PK-3 ECE Specialist Credential Math Webinar

UNPACKING THE MATH STANDARD 02/02/23

CTC Team

- Renee Marshall – Administrator
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Overview of Resources

- **Submit questions to** https://forms.office.com/g/NTpuWiMyjd
- **For information, webinars, slide decks and resources, please visit the CTC PK-3 ECE Specialist Instruction Credential page** https://www.ctc.ca.gov/educator-prep/pk-3-ece-specialist-instruction-credential
- **PK-3 Handbook** https://www.ctc.ca.gov/docs/default-source/educator-prep/standards/pk-3-handbook.pdf?sfvrsn=74bd26b1_9
- **Subscribe to the ECE News** https://www.ctc.ca.gov/commission/newsletters/ece-news-email-list
- **Subscribe to the PSD News** https://www.ctc.ca.gov/commission/newsletters/psd-news
- **Send us an email** ECE@ctc.ca.gov
- **ECE Office hours**
  - First Tuesdays – 12pm – 1pm : https://us02web.zoom.us/j/83000799079
  - Third Tuesdays – 12pm – 1pm : https://us02web.zoom.us/j/**84012874082**
- **ECE Community Circle**

Monday February 6th

11:00 am - 12:30 pm

Link to Register: https://us02web.zoom.us/j/85960942365

Agenda – What to Expect Today

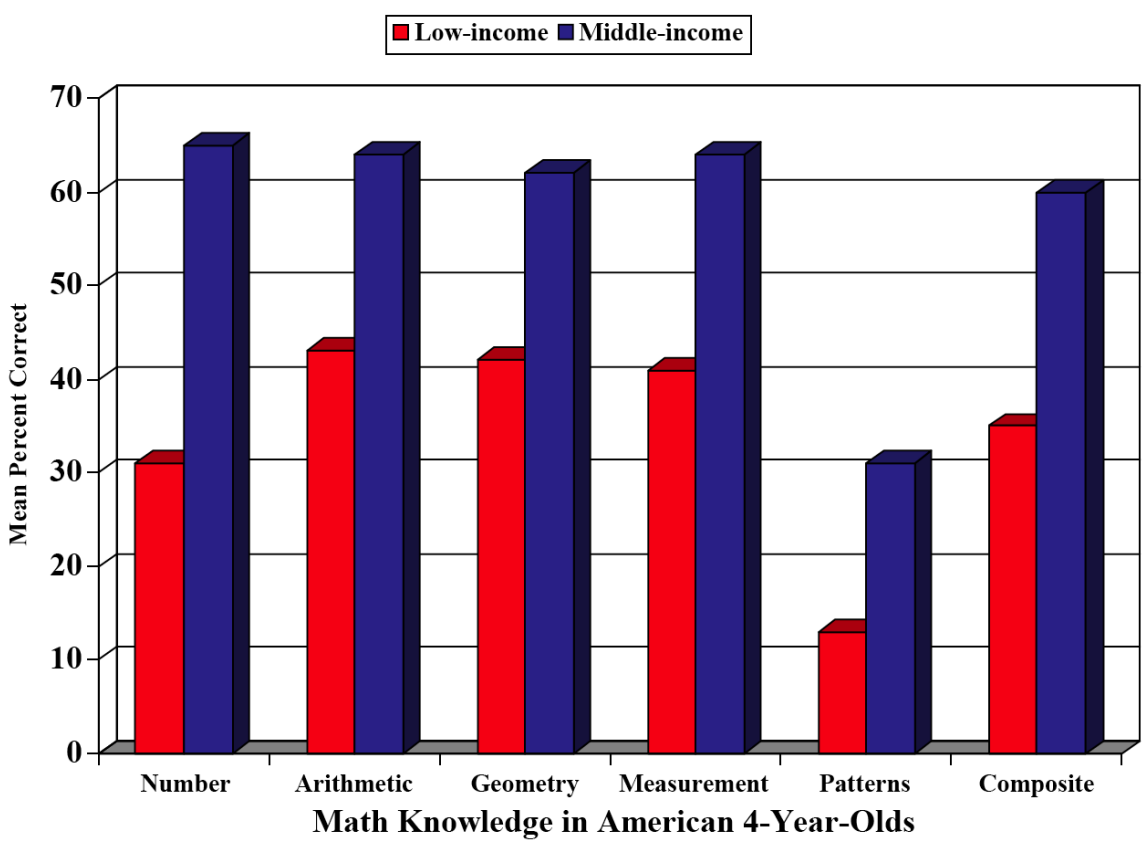
- Resources
- Speaker – Dr. Deborah Stipek
- PK-3 Math Program Standards
- Candidate Competencies and TPEs
- Submitting New Program Proposals
- Wrap up

Dr. Deborah Stipek, Guest Speaker

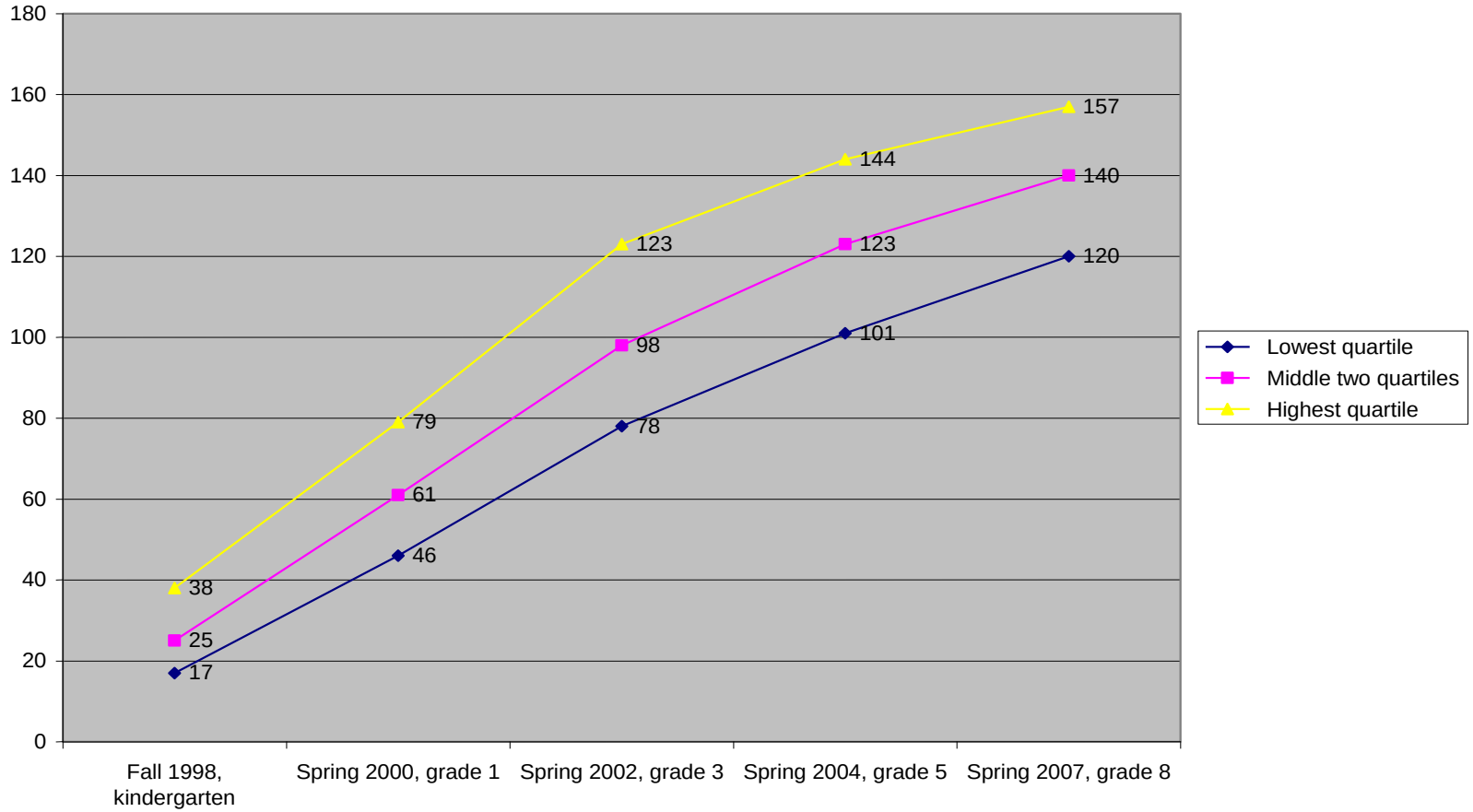
Math deserves more attention

- Math instruction is typically given much less attention than literacy in early childhood education.
- ***Math is important.***

Math Knowledge in American 4-Year-Olds



Mathematics Achievement Scores of Kindergartners Followed Through Grade 8, by Kindergarten Score Quartile



National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99, fall 1998, and spring 2000, 2002, 2004, and 2007; and National Science Foundation, Division of Science Resources Statistics.

Where did the math standard and TPEs come from?

- CTC recognized huge attention to language and literacy
- Formed a workgroup of experts in early math (Megan Franke, UCLA; Linda Platas, San Francisco State; Deborah Stipek, Stanford, and Renee Marshall, CA Community Colleges Teacher Preparation Programs)
- Also realized that math was not specifically addressed in the P-3 Teacher Performance Expectations
- Created P-3 Math Program Standard and Teacher Performance Expectations (TPEs) simultaneously to be aligned to each other

What was the math program standard based on?

- Multiple subject program standards
- What children are expected to know
  - Preschool Foundations
  - Common Core math standards (K-3), including math practices
  - Addressing all math strands
- Research on effective math instruction
  - Emphasis on building children's conceptual understanding, developing a strong foundation for later math learning.
    - Listening to and building on children's understandings, differentiated instruction
  - Problem solving, using a range of tools and strategies
  - Connecting math to everyday life
  - Building positive relationships with children

PK-3 Credential Math Standard Core Documents

Learning Foundation and Content Standard and Framework Documents:

- Become familiar with all these resources and how they align with the math program standard.
- Use the current Preschool Learning Foundation/Preschool Framework and K-3 Content Standard/Framework in a cohesive seamless manner.
- Embed the math program standard and TPEs in coursework and supervised field experiences highlighting these documents.

PK-3 Math Alignment with CA Key Documents PK-3 (Source Documents)

- The Alignment of the California Preschool Learning Foundations with Key Early Education Resources
- Preschool Learning Foundations and California Preschool Curriculum Frameworks
- California Content Standards and Curriculum Frameworks

PK-3 Math Alignment with CA Key Documents

TK - Learning Foundations	Kindergarten - Content Standards	First Grade – Content Standards	Second Grade – Content Standards	Third Grade – Content Standards
Mathematical Reasoning	Mathematical Practices	Mathematical Practices	Mathematical Practices	Mathematical Practices
Number Sense	Counting and Cardinality Operations and Algebraic Thinking Number & Operations in Base 10	Operations and Algebraic Thinking Number & Operations in Base 10	Operations and Algebraic Thinking Number & Operations in Base 10	Operations and Algebraic Thinking Number & Operations in Base 10 Number & Operations - Fractions

PK-3 Math Alignment with CA Key Documents (cont'd)

TK - Learning Foundations	Kindergarten - Content Standards	First Grade – Content Standards	Second Grade – Content Standards	Third Grade – Content Standards
Algebra and Functions (Classification and Patterning) Measurement and Data	Mathematical Practices Measurement and Data	Mathematical Practices Measurement and Data	Mathematical Practices Measurement and Data	Mathematical Practices Measurement and Data
Geometry	Geometry	Geometry	Geometry	Geometry

Opportunity to build pedagogy and practice from concrete developmental concepts to abstract mathematical thinking

Programs prepare candidates by:

- Building a strong foundation in math skills and ways of thinking about math through wonder and discovery, inquiry-based learning, and the interaction of math concepts into daily life.
- Recognizing that pedagogy and practice in the early years creates the foundation for building upon critical thinking and competence in relationship to math skills in each successive grade.
- Understanding math is a part of our lives from birth; it is the natural ways in which children develop through concrete objects, pictures, actions, and symbols to develop mathematical meaning.
- Recognizing math is the means and foundation to the solid development of the skills of learning, logical thinking and reasoning that are necessary for STEM learning.

Unpacking the Math Program Standard (1)

Facilitate learning in the areas of 1) number and operations, including counting and cardinality, 2) mathematical thinking and understanding relationships, 3) algebra and functions, 4) measurement and data analysis, and 5) geometry.

Examples that show how the Learning Foundations and the CA Content Standards align across grade levels:

- **Measurement and Data Analysis:**
  - **TK:** Compare two objects by length, weight, or capacity directly (e.g., putting objects side by side) or indirectly (e.g., using a third object).
  - **Kindergarten:** Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object.
  - **First Grade:** Order three objects by length; compare the lengths of two objects indirectly by using a third object.
  - **Second Grade:** Measure the length of an object twice, using length units of different lengths for the two measurements; describe how the two measurements relate to the size of the unit chosen.
  - **Third Grade:** Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units—whole numbers, halves, or quarters.

Unpacking the Math Program Standard (2)

Draw on and extend children's emerging mathematical knowledge, understandings, and capabilities at their current development level while providing the support needed to sustain their progress.

Examples that show how the Learning Foundations and the CA Content Standards align across grade levels:

- **TK:** Identify, describe, and construct a variety of different shapes, including variations of circle, triangle, rectangle, square, and other shapes found at home.
- **Kindergarten:** Describe objects in the environment using names of shapes and describe the relative positions of these objects using terms such as above, below, beside, in front of, behind, and next to.
- **First Grade:** Distinguish between defining attributes in the classroom (e.g., triangles are closed and three-sided) versus non-defining attributes (e.g., color, orientation, overall size); build and draw shapes to possess defining attributes.
- **Second Grade:** Recognize and draw shapes based on prior knowledge having specified attributes, such as a given number of angles or a given number of equal faces.5 Identify triangles, quadrilaterals, pentagons, hexagons, and cubes.
- **Third Grade:** Partition shapes into parts with equal areas using a familiar object. Express the area of each part as a unit fraction of the whole. For example, partition a shape into 4 parts with equal area, and describe the area of each part as 1/4 of the area of the shape.

Unpacking the Math Program Standard (3)

Build conceptual understanding of math in children's experiences and everyday life by using tools and strategies to solve problems with increasingly complex mathematical understandings and skills.

Examples that show how the Learning Foundations and the CA Content Standards align across grade levels:

- **TK:** Identify and apply a variety of mathematical strategies to solve problems in their environment such as how many days are in a week by using a calendar.
- **Kindergarten:** Identify whether the number of objects in one group is greater than, less than, or equal to the number of objects in another group, e.g., by using matching and counting strategies such as days in a week and weeks in a month from a class calendar.
- **First Grade:** Count to 120, Relate this to how many days in a month and week based on a class calendar.
- **Second Grade:** Read and write numbers to 1000 using base-ten numerals, number names, and expanded form. Relate this to how many years and days on a class calendar.
- **Third Grade:** Use multiplication and division within 365 to solve word problems that relate to the calendar year.

Unpacking the Math Program Standard (4)

Observe, listen, and reflect on children's mathematical thinking and discourse by asking questions and help them figure out different ways to solve problems and to explain or show how they arrived at their solution to the problem consistent with the standards and frameworks.

Examples that show how the Learning Foundations and the CA Content Standards align across grade levels:

- ❑ **TK:** Identify, describe, and construct a variety of different shapes, including variations of circle, triangle, rectangle, square, and other shapes in a collage. Share the picture with a friend.
- ❑ **Kindergarten:** Model shapes in the world by building shapes from components (e.g., sticks and clay balls) and drawing shapes.
- ❑ **First Grade:** Partition circles and rectangles into two and four equal shares, describe the shares using the words halves, fourths, and quarters, and use the phrases half of, fourth of, and quarter of. Describe the whole as two of, or four of the shares. Understand for these examples that decomposing into more equal shares creates smaller shares.
- ❑ **Second Grade:** Partition a rectangle into rows and columns of same-size squares on a graph and count to find the total number of them.
- ❑ **Third Grade:** Show partition shapes into parts with equal areas using an object. Express the area of each part as a unit fraction of the whole. For example, partition a shape into 4 parts with equal area, and describe the area of each part as 1/4 of the area of the shape.

Unpacking the Math Program Standard (5)

Use multiple modes of communication about mathematics, including language, gestures, movement, use of a variety of tools, writing, art, and other modalities, that allow children to express their mathematical development in meaningful and comprehensible ways.

Examples that show how the Learning Foundations and the CA Content Standards align across grade levels:

- ❑ **TK:** Make shapes with arms and legs, have the class guess the shape.
- ❑ **Kindergarten:** Identify shapes as two-dimensional (lying in a plane, "fat") or three-dimensional ("solid") using objects.
- ❑ **First Grade:** Compose two-dimensional shapes (rectangles, squares, trapezoids, triangles, half-circles, and quarter-circles) using art as a medium.
- ❑ **Second Grade:** Partition circles and rectangles into two, three, or four equal shares, describe the shares using the words halves, thirds, half of, a third of, etc., and describe the whole as two halves, three thirds, four fourths in groups using a piece of fruit.
- ❑ **Third Grade:** Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole. For example, partition a shape into 4 parts with equal area, and describe the area of each part as 1/4 of the area of the shape using a Styrofoam object.

Jean Piaget (1968)

"Every student is capable of good mathematical reasoning if attention (and care) is directed to activities of his interest, and if by this method the emotional inhibitions that too often give him a feeling of inferiority in lessons in mathematics are removed."

Mathematics Standards/TPE Mapping

- Standard merges/mixes program requirements and candidate competencies
- Candidate competencies are aligned with the PK-3 mathematics TPEs as well as elements from the other TPE domains
- Programs should be able to demonstrate how they are developing these candidate competencies through program coursework and/or clinical practice

Candidate Competencies and TPEs (1)

PK-3 Math Standard Language	TPEs	TPE Connections to the math standards
8.1 Teaching aligned with state standards The credential program's coursework and supervised field experiences include the study of effective means of teaching mathematics to young children, consistent with the State Board adopted K-3 Mathematics Standards and Framework and the *Preschool Learning Foundations* and *Curriculum Framework*. Coursework and supervised field experiences prepare teachers to model mathematical thinking, inquiry, practice, and processes in their classrooms and to engage in mathematics teaching and learning in a mutually respectful manner with students.	**2.4** **2.5** **3.2** **8.1** **8.4**	**2.4** …modeling and using respectful language to communicate and encourage positive student-to-student and student-to-teacher interactions **2.5** …foster a caring community where each child is treated fairly and respectfully by adults and peers **3.2** Use subject-specific pedagogy in accordance with state frameworks within and across the core curriculum, including a focus on language, literacy, and mathematics. **8.1** Plan and implement mathematics instruction … that is grounded in an understanding of California's Mathematics Standards and Framework and the Preschool Learning Foundations and Curriculum Framework. **8.4** Consistent with California's Standards for Mathematical Practice, develop children's abilities according to their individual developmental levels, linguistic, cognitive, social and emotional strengths and learning needs

Candidate Competencies and TPEs (2)

PK-3 Math Standard Language	TPEs	TPE Connections to the math standards
8.2 Building on children's prior knowledge Coursework and supervised field experiences prepare candidates to draw on and extend children's prior mathematical knowledge, understandings, and capabilities. The program prepares candidates to build positive relationships with children that help candidates understand children's mathematical understandings and provide appropriate learning activities and experiences that build on children's developing mathematical capabilities. The program prepares candidates to use their knowledge of individual children to meet them where they are developmentally and provide the support needed to sustain their progress.	**2.2** **2.4** **3.2** **3.4** **4.1**	**2.2.** Create a positive classroom climate by building rapport and a caring relationship with children and showing respect for children's perspectives, identities, and home languages **2.4** …modeling and using respectful language to communicate and encourage positive student-to-student and student-to-teacher interactions **3.2** Provide developmentally appropriate emergent mathematics-focused learning opportunities as well as play activities, cross-disciplinary activities **3.4** Set individualized goals and objectives for content learning and make appropriate instructional adaptations to promote access to the core curriculum for all children. **4.1** Plan activities and lessons, that build on what children know, accommodate children's developmental needs and learning preferences

Candidate Competencies and TPEs (2, cont'd)

PK-3 Math Standard Language	TPEs	TPE Connections to the math standards
8.2 Building on children's prior knowledge Coursework and supervised field experiences prepare candidates to draw on and extend children's prior mathematical knowledge, understandings, and capabilities. The program prepares candidates to build positive relationships with children that help candidates understand children's mathematical understandings and provide appropriate learning activities and experiences that build on children's developing mathematical capabilities. The program prepares candidates to use their knowledge of individual children to meet them where they are developmentally and provide the support needed to sustain their progress.	**4.8** **8.1** **8.3** **8.5**	**4.8** Apply information about children's current levels of development, content- specific learning needs, [and] assessment data **8.1** Plan and implement mathematics instruction appropriate to children's age, grade, and developmental levels **8.3** Provide a secure environment for children to take intellectual risks, foster positive attitudes toward mathematics and encourage student curiosity, academic discourse, and persistence in solving mathematical problems. **8.5** Differentiate and provide developmentally appropriate instruction and tasks to meet individual children's learning needs and engage children in self-initiated as well as teacher-led learning activities, including play-based activities, that use manipulatives and other tools to solve problems.

Candidate Competencies and TPEs (3)

PK-3 Math Standard Language	TPEs	TPE Connections to the math standards
8.3 Building Conceptual Understanding and Foundational Mathematics Skills Through coursework and supervised field experiences programs stress the goal of building children's conceptual understanding so that children develop a strong foundation for later math learning. Candidates learn to engage children in activities that encourage students to use a range of tools and strategies to solve problems, including working in pairs or small groups. The program teaches candidates to relate mathematics to children's interests and everyday life and embed math learning opportunities in daily activities. Candidates learn how to differentiate instruction and learning activities to meet individual children's learning needs.	**1.4** **1.6** **8.5** **8.7**	**1.4** Connect learning to real-life contexts **1.6** … adjust instruction as needed to provide access to the full range of the curriculum for all children. **8.5** Differentiate and provide developmentally appropriate instruction and tasks to meet individual children's learning needs **8.7** Support respectful child-to-child interactions as students engage with their classmates to figure out ways to solve problems and explain or show how they arrived at their solution

Candidate Competencies and TPEs (4)

PK-3 Math Standard Language	TPEs	TPE Connections to the math standards
8.4 Building on children's Mathematical Thinking and Problem-solving Candidates learn to provide learning activities and opportunities for children to figure out different ways to solve problems on their own or with classmates, and to explain or show how they arrived at their solution to the problem. Programs emphasize the importance of observing, listening, and reflecting on children's mathematical thinking and discourse and asking questions, posing new learning activities and opportunities and providing a variety of tools to further surface and build on children's mathematical thinking. Candidates learn to ask children questions to elicit children's thinking and problem-solving processes as they engage in math activities.	**1.7** **3.2** **8.6**	**1.7** Promote children's thinking … through developmentally appropriate activities that provide opportunities for children to engage in … problem-solving **3.2** Provide developmentally appropriate emergent mathematics-focused learning opportunities as well as play activities, cross-disciplinary activities … that require mathematical reasoning **8.6** Observe and interpret children's strategies in solving problems and ask thought-provoking questions that lead to deeper understanding (e.g., analysis, synthesis, evaluation)

Candidate Competencies and TPEs (5)

PK-3 Math Standard Language	TPEs	TPE Connections to the math standards
8.5 Teaching all the PK-3 critical Mathematical Strands Coursework and supervised field experiences prepare teachers to facilitate children's learning in all of the critical strands of mathematics in the areas of 1) number and operations, including counting and cardinality, 2) mathematical thinking and understanding relationships, 3) algebra and functions, 4) measurement and data analysis, and 5) geometry. For all strands and across all grade levels PK-3 (Appendix D), the program provides teachers with effective ways to both engage children in *thinking* about mathematics while they *do* mathematics, and help children develop confidence in their mathematical skills. The program assists teachers to learn to help children develop increasingly complex mathematical understandings and skills consistent with the progression of the mathematics strands identified in the K-3 Mathematics Standards and Framework and the *Preschool Learning Foundations* and *Curriculum Framework*.	**3.2** **8.2**	**3.2** Use subject-specific pedagogy in accordance with state frameworks within and across the core curriculum, including a focus on language, literacy, and mathematics… **8.2.** Provide learning opportunities, consistent with Universal Design for Learning principles, for children to develop knowledge related to 1) number and operations, including counting and cardinality, 2) mathematical thinking and understanding relationships, 3) algebra and functions, 4) measurement and data analysis, and 5) geometry, as described in the California's Mathematics Standards and the Preschool Learning Foundations.

Candidate Competencies and TPEs (6)

PK-3 Math Standard Language	TPEs	TPE Connections to the math standards
8.6 Promoting Children's and Candidates use of Multiple Modes of Communication to Support All Learners Through coursework and supervised field experiences, candidates learn that deep mathematical thinking and learning occurs and is supported through promoting multiple modes of communication about mathematics, including language, gestures, movement, use of a variety of tools, writing, art, and other modalities, thereby allowing all children, including English learners and children with disabilities, opportunities to express their mathematical development in meaningful and comprehensible ways.	**1.7** **3.5** **8.8**	**1.7** opportunities for children to engage in effective expression… **3.5** Promote core curriculum knowledge in all children, including mono- and multi-lingual children, children with disabilities and children with other learning needs, by adapting the curriculum and providing explicit instruction of vocabulary and academic language. **8.8** Support all children to develop the academic language of mathematics, ensuring access for all children to the content of mathematics appropriate to grade level expectations and encourage parents/guardians to use the home language to talk about mathematics (especially numbers, arithmetic, spatial relations, and patterns)…

Initial Program Review

- Commission-approved institutions that wish to offer a new program
- Explicit pieces of authentic evidence (e.g., course syllabi, faculty qualifications, manuals, handbooks, advising materials)
- Peer reviewed; iterative
- COA approval
- Please attend webinar Friday, February 3: 9am -11am

Resources

- **How find information:**
- **CTC PK-3 ECE Specialist Instruction Credential page**
- **PK-3 Handbook**
- **Subscribe to the ECE News**
- **Subscribe to the PSD News**

- **How to contact us:**
- **Submit questions to** https://forms.office.com/g/NTpuWiMyjd
- **Send us an email** ECE@ctc.ca.gov
- **ECE Office hours**
- First Tuesdays – 12pm – 1pm :
- Third Tuesdays – 12pm – 1pm :
- **ECE Community Circle**

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  11:00 am - 12:30 pm

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Additional PK-3 Credential Webinars

- **Past Webinars:**
  - PK-3 Overview – November 2022
  - PK-3 Q & A – December 2022
  - Unpacking the PK3 Literacy Standards - January 2022
  - Unpacking the PK3 Math Standard - February 2023
- Recordings can be found on the PK-3 ECE webpage
- **Upcoming Webinars:**
  - Unpacking the Equity, Inclusion, and Diversity Standard
- February 2; 1-2 pm
  - PK-3 Program Proposal Process:
- February 3; 9-11 am

Submitting Questions

- Please use the following link to submit your questions:

- Link: Link: https://forms.office.com/g/NTpuWiMyjd

Thank you!