



***Mathematical Readiness:
Early Childhood (K-3) Teaching and Learning Program***
Innovation Partnership

Program Overview

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S²TEM Centers SC is an innovation partnership managed by South Carolina's Coalition for Mathematics & Science at Clemson University. Its purposes are to improve instruction and accelerate student learning in Science, Technology, Engineering and Mathematics content areas through innovation, support and research.

General Overview

Introduction

S²TEM Centers SC/SCCMS has designed a comprehensive system of scaffolded support for early childhood teachers to support their understanding and application of evidence-based instructional strategies in the mathematics classroom to improve student learning. This partnership is intended to be a *three-year innovation program* designed to engage K-3rd grade teachers in ongoing, face-to-face, and virtual professional learning experiences with embedded instructional coaching support to increase their knowledge of and ability to implement evidence-based practices in mathematics instruction.

Students in South Carolina begin their journey towards College- and Career- Readiness once they enter our schools. Throughout the program, teachers will explore mathematics content (*World-Class Knowledge*) through the lens of *World-Class Skills* and *Life and Career Characteristics* that will prepare them to make the [Profile of the South Carolina Graduate](#) come to life in their classrooms.

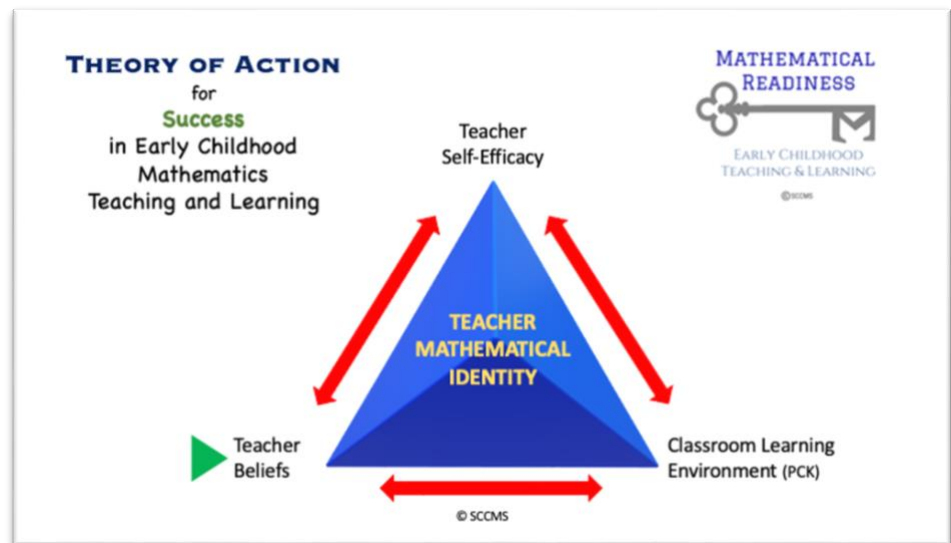
Program Purpose

How can we ensure that all children can benefit from high-quality early mathematics teaching and learning experiences?

High-quality early mathematical experiences ensure a solid foundation in mathematics and prepare our youngest students for the increasing demands of a workforce that requires a higher proficiency level (Linder, 2017). Investing in early math instruction can help put our children on track for academic success (Linder, 2017). Research confirms that children's early math skills are greater predictors than early literacy skills for future academic success in math, science, and reading, and these connections actually grow as learners progress through school (Clements & Sarama, 2013; Linder, 2017; Sheridan et al., 2019).

In South Carolina, recent data indicated that there is a significant need to focus on Mathematical Readiness. The 2020 South Carolina Kindergarten Readiness Assessment data (SCEOC, 2021) revealed that 26.8% of students tested at the Demonstrating Readiness level in the Mathematics domain, meaning they entered kindergarten with sufficient skills, knowledge, and abilities to engage with kindergarten-level mathematics instruction; however, 32.9% of students tested at the Emerging Readiness level in the Mathematics domain, meaning they needed significant support to engage in kindergarten-level mathematics instruction. How math is taught in a child's early years is just as important as what is taught (Linder, 2017). Investing in professional learning in mathematics for early childhood educators is needed to effectively intervene early on and avoid or reduce the learning gaps that are prevalent (Scott et. al, 2019; Linder 2017).

Teachers' personal views or philosophies of mathematics and what it means to do mathematics influences their beliefs about mathematics teaching and learning (Hughes et al., 2019). In fact, according to (Hughes et al., 2019), teacher beliefs have the strongest effect on their instructional practices, more so than content knowledge. Therefore, the program's focus is to develop positive mathematical beliefs and perceptions that will transform early childhood teachers' mathematics instruction. As their mindset evolves, program concentration shifts to teacher learning and engaging in mathematics content and evidence-based instructional practices. With a firm grasp of mathematics content knowledge and a positive relationship with the content, teachers will become more efficacious in their ability to teach and understand mathematics, thus developing a stronger mathematical identity (Heffernan & Newton, 2019). Early childhood teachers who are secure in their mathematical identity not only transfer a positive mathematical identity to students, but because they are confident as mathematics' teachers, student self-efficacy increases, as well as student learning and achievement in mathematics (Cohrssen et al., 2016).



Eligible Schools

All South Carolina public schools serving students in grades K, 1, 2, and/or 3 are eligible to apply for participation in the *Mathematical Readiness: Early Childhood (K-3) Teaching and Learning Program*.

Preference may be given to schools that meet the following criteria:

- Title I designation
- Diverse student population
- Data indicates the need for increased student achievement

Individual School Team

A school team may apply for this program as an individual school. A school is required to submit an application for a team that includes **one participating building administrator and a minimum of two participating teachers** in grades K-3. Teachers recommended for participation are *not required* to teach in the same grade level.

All participating teachers must:

- 1) be on continuing contract; and
- 2) have obtained **at least three years but no more than ten years** teaching experience in early childhood (K-3) mathematics by the end of the prior fiscal year.

District Team

A district may apply for this program on behalf of multiple schools. In addition to meeting the requirements for each school team (see above), there **must** be a district-level leader who will actively participate in the program. While a district may submit multiple school teams, it is possible that all school teams will not be selected for participation during the given application cycle.

Program Model

Research recommends that professional development in early childhood education include learning experiences that are long-term and sustained, connected to classroom practice and customized to teachers' needs (Sarama et al., 2018; Sheridan et al., 2019). In addition, it is beneficial for early childhood mathematics educators to experience instructional coaching and structured professional learning communities (Sarama et al., 2018).

The *Mathematical Readiness: Early Childhood (K-3 Teaching & Learning Program* is intended to be a 3-year professional development program employing six complementary teacher actions of the Professional Teaching and Learning Cycle (Study, Select, Plan, Implement, Analyze, and Adjust).

See http://txcc.sedl.org/resources/working_systemically/ptlc-intro.pdf

Components of the model include:

- Statewide professional learning experiences (4 full days provided as one fall session of 2 days back-to-back and one early spring session of 2 days back to back)
- School, District and/or Regional professional learning experiences (model will depend on location of all cohort members and needs of participants)
- Instructional coaching by S²TEM Centers SC Specialist
 - On-Site Coaching (once/month)
 - Virtual Coaching (once/month)
- Online teacher community of practice to share strategies, techniques, and lessons learned and to gain access to additional resources (on-going)
- School Administrator Support
 - Program Orientation (required)
 - Quarterly meetings with the S²TEM Centers SC Specialist (required)
 - Observes participating teachers once/semester (with S²TEM Centers SC Specialist)
 - Professional learning opportunities (recommended but not required)

A S²TEM Centers SC Specialist will work directly with the K-3rd grade teachers to model, observe, assist and provide feedback in understanding and applying evidence-based mathematics instructional strategies in the classroom through facilitated professional development, classroom observations and coaching conversations. The S²TEM Centers SC Specialist and participating

teachers will collaboratively analyze data from lessons to make informed instructional decisions to accelerate student learning.

School administrator support is vital for the success of the program; therefore, the principal of each participating school is required to participate in specific program components (as noted above). In addition, school administrators should provide support in planning, observing, reflecting, and attaining resources, as needed, to ensure teacher success in the program.

District leader support is imperative for ensuring success of school participation. If applying as a district, there must be a district-level leader who will participate in specific parts of the program, which include:

- program orientation; and
- quarterly meetings with each school administrator and S²TEM Centers SC Specialist.

Program Outcomes

The *Mathematical Readiness: Early Childhood (K-3) Teaching and Learning* Program has identified the following outcomes:

- 1) Strong foundational teacher mathematical identity
- 2) Positive teacher mathematical beliefs and perceptions
- 3) Engaged mathematics classroom learning environment, which includes:
 - Teacher knowledge and use of evidence-based mathematics instructional strategies
 - Teacher mathematical content knowledge
- 4) Confident teacher mathematical self-efficacy

NOTE: By focusing on these specific outcomes with teachers, according to research, additional outcomes should include: an increase in student learning and achievement in math, an increase in student self-efficacy and beliefs about math; and the development of students' positive mathematical identities. Students will achieve their developmentally appropriate level of the [South Carolina Portrait of a College- and Career- Ready Mathematics Student](#) (SCDOE, 2015, p.10).

Yearly Desired Outcomes:

- 1) 90% of participating teachers will demonstrate improved instructional practice
- 2) positive change in teacher beliefs and perceptions about mathematics
- 3) develop sense of collegiality among teachers and build a learning community (whole group, regional sessions, etc.)

Data Collection

S²TEM Centers SC Specialists will collect teacher mathematics practices data using a classroom observation protocol. Together, the specialist and teachers will review the data and cite specific evidence of teacher and/or student behavior during the lesson to determine the effectiveness of teacher use of evidence-based instructional strategies.

Teacher beliefs towards mathematics, in general, and the use of evidence-based mathematical strategies in their classrooms will be measured using pre- and post-surveys. Coaching conversations with the teachers will reveal changes in teacher thinking and behavior as they

become more adept in selecting, aligning, and implementing evidence-based mathematics instructional strategies to effectively support student learning.

Evidence of student learning increases in mathematics will be primarily quantitative. S²TEM Centers SC Specialists and teachers will review and analyze available school and classroom data to determine specific learning needs of students and make instructional decisions in implementing evidence-based mathematics instructional strategies to accelerate student learning most effectively.

Additional Information

Cohorts are organized on an annual basis. Cohort A was formed in 2022-2023 and Cohort B is expected to be formed in 2023-2024. For the full documentation regarding cohort expectations, including the Application and Memorandum of Agreement please see the specific cohort information posted at www.s2temsc.org/mathematicalreadiness

NOTE: This program is supported by state-appropriated funds. In the event that sufficient funds are not available, the program may be terminated.

References

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