997). This table was designed for instructors to use as a reference when creating active social learning opportunities for teaching mathematical content. At the NOSS 2025 conference, we provided several examples of learning activities that utilized various combinations of active social learning, equitable teaching, and self-regulated learning. We provide an additional example later in this article.

TED: Active Social Learning (of Mathematics Content)

Informed by social constructivism, *Active Social Learning,* is the first tenet of Teaching for Engaged Development (Figure 1) and emphasizes the central role of social interactions and language for learning and development (Vygotsky, 1978). In particular, active social learning seeks to tangibly create in the classroom what Vygotsky theorized as the Zone of Proximal Development (ZPD): a figurative space between where students can accomplish a task independently and where they cannot accomplish the task at all. Within the ZPD, students can learn or do something with help and collaboration from others. Vygotsky argued that students internalize their learning when they use language to collaborate with others within their ZPD. In a mathematics classroom, active social learning occurs when students accomplish a task through collaboration with others and engagement with mathematics content.

While instructor-centered practices, such as lecturing, are widely recognized as negatively affecting students (Freeman et al., 2014; Laursen et al., 2014; Laursen & Rasmussen, 2019), active social learning improves academic performance and also positively influences affective dimensions including persistence, confidence, and sense of belonging in mathematics and STEM more broadly (Hayward et al., 2016; Kogan & Laursen, 2014; Theobald et al., 2020). Several pedagogical practices can support this type of learning in the mathematics classroom, such as think-pair-share, paired board-work, and small group work (Freeman et al., 2014; Marzocchi & Soto, 2023). Marzocchi and Soto (2023) provide several solutions to help transform the mathematics classroom from the lecture culture to more active social learning practices. They note that support of these practices by the department and the institution in the form of professional development opportunities and even continuous encouragement for active learning environments strengthen instructors' practice in this area.

TED: Self-Regulated Learning Theory

Although there are many learning theories relevant to supporting college students' academic success and persistence, the second component we discuss from the TED framework draws from self-regulated learning theory (Bandura, 1991, 2001; Zimmerman, 2002) given its centrality in learning assistance and developmental education scholarship. Self-regulation refers to individuals' ability to set and monitor goals, and to adjust their efforts to achieve these goals (Bandura, 1991). Self-regulation exists in three phases: *Pre-action* or *Forethought* includes goal setting and strategic planning and is influenced by self-efficacy, outcome expectations, intrinsic motivation, and learning goal orientation. Next, *Action* or *Performance* includes self-instruction, attention focusing, task strategies, and monitoring. Finally, the *Post-action* or *Self-refection* phase encompasses self-evaluation and causal attribution (Bandura, 1991; Zimmerman, 2002).

Self-regulation can support students' ability to monitor their understanding of the course material and to prepare for upcoming exams. Mathematics courses often have weekly or twiceweekly assignments. Supporting students' goals around on-time assignment completion, in particular, can benefit their overall success in both developmental and college-level courses. Many students coming directly from high school are accustomed to generous late work policies that can negatively impact both learning and course success if incorporated into a 15-week (or shorter) college course. Students benefit from ample opportunities to practice strategically setting and reflecting on their goals. This includes articulating measurable and achievable goals, monitoring progress toward goals, receiving guidance to refine their strategies, and finally reflecting on their performance so they can adjust strategies for future classes. Each of these can be achieved by integrating end-goal oriented activities into the regular coursework. Making these learning strategies explicit and connected to the content is essential to sustaining a learning environment accessible to all students regardless of the skills or knowledge they bring into the classroom.

In a mathematics classroom, a semester-long learning activity related to setting and achieving one's goals can incorporate all of the components of SRL. In the pre-action phase, this might include spending time explicating grade weights or the points system that will be used to calculate the final grade and then having students set some goals related to final grades and the intermediate steps that it will take to meet those goals. The action or performance phase might incorporate a midsemester check-in about students' number of completed assignments, their number of absences, and a reflection about what corrections might need to be enacted to meet their initial goal. A final reflection activity based on this goal setting/achieving assignment that Amy uses includes "a letter to yourself on the first day of the semester." This assignment, which can be completed as a short essay or a video, asks students to send their past selves a piece of advice or encouragement about what they might have done to be successful or more successful in the class and what they might do to be successful in their future classes. Connecting the time and effort spent on assignments with the content mastery helps students better understand the connection between effort and outcome and helps them develop the metacognitive skills that support success in all their classes, not just in math.

TED: Equitable Practices for Engaged Learning

Third, TED also incorporates equitable teaching practices for engaged mathematics learning. We use the phrase *engaged learning* to encompass a range of pedagogical approaches that draw from learners' prior experiences to enhance all students' engagement in the learning process. Mathematics educator and social justice activist, Eric (Rico) Gutstein (2012) conceptualizes this type of instruction as giving students the tools to read and write the world with mathematics through projects designed with the aim of increasing students' awareness social justice issues. We see this as a process of beginning to *right* the world with and through mathematics. In their framework on equitable teaching, mathematics educators Bartell et al. (2017) included nine relevant practices: using students' funds of knowledge, establishing classroom norms for participation, positioning students as capable, monitoring students' positioning of each other, attending explicitly to race and culture, recognizing multiple forms of discourse and language as a resource, pressing for academic success, attending to students mathematical thinking, and supporting a sociopolitical disposition. To these we add teaching in ways that make the implicit, explicit–not only mathematical processes and steps (Herbel-Eisenmann et al., 2015), but also all aspects of the learning environment and its expectations

(Delpit, 1988). Such teaching is culturally relevant and responsive (Abdulrahim & Orosco, 2020; Gay, 2018; Gutstein et al., 1997; Ladson-Billings, 1995).

Gutstein has written extensively about his experiences integrating social justice issues into the middle school mathematics classroom through project-based learning such as "Driving While Brown or Black: Investigating Racial Profiling" (Gutstein, 2006, p. 53). Other scholars have examined the role of multilingualism in creating and delivering culturally relevant mathematics instruction for Latine elementary students (Krause et al., 2022; Maldonado Rodríguez et al., 2020). Although beyond the postsecondary mathematics classroom, these equity-oriented perspectives and assignments suggest what is possible for supporting an engaged learning environment in which students are invested in and able to direct their own learning. Ultimately, equity-oriented practices enhance instructors' ability to attend to students' academic and psychosocial developmental needs, allowing us to leverage areas of overlap within TED to better serve all students.

Instructional Reframing to Teach for Engaged Development in Postsecondary Mathematics

In our original explication TED at the 2025 NOSS conference, we presented several sample activities that integrate the three aspects of TED in different ways; however, simply modifying a handful of class activities cannot adequately address the entirety of the TED framework. Just as we recognize that course sequence modifications alone are insufficient for truly meaningful developmental education reform, we also acknowledge that simply modifying a few in-class activities will not establish the TED culture we seek to cultivate within developmental mathematics and other undergraduate mathematics courses for first-year students. Essentially, the framework invites instructors to reframe the ways that they interact with students and the ways that they conceptualize the purpose of their courses. We contend that this work with students must begin on the very first day of class. Ultimately, the work extends beyond adjusting existing assignments and requires restructuring the way we think about postsecondary mathematics pedagogy. In this final section, we demonstrate how the framework can structure broader engagement expectations in our classrooms and begin to influence mathematics course design from the very first day of the term.

An Equity and Self-Regulation Example for Collaborative Engagement

At the center of TED is our belief that, regardless of disciplinary context, students learn best in community and that this community must both draw from culturally rich resources that connect to students' lived experiences and support students' developing ability to carry out personally meaningful academic goals that align with the stated course objectives. Making classroom and course engagement expectations explicit for students is a central goal of TED. This explication is an essential equity practice (Delpit, 1988; Herbel-Eisenmann et al., 2015). Many students enter college with expectations about how to be a student based upon high school experiences that do not align with their college instructors' (oftentimes implicit) expectations for students' participation in the college classroom. For example, while high school teachers frequently reward attendance, college professors may heavily weight exams and assignments, offering few to no points depending upon whether or not a student was physically present in class, based on the faculty's (often correct) assumption that attendance is the minimum necessary for both learning and achieving a passing grade. Clarifying expectations for success is particularly essential in developmental math courses, which are among the first many students will take in college and which are responsible for teaching more than just content. In this section, we offer an extended example to guide readers' understanding of what this pedagogical approach to build community would look like in a first-year mathematics class.

First-year mathematics courses provide an ideal opportunity for students to connect their engagement with course material and their academic success. These early college classes are also where many students learn that their instructors provide opportunities, but that they as the students, are ultimately responsible for their success. Our classrooms are an ideal environment for unpacking engagement norms, and faculty should consider this time at the beginning of students' postsecondary career as a transitional period deserving of scaffolded developmental learning opportunities for students to actively engage in their learning journey.

Integrated support begins in the first minute of the first day. Instead of the instructor reading—or simply referring to—the syllabus statement on participation, faculty utilizing TED will collaborate with students to create, monitor, and evaluate the expectations for their in-class engagement. Discussion about what it means to be engaged during class sessions is essential for first-year students, especially first-generation students and students taking developmental courses. Such discussions should clearly explicate expectations, including the academic standards for coursework and expected behaviors for both students and the instructor. Importantly, we also urge our colleagues to shift from a focus on participation (seen as an active, physical manifestation of students' investment in their learning) to a focus on engagement. Following Hoffman et al. (2005), we view engagement as a practice that also acknowledges more passive forms of learning, such as listening and taking notes during lectures or working independently at one's own desk rather than at the board to solve a problem in class. Ultimately, we view engagement as more valuable than participation, but potentially more difficult to observe.

Faculty can ask students to provide engaged–and unengaged–behavior examples to be added to a class contract or the syllabus and to be assigned corresponding grades. For example, the class might agree that in-class engagement involves attempting all problems discussed in class and asking for help when a problem is not understood. The class might further decide that students with this level of in-class engagement will earn full points for that category in the gradebook. Use of headphones or earbuds during class activities or lectures is another fruitful topic for the discussion about engagement. Regardless of students' intentions, wearing headphones often signals to both the instructor and classmates that a student is not fully present and that the lesson is not valuable to them. (Of course, there are exceptions to this due to overstimulation, but these exceptions should be accommodated with the help of the disability/access office). Jointly establishing class expectations regarding headphone or earbud use invites students to take ownership of their actions/behaviors and the way these are perceived by other members of their academic community. The class can also have a fruitful conversation about attendance and the percentage of classes that a student must be fully engaged (and therefore necessarily present) in to earn a passing grade.

Each of these topics can inspire a collective discussion about engagement expectations that directly addresses *Active Social Learning* (i.e., discussing and collectively establishing rather than receiving engagement expectations) and *Equity Practices* (i.e., drawing from students' examples and evaluations of various forms of engagement) from the TED framework while also preparing students to engage in *Self-Regulated Learning* by setting goals for their own engagement. Further, we see such efforts to incorporate student perspectives and knowledge about classroom expectations as honoring the wealth of knowledge students bring into the classroom in alignment with other asset-based pedagogies (Gay, 2018; Ladson-Billings, 2021; Paris & Alim, 2014). Further, TED seeks to draw from students' academic capital, i.e., their knowledge about being in a classroom and being successful in college. We argue that students' knowledge of how to engage in academic contexts and their goals for enrolling in college are also valuable symbolic resources which can be leveraged to increase their college success.

Beyond their choices about whether and how to engage in class, students' choices regarding their out-of-class assignments also have a significant impact on their grades and success in the first-year mathematics classroom. However, many students come to college with unrealistic understandings of the workload necessary for success. Frequently, these expectation recalibrations are something students have had to make independently. Similarly, students may not understand the significance of completing assigned out-of-class problems for concepts that are only briefly discussed in class, but which students are expected to master. Clearly explicating the rationale for an assignment, including how its completion will prepare students for understanding upcoming concepts, positions students to understand the assignment's importance and thus to make an informed decision about whether and how to complete the assigned work, supporting their self-regulated learning. This work of engaging students as autonomous partners in their learning requires continuous discussion throughout the term.

Rather than simply handing out a course calendar with assignment due dates on the first day of the semester and reminding students to refer to it throughout the term, faculty who teach first-year mathematics courses can help students apply their self-regulation and time-management skills by working together to create a study schedule and then helping students to monitor their progress and teach them to adjust as necessary to achieve their goals. This practice can be especially helpful for students who have responsibilities outside of postsecondary coursework such as full or part-time work or caring for family members. This equity practice includes clarifying for students that credit hours correlate to expected outside-of-class study time–for each hour they are in class, they are expected to spend two or three hours outside of class doing assignments, preparing for lecture, and other studying. Performing these calculations with students is an easy addition to the first-day-of-class routine. In our own courses, we encourage students to create a schedule for when they will study and prepare for class in a weekly calendar to set clear expectations about the time required for the course and to give students a tangible takeaway that serves as a reminder of these expectations. Students can also create weekly to-do lists, beginning the work as a class with the instructor gradually releasing responsibility so that students are ultimately responsible for creating their own lists. Many students have not yet fully developed these skills by the time they come to college or university. Developmental and introductory classes should be a place where students are supported in developing these skills that will support their success and persistence in postsecondary education.

Dedicating time, as a part of our daily teaching practice, to help students understand the overall course expectations, the weekly expectations, and the daily classroom norms, makes the implicit explicit and helps set students up for success. When faculty model how to plan for the week, month, and semester as part of regular classwork, they help students apply their self-regulated learning in daily use. Because many students are grade-motivated, this practice requires setting expectations about what it takes to make the grade students want over the length of the course. Faculty cannot simply write down their expectations in a syllabus and assume students will understand the expectations. We need to teach them. We also need to work with them to agree to our terms for how they can meet these expectations, why they should, and what it means if they do not. When students are unprepared for the expectations of their college classes, they are at increased risk of falling behind in the work, not understanding course concepts, and ultimately not persisting to graduation. Unfortunately, students in developmental classes often engage in a type of double jeopardy as they experience stigmatization based upon their placement into the developmental course as well as mistakenly assume that other students are “math people who just get it” and make good grades without effort.

In Amy’s developmental mathematics courses, almost all of the students are first-year, first-time-in-college students. In the middle of one semester, she received an email from a student asking how they could submit the work they had just finished—but which was past due by several weeks. Although it may be tempting to accept this work in acknowledgement of the student’s effort, Amy instead redirected the student to the late work policies that the class had agreed upon on the first day. Amy also reminded the student that missing a few assignments would not impact their grade much as long as they kept up with future work. She ended by celebrating that the student had completed the assignments because they would build upon that knowledge in the future lessons. Discussing engagement expectations for inside and out of the classroom ensures that students are fully informed—a necessary precondition to students’ autonomous and agentive learning. Creating the space for norm setting as a class makes explicit the otherwise implicit expectations of a college-level classroom.

Most postsecondary mathematics developmental mathematics instructors are expected to have deep and wide mathematical content knowledge. Many have been considered gifted in mathematics from a young age. Additionally, instructors often routinely use some aspects of equitable teaching practices, such as attending to students’ mathematical thinking and pressing for academic success, which are often well integrated in many developmental classrooms. Still, other equitable practices such as building on students’ funds of knowledge and attending explicitly to race and culture are not as familiar or as well utilized (Bartell et al., 2017). Many of our students enter the classroom with tenacity and the experience of having overcome significant barriers to their enrollment in college. Our personal experience with supporting developmental mathematics faculty has taught us that many of these instructors feel underprepared to teach non-disciplinary content such as self-regulation elements of goal-setting, planning, monitoring, and reflecting in ways that capitalize on what these students bring to the classroom.

Providing examples of non-content-based skills students need and how content-based assignments and projects can be utilized to help students’ mastery adds to mathematics instructors’ existing knowledge base. However, not all mathematics instructors have the pedagogical knowledge to implement these non-traditional types of learning activities. Our institutions need to support instructors as they acquire this knowledge and begin to integrate these principles into their teaching praxis. Communities of practice specifically designed for instructors who teach developmental and introductory courses and led by experts in developmental education and postsecondary student success can introduce these “new to some” practices. Equity minded researchers Marzocchi and Soto (2023) explain how communities of practice can help instructors transform their traditional lecture heavy classrooms to include active learning opportunities. There is reason to believe that communities of practice could also help instructors incorporate academic development activities and equitable teaching practices as well (Bannister, 2018). The collaborative nature of communities of practices helps to ensure that members work together on a mission of continual improvement of all the course activities–be they mathematical content, developmental learning opportunities, equity practices, or all of these for the benefit of all the students.

Future Applications and Implications

Based on our experience, we argue that the developmental education reforms redesigning course sequences will ultimately fall short of both their equity goals and their content mastery objectives without a similar redesign of how students are taught in first-year mathematics courses. While previous reform efforts have largely been driven by stakeholders from outside the classroom, we argue that instructors themselves are best suited to lead reforms of how students are taught in first-year mathematics classes. In this present iteration of the TED framework, we draw in particular from self-regulation theory to argue that the developmental mathematics class is an essential space for supporting students' developing understanding of college classroom participation or engagement expectations. We hope that future expansion of the framework will allow us to explore how to incorporate other learning theories into our work. Through the framework, students are viewed as partnering with their instructors to collaboratively plan for the students' success. Drawing from scholarly knowledge from developmental education, mathematics education, and education studies, we present the TED framework as a pedagogical approach to guide mathematics faculty's reimagining of their instructional practice. We offer the TED framework as an opportunity to begin engaging all of our colleagues in conversations about supporting students beyond the disciplinary content. In particular, TED encourages instructors to begin from an asset-based and holistic view of their students and their students' abilities and goals. This article offers our extended exploration of how the TED framework can reshape the first day of class, carry that reshaping throughout the semester, and reframe the class community's understanding of learning; this article further invites faculty to engage in conversations at their own institutions about how we can reimagine first-year mathematics to truly support student success in our classrooms and beyond. We acknowledge that this framework is the first step in a much longer journey of rethinking the way we teach mathematics content and students. We hope that future collaborations within our community of practice will yield subsequent publications of empirical data from action research resulting from the use of our framework.

The TED framework challenges current beliefs about teaching and learning in postsecondary developmental mathematics by drawing from connections to equity-oriented and active, social learning pedagogies for mathematics as well as self-regulation theory. While seemingly disconnected, these approaches share a view of students as agentive and well-resourced for actively engaging in their learning. As noted above, Teaching for Engaged Development is not a demand that all instruction and activities address all three aspects of the framework. Rather, the framework is intended to support developmental and introductory mathematics instruction that aims to provide a balanced approach throughout the course.

At our own institution, we have invited faculty to participate in an interdisciplinary community of practice that explores different developmental education theories and their practical applications across English composition, reading, and mathematics. Our voluntary community of practice is comprised of faculty and graduate teaching assistants who teach sections of corequisite developmental mathematics or literacy courses. The community meets quarterly to explore a concept or skill, such as goal setting, and then establish plans for implementing small assignments that address the skill across the disciplines. Over the two years our community has been meeting, faculty and doctoral students from each discipline have taken the lead in our professional development initiatives as we seek to integrate additional student success support into our classes. However, at the heart of our community of practice is the support we provide each other as we improve our own practice in order to better support our students. Our next steps involve researching the impact of the practices supported by the TED framework to explore questions about the extent to which teaching this way supports students' academic success in their current mathematics class(es), their success in all classes after developmental courses, their persistence, and their sense of belonging in the university community.

Having more instructors with a deep understanding of developmental education serves all students—and the institution as a whole. This is especially relevant for access-oriented institutions. The cross-disciplinary focus of developmental education further guides the TED framework's integration into our courses and, as such, requires both instructor and course developer buy-in. Academic development and content mastery are critical aspects of developmental education and should hold a prominent place in developmental courses. We urge course designers to strongly consider adding academic development goals to course objectives so that instructors and students understand academic development to be as important as content mastery in the developmental mathematics course.

This work is challenging, and we call upon our colleagues to work collectively to refine our postsecondary mathematics instruction at all levels. Corequisite education is designed for collaboration. We should use that to our benefit rather than work against it. Finally, we call for broader connections between researchers from mathematics education and other fields to continue developing theories of teaching and learning in support of student success in developmental mathematics and beyond. Such collaboration is essential not just for developmental education, but for our broader educational equity goals. These connections are vital so that the students we teach can build a better future for themselves and for their communities.

References

Abdulrahim, N. A., & Orosco, M. J. (2020). Culturally responsive mathematics teaching: A research synthesis. *The Urban Review*, *52*(1), 1-25. https://doi.org/http://dx.doi.org/10.1007/s11256-019-00509-2

Ariovich, L., & Walker, S. A. (2014). Assessing course redesign: The case of developmental math. *Research & Practice in Assessment*, *9*(1), 45-57. https://doi.org/ https://link-gale-com.libproxy.txstate.edu/apps/doc/A384098518/AONE?u=txshracd2550&sid=bookmark-AONE&xid=ee5ebc15

Bandura, A. (1991). Social cognitive theory of self-regulation. *Organizational Behavior and Human Decision Processes*, *50*(2), 248-287. https://doi.org/http://dx.doi.org/10.1016/0749-5978(91)90022-L

Bandura, A. (1997). *Self-efficacy: The exercise of control*. Macmillan.

Bandura, A. (2001). Social cognitive theory: An agentic perspective. *Annual review of psychology*, *52*(1), 1-26. https://doi.org/http://dx.doi.org/10.1146/annurev.psych.52.1.1

Bartell, T., Wager, A., Edwards, A., Battey, D., Foote, M., & Spencer, J. (2017). Toward a Framework for Research Linking Equitable Teaching With the Standards for Mathematical Practice [research-article]. *Journal for Research in Mathematics Education*, *48*(1), 7-21. https://doi.org/10.5951/jresematheduc.48.1.0007

Bickerstaff, S., Beal, K., Raufman, J., Lewy, E. B., & Slaughter, A. (2022). *Five principles for reforming developmental education: A review of the evidence* (Center for the Analysis of Postsecondary Readiness, Issue.

Boekaerts, M. (1995). Self-regulated learning: Bridging the gap between metacognitive and metamotivation theories. *Educational Psychologist*, *30*(4), 195-200. https://doi.org/10.1207/s15326985ep3004_4

Brathwaite, J., Fay, M. P., & Moussa, A. (2020). *Improving developmental and college-level mathematics: Prominent reforms and the need to address equity. CCRC Working Paper No. 124* (Community College Research Center, Teachers College, Columbia University, Issue. https://ccrc.tc.columbia.edu/publications/improving-developmental-college-level-mathematics.html

Brower, R. L., Woods, C. S., Jones, T. B., Park, T. J., Hu, S., Tandberg, D. A., Nix, A. N., Rahming, S. G., & Martindale, S. K. (2018). Scaffolding mathematics remediation for academically at-risk students following developmental education reform in Florida. *Community College Journal of Research and Practice*, *42*(2), 112-128. https://doi.org/10.1080/10668926.2017.1279089

Chen, X. (2016). *Remedial coursetaking at US public 2-and 4-year institutions: Scope, experiences, and outcomes. Statistical Analysis Report. NCES 2016-405* (National Center for Education Statistics, Issue.

Delpit, L. D. (1988). The silenced dialogue: Power and pedagogy in educating other people's children. *Harvard Educational Review*, *58*(3), 280-298. https://doi.org/10.17763/haer.58.3.c43481778r528qw4

Freeman, S., Eddy, S. L., McDonough, M., Smith, M. K., Okoroafor, N., Jordt, H., & Wenderoth, M. P. (2014). Active learning increases student performance in science, engineering, and mathematics. Proceedings of the National Academy of Sciences.,

Gay, G. (2018). *Culturally responsive teaching: Theory, research, and practice*. Teachers College Press.

Gutstein, E. (2006). "The real world as we have seen it": Latino/a parents' voices on teaching mathematics for social justice. *Mathematical Thinking and Learning*, *8*(3), 331-358. https://doi.org/https://doi.org/10.1207/s15327833mtl0803_7

Gutstein, E. (2012). *Reading and writing the world with mathematics: Toward a pedagogy for social justice*. Routledge. https://doi.org/https://doi.org/10.4324/9780203112946

Gutstein, E., Lipman, P., Hernandez, P., & de los Reyes, R. (1997). Culturally relevant mathematics teaching in a Mexican American context. *Journal for Research in Mathematics Education*, *28*(6), 709-737. https://www.jstor.org/stable/749639?utm_source=chatgpt.com

Hayward, C. N., Kogan, M., & Laursen, S. L. (2016). Facilitating instructor adoption of inquiry-based learning in college mathematics. *International Journal of Research in Undergraduate Mathematics Education*, *2*, 59-82. https://doi.org/https://doi.org/10.1007/s40753-015-0021-y

Herbel-Eisenmann, B. A., & Otten, S. (2011). Mapping mathematics in classroom discourse. *Journal for Research in Mathematics Education*, *42*(5), 451-485. https://doi.org/https://doi.org/10.5951/jresematheduc.42.5.0451

Herbel-Eisenmann, B. A., Wagner, D., & Johnson, K. R. (2015). Positioning in mathematics education: Revelations on an imported theory. *Educational Studies in Mathematics*, *89*(2), 185-204. https://doi.org/https://doi.org/10.1007/s10649-014-9588-5

Hodges, R., Payne, E. M., McConnell, M. C., Lollar, J., Guckert, D. A., Owens, S., Gonzales, C., Hoff, M. A., Lussier, K. O. D., & Wu, N. (2020). Developmental education policy and reforms: A 50-state snapshot. *Journal of Developmental Education*, *41*(1), 2-17. https://eric.ed.gov/?id=EJ1320569

Hoffman, D., Perillo, P., Hawthorne Calizo, L. S., Hadfield, J., & Lee, D. M. (2005). Engagement versus participation: A difference that matters. *About Campus*, *10*(5), 10-17. https://doi.org/https://doi.org/10.1002/abc.143

Jaggars, S. S., & Bickerstaff, S. (2018). Developmental education: The evolution of research and reform. *Higher education: Handbook of theory and research: Published under the sponsorship of the Association for Institutional Research (AIR) and the Association for the Study of Higher Education (ASHE)*, 469-503. https://doi.org/https://doi.org/10.1007/978-3-319-72490-4_10

Kogan, M., & Laursen, S. L. (2014). Assessing long-term effects of inquiry-based learning: A case study from college mathematics. *Innovative Higher Education*, *39*, 183-199. https://doi.org/https://doi.org/10.1007/s10755-013-9269-9

Krause, G., Adams Corral, M., & Maldonado Rodríguez, L. A. (2022). Developing awareness around language practices in the elementary bilingual mathematics classroom. *Journal of Urban Mathematics Education*. https://doi.org/https://doi.org/10.21423/jume-v15i2a462

Ladson-Billings, G. (1995). But that's just good teaching! The case for culturally relevant pedagogy. *Theory Into Practice*, *34*(3), 159-165. https://doi.org/https://doi.org/10.1080/00405849509543675

Ladson-Billings, G. (2021). *Culturally relevant pedagogy : asking a different question*. Teachers College Press. https://eric.ed.gov/?id=ED614975&utm_source=chatgpt.com

Laursen, S. L., Hassi, M.-L., Kogan, M., & Weston, T. J. (2014). Benefits for women and men of inquiry-based learning in college mathematics: A multi-institution study. *Journal for Research in Mathematics Education*, *45*(4), 406-418. https://doi.org/https://doi.org/10.5951/jresematheduc.45.4.0406

Laursen, S. L., & Rasmussen, C. (2019). I on the prize: Inquiry approaches in undergraduate mathematics. *International Journal of Research in Undergraduate Mathematics Education*, *5*(1), 129-146. https://doi.org/https://doi.org/10.1007/s40753-019-00085-6

Maldonado Rodríguez, L. A., Krause, G., & Adams Corral, M. (2020). Flowing with the translanguaging corriente: Juntos engaging with and making sense of mathematics. *Teaching for excellence and equity in mathematics*, *15*(2). https://doi.org/https://doi.org/10.21423/jume-v15i2a462

Marzocchi, A. S., & Soto, R. C. (2023). From the front lines of active learning: Lessons learned from those who are trying. *International Journal of Research in Undergraduate Mathematics Education*, *9*(2), 524-555. https://doi.org/https://doi.org/10.1007/s40753-022-00176-x

Meiselman, A. Y., & Schudde, L. (2022). The impact of corequisite math on community college student outcomes: Evidence from Texas. *Education Finance and Policy*, *17*(4), 719-744. https://doi.org/https://doi.org/10.1162/edfp_a_00365

Paris, D., & Alim, H. S. (2014). What are we seeking to sustain through culturally sustaining pedagogy? A loving critique forward. *Harvard Educational Review*, *84*(1), 85-100. https://eric.ed.gov/?id=EJ1034292&utm_source=chatgpt.com

Ran, F. X., & Lin, Y. (2022). The effects of corequisite remediation: Evidence from a statewide reform in Tennessee. *Educational Evaluation and Policy Analysis*, *44*(3), 458-484. https://doi.org/https://doi.org/10.3102/01623737211070836

Theobald, E. J., Hill, M. J., Tran, E., Agrawal, S., Arroyo, E. N., Behling, S., Chambwe, N., Cintrón, D. L., Cooper, J. D., & Dunster, G. (2020). Active learning narrows achievement gaps for underrepresented students in undergraduate science, technology, engineering, and math. *Proceedings of the national academy of sciences*, *117*(12), 6476-6483. https://doi.org/https://doi.org/10.1073/pnas.1916903117

Vygotsky, L. (1978). Interaction between learning and development. In M. Gauvain & M. Cole (Eds.), *Readings on the development of children*. Macmillan.

Zimmerman, B. J. (1995). Self-regulation involves more than metacognition: A social cognitive perspective. *Educational Psychologist*, *30*(4), 217-221. https://doi.org/https://doi.org/10.1207/s15326985ep3004_8

Zimmerman, B. J. (2002). Becoming a self-regulated learner: An overview. *Theory Into Practice*, *41*(2), 64-70.