**Side-by-Side Comparison of Current and Proposed Endorsement Competencies with Alignment to CCSS-M & STEM Integration**

**Early Childhood Education (P-3) Endorsement Competencies Related to Mathematics**

**9.0 Knowing essential concepts of content areas: Candidates understand and apply knowledge of the arts, English language arts, health-fitness, mathematics, science, and social studies.**

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| **Current Competencies** | **Draft Competencies** |
| **9.D Mathematics**  The competent early childhood teacher understands the development of mathematical and spatial thinking, including intuitive knowledge, in young children and the role of culture in the development of mathematical concepts. | **9.D Mathematics**  Candidates possess a deep understanding of children’s development and mathematical and spatial learning. |
| 9.D.1 Understands the developmental foundations of mathematical learning (birth through eight), including the recognition that infants have a sense of number and spatial perception. | 9.D.1 Understand the developmental progression of mathematical learning from (birth to eight) with the infancy skills of number sense and spatial perception to early childhood skills of pre-numeracy, such as recognition of shapes, visual matching, counting, knowledge of numbers, visual recognition of numbers, ordering, sorting, classifying, sequencing, creation of two- and three-dimensional objects, creating and expanding repeated reasoning, and spatial rotation. |
| 9.D.2 Understands the ways that mathematics impacts and interacts with learning and development. | 9.D.2 Understand and apply the fundamental principles, concepts, and procedures related to mathematical problem solving, exploration, and reasoning, including processes and skills related to using mathematical language to communicate relationships and concepts, adaptive reasoning, strategic competence, procedural fluency, and productive disposition. |
| 9.D.3 Knowledge of pre-numeracy skills, such as recognition of shapes, visual matching, counting, knowledge of numbers, visual recognition of numbers, ordering, sorting, and classifying,  creation of two- and three-dimensional objects, creating and expanding patterns, and spatial rotation. | 9.D.3 Standards for Mathematical Practices: Demonstrate ability to embed CCSS-M Mathematical Practices in the instructional process to deepen conceptual understanding.  9.D.3.A Make sense of problems and persevere in solving them.  9.D.3.B Reason abstractly and quantitatively.  9.D.3.C Construct viable arguments and critique the reasoning of others.  9.D.3.D Model with mathematics.  9.D.3.E Use appropriate tools strategically.  9.D.3.F Attend to precision.  9.D.3.G Look for and make use of structure.  9.D.3.H Look for and express regularity in repeated reasoning. |
| 9.D.10 Number and Operation  9.D.10.A Develops the meaning of addition, subtraction, multiplication, and division and provide multiple models involving operations with whole numbers.  9.D.10.B Demonstrates proficiency and flexibility in multi-digit computation using algorithms, mental mathematics, and computational estimation.  9.D.10.C Provides equivalent representations of fractions, decimals, and percents.  9.D.10.D Creates, solves, and applies proportions.  9.D.10.E Recognizes and applies the fundamental ideas of number theory.  9.D.10.F Makes sense of large and small numbers.  9.D.10.G Recognizes the meaning and use of place value in representing whole numbers and finite decimals, comparing and ordering numbers, and understanding the relative magnitude of numbers. | 9.D.4 Counting and Cardinality / Number and Operations in Base Ten & Fractions: Demonstrate a conceptual understanding of and procedural facility and application of operations, number systems, and properties.  9.D.4.A Demonstrates understanding of the progression of learning that begins with the base-ten number system, place value, and operations thereof, builds into understanding of and operations with fractions and rational numbers, and extends to understanding of and operations with real numbers.  9.D.4.B Understand and apply ratios, proportional thinking, and other methods for representing and solving mathematical and real world problems. |
| 9.D.11 Multiple Perspectives on Algebra  9.D.11.A Explores, analyzes, and represents patterns, relations, and functions.  9.D.11.B Investigates equality, equations, and proportional relationships.  9.D.11.C Uses mathematical models to represent quantitative relationships.  9.D.11.D Analyzes change in various contexts.  9.D.11.E Understands of the historical development of algebra, including contributions from many cultures. | 9.D.5 Operations and Algebraic Thinking: Demonstrate a conceptual understanding of and procedural facility with arithmetic properties and their application to algebra concepts.  9.D.5.A Understand and apply properties of mathematical operations, strategies for computing and estimating solutions, and methods for modeling mathematical operations.  9.D.5.B Solve and graphically represent real life and mathematical problems using numerical and algebraic expressions, equations, inequalities, and systems of equations and inequalities.  9.D.5.C Understand the connections between proportional relationships, lines, and linear equations and use them to solve real world and mathematical problems. |
| 9.D.13    Data Analysis, Statistics, and Probability  9.D.13.A Designs investigations collect data, use a variety of methods to display data, interpret data representations and draw and represent conclusions .  9.D.13.B Uses appropriate statistical methods and technological tools to analyze data and describe shape, spread, and center.  9.D.13.C Draws conclusions involving uncertainty by using hands-on and technology-based simulation for estimating probabilities and gathering data to make inferences and decisions.  9.D.13.D Identifies misuses of statistics and invalid conclusions from probability.  9.D.13.E Understands the historical development of probability and statistics, including contributions from many cultures.  9.D.14 Measurement  9.D.14.A Recognizes the common representations and uses of measurement and choose appropriate tools and units for measuring.  9.D.14.B Identifies the attributes to be measured and apply appropriate techniques, tools, and formulas to determine measurements and their application in a variety of contexts.  9.D.14.C Uses estimation as a way of understanding measurement units and processes.  9.D.14.D Understands the historical development of measurement and measurement systems, including contributions from many cultures. | 9.D.6 Measurement and Data: Understand measurement systems and units, concepts related to geometric measurement, and tools and techniques used to solve measurement problems.  9.D.6.A Apply standard units of measurement and estimation.  9.D.6.B Understand processes and skills related to collecting, interpreting, and representing data. |
| 9.D.12 Geometries  Understands core concepts and principles of Euclidean geometry in two and three dimensions.  9.D.12.A Builds and manipulates representations of two- and three-dimensional objects using concrete models, drawings, and geometry software, and perceive an object from different perspectives.  9.D.12.B Specifies locations and describes spatial relationships using basic coordinate geometry.  9.D.12.C Analyzes properties and relationships of geometric shapes and structures.  9.D.12.D Applies transformations and uses symmetry, similarity, and congruence in mathematical situations.  9.D.12.E Understands the historical development of Euclidean geometry, including contributions from many cultures. | 9.D.7 Geometry: Demonstrate a conceptual understanding of geometric properties and relationships as they apply to congruence, similarity, and geometric figures.  9.D.7.A Solve real life and mathematical problems involving lines, area, surface area, and volume.  9.D.7.B Classify, visualize, and describe two-dimensional figures and three-dimensional objects as well as the relationship among them.  9.D.7.C Apply geometric concepts to model real world situations. |
| 9.D.9 Technology  9.D.9.A Uses knowledge of mathematics to select and use appropriate technological tools.  9.D.9.B Understands the appropriate use of technology to experiment, visualize, and enable students to make and explore conjectures. | 9.D.8 Modeling and Technology: Connect mathematics with real life problems through the use of mathematical modeling and technology.  9.D.8.A Construct mathematical models in the content strands (e.g., look at a real life situation and transpose it into a mathematical problem, solve the problem, and interpret the solution in real life.)  9.D.8.B Use the appropriate technology available to explore conjectures, visualize, and analyze the mathematics, develop concepts and apply them to a context, and use technology to model in the real world. |
| 9.D.4 Mathematical Problem Solving  9.D.4.A Applies and adapts a variety of appropriate strategies to solve problems of different types.  9.D.4.B Solves problems that arise in mathematics and those involving mathematics in other contexts.  9.D.4.C Builds new mathematical knowledge through problem solving.  9.D.4.D Monitors and reflects on the process of mathematical problem solving.  9.D.5 Reasoning and Proof  9.D.5.A Recognizes reasoning and use of evidence as fundamental aspects of mathematics.  9.D.5.B Makes and investigates mathematical conjectures.  9.D.5.C Develops, evaluates and selects mathematical arguments and proofs as appropriate for the P-3 curriculum.  9.D.6 Mathematical Communication  9.D.6.A Systematically gathers mathematical information for a given purpose and communicates mathematical thinking coherently and clearly to peers, faculty, and others.  9.D.6.B Uses the language of mathematics to express ideas precisely.  9.D.6.C Organizes mathematical thinking through communication.  9.D.6.D Analyzes and evaluate the mathematical thinking and strategies of others.  9.D.7 Mathematical Connections  9.D.7.A Recognizes and uses connections among mathematical ideas.  9.D.7.B Recognizes and applies mathematics in real-world contexts.  9.D.7.C Demonstrates how mathematical ideas interconnect and build on one another to produce a coherent whole.  9.D.8 Mathematical Representation  9.D.8.A Uses varied representations (words, pictures, data representation) to model and interpret physical, social, and mathematical phenomena.  9.D.8.B Creates and uses representations to organize, record, and communicate mathematical ideas.  9.D.8.C Selects, applies, and translates among mathematical representations to solve problems. | 9.D.9 Mathematics Instructional Methodology: Candidates possess a deep understanding of how students learn mathematics and of the pedagogical knowledge specific to mathematics teaching and learning.  9.D.9.A Select, use, and determine suitability of the available mathematics curricula, teaching materials, and other resources including manipulatives for the learning of mathematics for all students.  9.D.9.B Demonstrate ability to present mathematical concepts using multiple representations (e.g., numerical, graphical, analytical, and contextual).  9.D.9.C Demonstrate the ability to guide student discourse in mathematical problem solving, argumentation (creation and critiquing), literacy, and in-depth conceptual understanding.  9.D.9.D Demonstrate knowledge of learning progressions, including conceptual and procedural milestones and common misconceptions, within each content domain and connections to instruction.  9.D.9.D.1 Demonstrate knowledge of major, supporting, and additional clusters for each grade level.  9.D.9.D.2 Demonstrate an understanding of the concept of mathematical rigor including conceptual understanding, procedural skill and fluency, and application.  9.D.9.D.3 Demonstrate an understanding of coherent connections within clusters at a grade level and the progression from grade level to grade level that builds on previous learning.  9.D.9.E Engage in developmentally and culturally responsive teaching of mathematics that minimizes power and status issues, nurtures a positive mathematics disposition, and utilizes students’ cultural funds of knowledge and experiences as resources for lessons. |