APA-3

CERTIFICATION OF ADMINISTRATIVE RULES
FILED WITH THE LEGISLATIVE SERVICES AGENCY
OTHNI LATHRAM, DIRECTOR

(Pursuant to Code of Alabama 1975, §41-22-6, as amended).

I certify that the attached is/are correct copy/copies of rule/s as promulgated and adopted on Thursday, August 8, 2024, and filed with the agency secretary on Thursday, August 8, 2024.

AGENCY NAME: State Board of Education State Department of Education Office of Teaching and Leading

INTENDED ACTION: New

RULE NO.: 290-3-3-.63
(If amended rule, give specific paragraph, subparagraphs, etc., being amended)

RULE TITLE: Numeracy Coursework: Standards.

ACTION TAKEN: State whether the rule was adopted with or without changes from the proposal due to written or oral comments:

Adopted with changes. (typographical changes only)

NOTICE OF INTENDED ACTION PUBLISHED IN VOLUME XLII, ISSUE NO. 9, AAM, DATED FRIDAY, JUNE 28, 2024.

STATUTORY RULEMAKING AUTHORITY: § 16-4-7, Ala. Code 1975

(Date Filed)
(For LRS Use Only)

REC'D & FILED
AUG 13, 2024
LEGISLATIVE SVC AGENCY

Eric G. Mackey
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Certifying Officer or his or her Deputy

(NOTE: In accordance with §41-22-6(b), as amended, a proposed rule is required to be certified within 90 days after completion of the notice.)

290-3-3-.63 Numeracy Coursework: Standards..
In accordance with Act 2022- 249 the Alabama State Board of Education (ALSBE) modifies its standards relative to teaching of numeracy, including algebraic reasoning, cardinality, computational fluency, and conceptual understanding, in the early childhood education, early childhood special education, elementary education, and collaborative special education Educator Preparation Programs (EPPs). ~~Each program shall contain no less than twelve~~Class B programs shall contain no less than 12 credit hours in numeracy, including learning specific to dyscalculia. Number and operations, treated algebraically, with attention to properties of operation and problem solving should occupy 6 of those hours. ~~With the remaining 6 hours devoted to additional ideas: fractions~~The remaining 6 hours shall address algebraic thinking, measurement, data, and geometry. Alternative Class A programs shall have a total of 12 hours in math courses, with a minimum of 6 hours in the aforementioned content areas and a maximum of 6 hours in accredited math courses available to transfer. The numeracy standards in this rule are to be implemented in coursework by August 2025.

(1) Numeracy. Numeracy is defined herein as the ability to understand and work with numbers. Numeracy is the knowledge, skills, behaviors, and dispositions that students need to use mathematics in the world and having the dispositions and capacities to use mathematical knowledge and skills purposely.

(2) Understand, explain, and **model** are professional dispositions and practices, including respecting and maintaining objectivity and clarity in the best interest of all learners, including those struggling with number sense, and maintaining public trust using current scientifically supported best practices.

(3) A Numeracy Framework, developed by Willis and Hogan (2000) for teachers of numeracy incorporates a blend of three types of thinking or knowledge:

(a) Mathematical—the skills, concepts, and techniques for solving quantitative problems

(b) Contextual—the awareness and knowledge of how the context affects the mathematics being used

(c) Strategic—the ability to recognize the appropriate mathematics needed to solve a problem, to apply and adapt it as necessary, and to question the use of mathematics in context.

(4) Curriculum. The curriculum is reflective of the recommendations of the National Council of Teachers of

Mathematics (NCTM), the Conference Board of the Mathematics Sciences (CBMS), the United States Department of Education (USDOE), and the Mathematics Sciences Research Institute (MSRI). These standards have been aligned with the Alabama Course of Study (ACOS) to ensure that candidates in programs that span grades K-5 have a deep knowledge and understanding of all the numerical practices that students in this grade ban should develop. Additionally, these standards reflect the efforts of the Council for Accreditation of Educator Preparation (CAEP). They outline the mathematical knowledge and ability statements that completers of these programs should demonstrate to ensure that each student learns and develops to his/her fullest potential.

(5) Pedagogical Framework. The pedagogy undergirds the content for each of the mathematical content areas. The teachers of numeracy will utilize these teaching practices from NCTM to ensure that content is being delivered in a way to optimize student understanding and application. The eight core pedagogical principles are:

~~(a)~~ a. Establish mathematics goals to focus on learning~~.~~,
~~(b)~~ b. Implement tasks that promote reasoning and problem-solving,
c. ~~solving.~~
~~(c) Use and connect mathematical representations.~~Use and connect mathematical representations,
~~(d)~~ d. Facilitate meaningful mathematical discourse,
e.
~~(e) Pose purposeful questions.~~Pose purposeful questions,
f. Build procedural fluency from conceptual understanding, ~~(f) Build procedural fluency from conceptual understanding.~~
~~(g) Support productive struggle in learning mathematics.~~g. Support productive struggle in learning mathematics, and
~~(h)~~ h. Elicit and use evidence of student thinking.

(6) Mathematical Practices Mathematical practices are the skills and habits that faculty must provide opportunities for candidates to develop and become proficient in mathematics. Teachers of mathematics will understand, explain, and model how these mathematical practices define processes in which students must engage in everyday as their mathematical maturity develops. Faculty must provide opportunities for the candidate to make connections between the mathematical practices and mathematics content within mathematics instruction. These practices include:

a. Making sense of problems and persevering in solving them~~.~~,

b. Reasoning abstractly and quantitatively,
c. Constructing viable arguments and critiquing the ~~reasoning of others~~ reasoning of others,
d. Modeling with mathematics,
e. Using appropriate tools strategically,
f. Attending to precision,
g. Looking for and making use of structure, and
~~1~~h. Looking for and expressing regularity in repeated reasoning.

(7) Assessing, Planning and Designing Contexts for Learning. Assessing, planning, and designing contexts for learning support the development of a coherent curriculum and an understanding of how content topics and expectations are connected to each other throughout the elementary grades. This connection from academic to curricular, across grade levels requires teachers of mathematics to demonstrate understanding related to student learning, curricular practices and standards, academic language and assessments as they consider learning progressions within and across grade levels.

(a) Understand, explain, and model how to plan sequences of instruction that includes goals, appropriate materials, activities and assessments, and supports engagement in learning through evidence-based practices.

(b) Understand, explain, and model how to administer formative and summative assessments to determine student competencies and learning needs, and use this assessment data to provide feedback, improve instruction and monitor learning.

(c) Understand, explain, and model how to differentiate instructional plans to meet the needs of diverse students in the classroom.

(d) Understand, explain, and model how to develop accommodations for students with dyscalculia or a math learning disability and provide specific strategies to assist them such as:

1. Early warning signs, screening, and recommendations for intervention,
2. Use of visual representations,
3. Use of instructional examples and concrete objects,
4. Student verbalization,
5. Use of heuristic/multiple strategies,
6. Provide ongoing feedback, and
7. Review strategies and connect to previous learning.

~~1.~~

8. **Content Knowledge.** Effective elementary numeracy teachers understand, explain, and model knowledge and understanding of major numeracy concepts, algorithms, procedures, connections, and applications in varied contexts, within and among mathematical domains.

(a) Numerical Practices. Numerical Practices consist of concepts within number and operations base ten, and operations and algebraic thinking. Upon program completion candidates shall be able to do the following:

1. **Foundations of Counting.** Understand, explain, and model the intricacy of counting, including the distinction between counting as a list of numbers in order and counting to determine a number of objects. *(ACOS K.1, K.2, K.3, K.4, K.5, 1.10)*

2. Operations with Numbers: Base Ten

(i) Understand, explain, and model how the base-ten place value system relies on repeated bundling in groups of ten and how to use varied representations including objects, drawings, layered place value cards, and numerical expressions to help reveal the base-ten structure. *(ACOS K.14, 1.11, 1.12, 2.6, 2.7, 2.8, 2.9, 4.6, 4.7, 4.8, 4.9, 5.3, 5.4, 5.5)*

(ii) Understand, explain, and model how efficient base-ten computation methods for addition, subtraction, multiplication, and division rely on decomposing numbers represented in base ten according to the base-ten units represented by their digits and applying (often informally) properties of operations, including the commutative and associative properties of addition and multiplication and the distributive property, to decompose a calculation into parts. *(ACOS K.10, K.11, K.12, 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.13, 1.14, 1.15, 2.1, 2.2, 2.10, 2.11, 2.12, 2.13, 2.14, 3.10, 3.11, 3.12, 4.10, 4.11, 4.12, 5.6, 5.7, 5.8)*

(iii) Understand, explain, and model how to use drawings or manipulative materials to reveal, discuss, and explain the rationale behind computation methods. *(ACOS K.13, K.15,1.13, 2.1, 2.2, 2.3, 2.4, 2.10, 2.11, 2.12, 2.13, 2.14, 2.21, 2.22, 2.~~2.2, 2.3, 2.4, 2.10, 2.11, 2.12, 2.13,2.14, 2,21, 2,22,~~ 24c, 3.1, 3.2, 3.3, 3.5, 3.6, 3.8, 3.9, 3.11, 3.12, 4.2, 4.3b, 4.10, 4.11, 4.12, 5.7)*

(iv)Understand, explain, and model how to extend the base-ten system to decimals and use number lines to represent decimals.

Explain the rationale for decimal computation methods. ***(ACOS 5.3, 5.4a, 5.5, 5.8)***

3. Operations and Algebraic Thinking

(i) Understand, explain, and model the different types of problems solved by addition, subtraction, multiplication, and division, and meanings of the operations illustrated by these problem types. ***(ACOS K.9, 1.1, 1.2, 2.1, 3.3, 3.8, 4.1, 4.2, 4.3, 5.1)***

(ii) Understand, explain, and model teaching/learning paths for single-digit addition and associated subtraction and single-digit multiplication and associated division, including the use of properties of operations. ***(ACOS K.8, K.12, 1.3, 1.4, 1.5, 1.6, 2.2, 3.1, 3.2, 3.5, 3.6, 3.7)***

(iii) Understand, explain, and model foundations of algebra within elementary mathematics, including understanding the equal sign as meaning "the same amount as" rather than a "calculate the answer" symbol. ***(ACOS 1.7, 3.4)***

(iv) Understand, explain, and model numerical and algebraic expressions by describing them in words, parsing them into their component parts, and interpreting the components in terms of a context. ***(ACOS K.10, K.11, 1.8, 2.3, 2.4, 3.8, 4.3, 5.1)***

(v) Understand, explain, and model lines of reasoning used to solve equations and systems of equations. (ACOS K.13, 1.9, 2.5, 3.9, 4.4, 4.5, 5.2)

(b) Operations with Numbers: Fractions

1. Understand, explain, and model fractions as numbers, which can be represented by area and set models and by lengths on a number line. Define *a/b* fractions as *a* part, each of size *1/b*. Attend closely to the whole (referent unit) while solving problems and explaining solutions. ***(ACOS 1.23, 2.27, 3.13, 3.14)***

2. Understand, explain, and model addition, subtraction, multiplication, and division problem types and associated meanings for the operations extend from whole numbers to fractions. ***(ACOS 4.15, 4.16, 5.11, 5.14, 5.15)***

3. Understand, explain, and model the rationale for defining and representing equivalent fractions and procedures for adding, subtracting, multiplying, and dividing fractions. ***(ACOS 3.15,***

4.13, 4.14, 4~~,17, 4,18, 4.19, 5,~~.17, 4.18, 4.19, 5.9, 5.10, 5.12)

4. Understand, explain, and model the connection between fractions and division, a/b = a÷b, and how fractions, ratios, and rates are connected via unit rates. *(ACOS 5.11)*

5.Understand, explain, and model how quantities vary together in a proportional relationship, using tables, double number lines, and tape diagrams as supports. *(ACOS 6.1, 6.2, 6.3)*

6. Understand, explain, and model proportional relationships from other relationships, such as additive relationships and inversely proportional relationships. *(ACOS 5.13, 7.2)*

7. Understand, explain, and model unit rates to solve problems and to formulate equations for proportional relationships. *(ACOS 5.13, 7.1, 7.2)*

(c) Measurement, Data Analysis and Geometry. Measurement is the process of finding a number that shows the amount of something. It is a system to measure the height, weight, capacity or even number of certain objects. It is the process of quantifying something and then possibly making comparisons between two or more objects or concepts. Typically, measurements involve 2 parts—a numeric value and the specific unit. Data analysis is the ability to formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them. Geometry is the study of different types of shapes, figures, and sizes in real life. Upon program completion candidates shall be able to do the following:

1. Measurement.

(i) Understand, explain, and model the general principles of measurement, the process of iterations, and the central role of units: that measurement requires a choice of measurable attribute, that measurement is comparison with a unit and how the size of a unit affects measurements, and the iteration, additivity, and invariance used in determining measurements. *(ACOS K.16, K.17, 1.17, 1.18, 1.19, 1.20, 2.17, 2.18, 2.19, 2.20, 2.23, 2.24, 4.21, 5.17)*

(ii) Understand, explain, and model how the number line connects measurement with number through length. *(ACOS 2.21, 2.22, 4.22)*

(iii) Understand, explain, and model what area and volume are and give rationales for area and volume formulas that can be obtained by ~~finitely~~infinitely many compositions and

decompositions of unit squares or unit cubes, including formulas for the areas of rectangles, triangles, and parallelograms, and volumes of rectangular prisms. ***(ACOS 3.18, 3.19, 3.20, 3.21, 3.22, 3.23, 3.24, 3.25, 4.23, 5.18, 5.19, 6.26, 6.27, 6.28)***

2. Data Analysis (Statistics and Probability)

(i) Understand, explain, and model appropriate graphs and numerical summaries to describe the distribution of categorical and numerical data. ***(ACOS K.15, 1.16, 2.15, 3.16, 3.17, 5.16)***

(ii) Understand, explain, and model that responses to statistical questions should consider variability. ***(ACOS 2.16, 4.20, 5.16, 6.22)***

(iii) Understand, explain, and model distributions for quantitative data are compared with respect to similarities and differences in center, variability (spread), and shape. ***(ACOS 6.22, 6.23, 6.24)***

(iv) Understand, explain, and model theoretical and experimental probabilities of simple and compound events, and why their values may differ for a given event in a particular experimental situation. ***(ACOS 7.15)***

(v) Understand, explain, and model how the scope of inference to a population is based on the method used to select the sample. ***(ACOS 7.10, 7.26)***

3. Geometry.

(i)Understand, explain, and model geometric concepts of angle, parallel, and perpendicular, and use them in describing and defining shapes; describing and reasoning about spatial locations (including the coordinate plane). ***(ACOS K.18, K.19, K. 20, 4.24, 4.25, 4.26, 4.27, 4.28, 4.29, 5.20, 6.25)***

(ii)Understand, explain, and model how shapes are classified into categories, and reasoning to explain the relationships among the categories. ***(ACOS K.21, K.22, K.23, 1.21, 1.22, 2.25, 2.26, 3.26, 5.21, 5.22, 5.23)***

(iii)Understand, explain, and model proportional relationships in scaling shapes up and down. ***(ACOS 7.17)***

(9) Unique Field Experience and/or Practicum Requirements. Field experiences shall include placements where candidates can observe the classroom teacher providing numeracy instruction and participate in the teaching of numeracy in grade levels K-5.

(10) Faculty.

(a) Undergraduate Programs. The faculty should include at least one individual with at least a master's degree and 3 full years of professional educational work experience teaching mathematics in grade levels K-5.

(b) Graduate Programs. The faculty should include at least one individual with at least an education ~~specialist~~specialist degree and 3 full years of professional educational work experience teaching mathematics in grade levels K-5.

Author: Dr. Eric G. Mackey.
Statutory Authority: Ala. Code §§ 16-3-16, 16-23-14, and 16-6H-1 through -19 (1975); Act 2022-239.
History: Emergency Rule filed June 20, 2024; effective June 20, 2024. ~~Permanent New Rule published _____, 2024; effective _____,~~ Permanent New Rule published August 30, 2024; effective October 14, 2024.