Effective October 15, 2021

505-3-.27 MATHEMATICS EDUCATION PROGRAM

(1) Purpose. This rule states field-specific content standards for approving programs that prepare individuals to teach Mathematics in grades 6-12 and supplements requirements in GaPSC Rule 505-3-.01, REQUIREMENTS AND STANDARDS FOR APPROVING EDUCATOR PREPARATION PROVIDERS AND EDUCATOR PREPARATION PROGRAMS.

(2) Requirements.

(a) To receive approval, a GaPSC-approved educator preparation provider shall offer an educator preparation program described in program planning forms, catalogs, and syllabi addressing the following standards adapted from the standards published in 2020 by the National Council of Teachers of Mathematics (NCTM):

1. Knowing and Understanding Mathematics. Candidates demonstrate and apply understandings of major mathematics concepts, procedures, knowledge, and applications within and among mathematical domains of Number; Algebra and Functions; Calculus; Statistics and Probability; Geometry, Trigonometry, and Measurement.

(i) Essential Concepts in Number. Candidates demonstrate and apply understandings of major mathematics concepts, procedures, knowledge, and applications of number including flexibly applying procedures, using real and rational numbers in contexts, developing solution strategies, and evaluating the correctness of conclusions. Major mathematical concepts in Number include number theory; ratio, rate, and proportion; and structure, relationships, operations, and representations.

(ii) Essential Concepts in Algebra and Functions. Candidates demonstrate and apply understandings of major mathematics concepts, procedures, knowledge, and applications of algebra and functions including how mathematics can be used systematically to represent patterns and relationships including proportional reasoning, to analyze change, and to model everyday events and problems of life and society. Essential Concepts in Algebra and Functions include algebra that connects mathematical structure to symbolic, graphical, and tabular descriptions; connecting algebra to functions; and developing families of functions as a fundamental concept of mathematics. Additional Concepts should include algebra from a more theoretical approach, including relationships between structures (e.g. groups, rings, and fields) as well as formal structures for number systems and numerical and symbolic calculations.

(iii) Essential Concepts in Calculus. Candidates demonstrate and apply understandings of major mathematics concepts, procedures, knowledge, and applications of calculus, including the mathematical study of the calculation of instantaneous rates of change and the summation of infinitely many small factors to determine some

whole. Essential Concepts in Calculus include limits, continuity, the Fundamental Theorem of Calculus, and the meaning and techniques of differentiation and integration.

(iv) Essential Concepts in Statistics and Probability. Candidates demonstrate and apply understandings of statistical thinking and the major concepts, procedures, knowledge, and applications of statistics and probability including how statistical problem solving and decision making depend on understanding, explaining, and quantifying the variability in a set of data to make decisions. They understand the role of randomization and chance in determining the probability of events. Essential

Concepts in Statistics and Probability include quantitative literacy, visualizing and summarizing data, statistical inference, probability, and applied problems.

(v) Essential Concepts in Geometry, Trigonometry, and Measurement. Candidates demonstrate and apply understandings of major mathematics concepts, procedures, knowledge, and applications of geometry, including using visual representations for numerical functions and relations, data and statistics, and networks, to provide a lens for solving problems in the physical world. Essential Concepts in Geometry, Trigonometry, and Measurement include transformations, geometric arguments, reasoning and proof, applied problems, and non-Euclidean geometries.

2. Knowing and Using Mathematical Processes. Candidates demonstrate, within or across mathematical domains, their knowledge of and ability to apply the mathematical processes of problem solving; reason and communicate mathematically; and engage in mathematical modeling. Candidates apply technology appropriately within these mathematical processes.

(i) Problem Solving. Candidates demonstrate a range of mathematical problem-solving strategies to make sense of and solve non-routine problems (both contextual and non-contextual) across mathematical domains.

(ii) Reasoning and Communicating. Candidates organize their mathematical reasoning and use the language of mathematics to express their mathematical reasoning precisely, both orally and in writing, to multiple audiences.

(iii) Mathematical Modeling and Use of Mathematical Models. Candidates understand the difference between the mathematical modeling process and models in mathematics. Candidates engage in the mathematical modeling process and demonstrate their ability to model mathematics.

3. Knowing Students and Planning for Mathematical Learning. Candidates use knowledge of students and mathematics to plan rigorous and engaging mathematics instruction supporting students' access and learning. The mathematics instruction developed provides equitable, culturally responsive opportunities for all students to learn and apply mathematics concepts, skills, and practices.

(i) Student Diversity. Candidates identify and use students' individual and group differences when planning rigorous and engaging mathematics instruction that supports students' meaningful participation and learning.

(ii) Students' Mathematical Strengths. Candidates identify and use students' mathematical strengths to plan rigorous and engaging mathematics instruction that supports students' meaningful participation and learning.

(iii) Positive Mathematical Identities. Candidates understand that teachers' interactions impact individual students by influencing and reinforcing students' mathematical identities, positive or negative, and plan experiences and instruction to develop and foster positive mathematical identities.

4. Teaching Meaningful Mathematics. Candidates implement effective and equitable teaching practices to support rigorous mathematical learning for a full range of students. Candidates establish rigorous mathematics learning goals, engage students in high cognitive demand

learning, use mathematics-specific tools and representations, elicit and use student responses, develop conceptual understanding and procedural fluency, and pose purposeful questions to facilitate student discourse.

(i) Establish Rigorous Mathematics Learning Goals. Candidates establish rigorous mathematics learning goals for students based on mathematics standards and practices.

(ii) Engage Students in High Cognitive Demand Learning. Candidates select or develop and implement high cognitive demand tasks to engage students in mathematical learning experiences that promote reasoning and sense making.

(iii) Incorporate Mathematics-Specific Tools. Candidates select mathematics-specific tools, including technology, to support students' learning, understanding, and application of mathematics and to integrate tools into instruction.

(iv) Use Mathematical Representations. Candidates select and use mathematical representations to engage students in examining understandings of mathematics concepts and the connections to other representations.

(v) Elicit and Use Student Responses. Candidates use multiple student responses, potential challenges, and misconceptions, and they highlight students' thinking as a central aspect of mathematics teaching and learning.

(vi) Develop Conceptual Understanding and Procedural Fluency. Candidates use conceptual understanding to build procedural fluency for students through instruction that includes explicit connections between concepts and procedures.

(vii) Facilitate Discourse. Candidates pose purposeful questions to facilitate discourse among students that ensures each student learns rigorous mathematics and builds a shared understanding of mathematical ideas.

5. Assessing Impact on Student Learning. Candidates assess and use evidence of students' learning of rigorous mathematics to improve instruction and subsequent student learning. Candidates analyze learning gains from formal and informal assessments for individual students, the class as a whole, and subgroups of students disaggregated by demographic categories, and they use this information to inform planning and teaching.

(i) Assessing for Learning. Candidates select, modify, or create both informal and formal assessments to elicit information on students' progress toward rigorous mathematics learning goals.

(ii) Analyze Assessment Data. Candidates collect information on students' progress and use data from informal and formal assessments to analyze progress of individual students, the class as a whole, and subgroups of students disaggregated by demographic categories toward rigorous mathematics learning goals.

(iii) Modify Instruction. Candidates use the evidence of student learning of individual students, the class as a whole, and subgroups of students disaggregated by demographic categories to analyze the effectiveness of their instruction with respect to these groups. Candidates propose adjustments to instruction to improve student learning for each and every student based on the analysis.

6. Social and Professional Context of Mathematics Teaching and Learning. Candidates are

reflective mathematics educators who collaborate with colleagues and other stakeholders to grow professionally, to support student learning, and to create more equitable mathematics learning environments.

(i) Promote Equitable Learning Environments. Candidates seek to create more equitable learning environments by identifying beliefs about teaching and learning mathematics, and associated classroom practices that produce equitable or inequitable mathematical learning for students.

(ii) Promote Positive Mathematical Identities. Candidates reflect on their impact on students' mathematical identities and develop professional learning goals that promote students' positive mathematical identities.

(iii) Engage Families and Community. Candidates communicate with families to share and discuss strategies for ensuring the mathematical success of their children.

(iv) Collaborate with Colleagues. Candidates collaborate with colleagues to grow professionally and support student learning of mathematics.

7. Secondary Field Experiences and Clinical Practice. Secondary mathematics candidates engage in a planned sequence of field experiences and clinical practice in diverse settings under the supervision of experienced and highly qualified mathematics teachers. They develop a broad experiential base of knowledge, skills, effective approaches to mathematics teaching and learning, and professional behaviors across both middle and high school settings that involve a diverse range and varied groupings of students. Candidates experience a full-time student teaching/internship in secondary mathematics supervised by an EPP supervisor, with secondary mathematics teaching experience or an equivalent knowledge base.

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