

505-3-.93 K-5 SCIENCE ENDORSEMENT PROGRAM

(1) Purpose.

(a) This rule describes requirements and field-specific content standards for approving endorsement programs that prepare science specialists for teaching students in grades K-5 and supplements requirements in GaPSC Rule 505-3-.01, REQUIREMENTS AND STANDARDS FOR APPROVING EDUCATOR PREPARATION PROVIDERS AND EDUCATOR PREPARATION PROGRAMS.

(b) This endorsement program is optional and is designed to strengthen and enhance educator competency levels. This endorsement is designed to advance science content knowledge, provide professional growth, and promote changes in practice that impact student achievement.

(2) Requirements.

(a) To be eligible to enroll in this endorsement program, the educator must have:

1. A valid, level 4 or higher Induction, Professional, Advanced Professional, or Lead Professional teaching certificate in one of the following fields:

- (i) Elementary Education (P-5);
- (ii) Middle Grades Science (4-8);
- (iii) Special Education General Curriculum/ Elementary Education (P-5); or
- (iv) The following certificates combined with a core academic content concentration in Science:
 - (I) Special Education General Curriculum (P-12);
 - (II) Special Education Adapted Curriculum (P-12);
 - (III) Special Education Behavior Disorders (P-12);
 - (IV) Special Education Learning Disabilities (P-12);
 - (V) Special Education Deaf Education (P-12);
 - (VI) Special Education Physical and Health Disabilities (P-12);
 - (VII) Special Education Visual Impairment (P-12); or
 - (VIII) Gifted Certificate (P-12); and

2. A minimum of one year of teaching experience.

(b) The program may be offered only by a GaPSC-approved educator preparation provider.

(c) The program shall be offered as a post-baccalaureate endorsement and may not be embedded in an initial preparation program.

(d) The program shall require candidates to complete an authentic residency. An authentic residency is defined as a supervised and coordinated series of real applications of knowledge and skills

occurring in actual classroom settings that allow candidates to further develop and demonstrate the knowledge and skills acquired in coursework. Residency experiences shall require demonstration of the content knowledge and pedagogical skills delineated in program content standards. Authentic residency experiences shall occur in candidates' assigned classrooms, as well as in settings other than candidates' assigned classrooms to ensure experiences with diverse students and with students in the grade levels of the candidate's base certificate. The authentic residency must include a portfolio component.

(e) Prior to the creation of this rule a certificate known as the Early Childhood Science Endorsement was available. Those holding the Early Childhood Science Endorsement issued prior to June 30, 2010 may keep the endorsement; however, it will not result in eligibility for salary incentives. The K-5 Science Endorsement program shall include a process by which educators holding the Early Childhood Science Endorsement may add the K-5 Science Endorsement and thereby become eligible to earn salary incentives without repeating the full endorsement program. The process shall include but not be limited to the submission of a portfolio which will be assessed by the program provider. Based on the assessment of the portfolio, the program provider may prescribe coursework or performance-based assessments as necessary to ensure that all standards and requirements herein are met before recommending the candidate for the K-5 Science Endorsement.

(f) The portfolio shall include but not be limited to: evidence of observations by supervisors, student work samples, student work samples with analysis, self-reflection, and evidence of the effective use of technology to assist in student learning.

(g) The preparation program described in program planning forms, catalogs, and syllabi shall require a minimum of three courses of which two courses shall be focused on the advancement of content knowledge and one course shall be focused on content-specific pedagogy and proven strategies that address the following standards:

1. The program shall prepare candidates who structure and interpret concepts, ideas and relationships in science at a level appropriate to K-5 students as indicated in the following:

(i) The program shall prepare candidates who understand the major concepts and principles of the science disciplines (life, physical, and earth and space) and interdisciplinary science perspectives as defined by *A Framework for K-12 Science Education – Practices, Crosscutting Concepts, and Core Ideas 2012*.

(l) In relation to the life sciences, candidates shall understand

I. From Molecules to Organisms: Structures and Processes – How organisms live, grow, respond to their environment, and reproduce including:

A. Structure and Function – How the structures of organisms enable life's functions;

B. Growth and Development of Organisms – How organisms grow and develop;

C. Organization for Matter and Energy Flow in Organisms – How organisms obtain and use the matter and energy they need to live and grow; and

D. Information Processing – How organisms detect, process, and use information about the environment.

II. Ecosystems: Interactions, Energy, and Dynamics – How and why organisms interact with their environment and the effects of the interactions including:

A. Interdependent Relationships in Ecosystems – How organisms interact with the living and nonliving environments to obtain matter and energy;

B. Cycles of Matter and Energy Transfer in Ecosystems – How matter and energy move through an ecosystem;

C. Ecosystem Dynamics, Functioning, and Resilience - What happens to ecosystems when the environment changes; and

D. Social Interactions and Group Behavior – How organisms interact in groups so as to benefit individuals.

III. Heredity: Inheritance and Variation of Traits – How characteristics of one generation pass to the next and how individuals of the same species and even siblings have different characteristics including:

A. Inheritance of Traits – How the characteristics of one generation relate to the previous generation; and

B. Variation of Traits – How individuals of the same species vary in how they look, function, and behave.

IV. Biological Evolution: Unity and Diversity – How there can be so many similarities among organisms yet so many different kinds of plants, animals, and microorganisms and how biodiversity affects humans including:

A. Evidence of Common Ancestry and Diversity – What evidence shows that different species are related;

B. Natural Selection – How genetic variation among organisms affects survival and reproduction;

C. Adaptation – How the environment influences populations of organisms over multiple generations; and

D. Biodiversity and Humans – Biodiversity, how humans affect it, and how it affects humans;

(II) In relation to the physical sciences, candidates shall understand

I. Matter and Its Interactions – How one explains the structure, properties, and interactions of matter including:

A. Structure and Properties of Matter - How particles combine to form the variety of matter one observes; and

B. Chemical Reactions – How substances combine or change (react) to make new substances and how one characterizes and explains these reactions and makes predictions about them.

II. Motion and Stability: Forces and Interactions – How one explains and predicts interactions between objects and within systems of objects including:

A. Forces and Motion – How one predicts an object's continued motion, changes in motion, or stability;

- B. Types of Interactions – What underlying forces explain the variety of interactions observed; and
 - C. Stability and Instability in Physical Systems – Why some physical systems are more stable than others.
- III. Energy – How energy is transferred and conserved including:
- A. Definitions of Energy;
 - B. Conservation of Energy in Energy Transfer – What is meant by conservation of energy and how energy is transferred between objects or systems;
 - C. Relationship Between Energy and Forces- How forces are related to energy; and
 - D. Energy in Chemical Processes and Everyday Life – How food and fuel provide energy and if energy is conserved, why people say it is produced or used;
- IV. Waves and Their Application in Technologies for Information Transfer – How waves are used to transfer energy and information including:
- A. Wave Properties –The characteristics, properties, and behaviors of waves;
 - B. Electromagnetic Radiation – What is light, how one explains the varied effects that involve light, and other forms of electromagnetic radiation; and
 - C. Information Technologies and Instrumentation – How instruments that transmit and detect waves are used to extend human senses.
- (III) In relation to the Earth and space sciences, candidates shall understand
- I. Earth's Place in the Universe Including:
 - A. The Universe and Its Stars;
 - B. Earth and the Solar System – The predictable patterns caused by Earth's movement in the solar system; and
 - C. The History of Planet Earth – How people reconstruct and date events in Earth's planetary history.
 - II. Earth's Systems – How and why Earth is constantly changing including:
 - A. Earth Materials and Systems – How Earth's major systems interact;
 - B. Plate Tectonics and Large-Scale System Interactions – Why the continents move, and what causes earthquakes and volcanoes;
 - C. The Roles of Water in Earth's Surface Processes – How the properties and movements of water shape Earth's surface and affect its systems;
 - D. Weather and Climate – What regulates weather and climate; and
 - E. Biogeology – How living organisms alter Earth's processes and structures.

III. Earth and Human Activity – How Earth’s surface processes and human activities affect each other including:

- A. Natural Resources – How humans depend on Earth’s resources;
- B. Natural Hazards – How natural hazards affect individuals and societies;
- C. Human Impacts on Earth Systems – How humans change the planet; and
- D. Global Climate Change – How people model and predict the effects of human activities on Earth’s climate.

(ii) The program shall prepare candidates who understand how the major crosscutting concepts and scientific and engineering practices, which include inquiry, are integrated with the scientific disciplinary core ideas to create a three dimensional learning experience as indicated in the following:

(I) Scientific and Engineering Practices including:

I. Asking questions (for science) and defining problems (for engineering):

- A. Developing and using models;
- B. Planning and carrying out investigations;
- C. Analyzing and interpreting data;
- D. Using mathematics and computational thinking;
- E. Constructing explanations (for science) and designing solutions (for engineering);
- F. Engaging in argument from evidence; and
- G. Obtaining, evaluating, and communicating information.

II. Crosscutting Concepts including:

- A. Patterns;
- B. Cause and effect: Mechanism and explanation;
- C. Scale, proportion, and quantity;
- D. Systems and system models;
- E. Energy and matter: Flows, cycles, and conservation;
- F. Structure and function; and
- G. Stability and change.

2. The program shall prepare candidates who are able to engage K-5 students regularly and effectively integrate core ideas, crosscutting concepts, and science and engineering practices and who

understand the roles the three dimensions of the Framework play in the development of scientific knowledge as indicated in the following:

- (i) The program shall prepare candidates who understand scientific and engineering practices and their relationship to the development of scientific knowledge;
- (ii) The program shall prepare candidates who engage K-5 students effectively in scientific and engineering practices appropriate for their grade level and abilities;
- (iii) The program shall prepare candidates who understand how to engage K-5 students effectively in studies of the nature of science and conventions of scientific explanations; and
- (iv) The program shall prepare candidates who use appropriate technology to teach K-5 students science.

3. The program shall prepare candidates who relate science to the daily lives and interests of students, understand the relationships of science to society and the community, and use human and institutional resources to advance the science education of their students understanding as indicated in the following:

- (i) The program shall prepare candidates who relate science to the personal lives, needs, and interests of K-5 students;
- (ii) The program shall prepare candidates who understand the values and needs of the community and their effect on science teaching and learning;
- (iii) The program shall prepare candidates who use community, human, and institutional resources to advance science learning in the classroom and in the field;
- (iv) The program shall prepare candidates who understand the nature of science.

4. The program shall prepare candidates who are able to engage a diverse community of student learners through differentiated strategies as indicated in the following:

- (i) The program shall prepare candidates who value and respect the experiences that all students bring from their backgrounds (e.g., homes or communities) and who tailor instruction by using culturally relevant pedagogy.
- (ii) The program shall prepare candidates to support a diverse population of students, to include economically disadvantaged, by connecting science education to students' sense of "place" by physical, historical, and/or sociocultural dimensions.
- (iii) The program shall prepare candidates to positively impact the achievement and confidence of underrepresented groups, including females and other minority groups, by incorporating instructional strategies to increase their intentions to continue studies in science and curricula to improve their achievement and confidence in science.

(iv) The program shall prepare candidates to support students with limited English proficiency by using adequate literacy strategies for all students, language support strategies with ELLs, and discourse strategies with ELLs.

5. The program shall prepare candidates who use a variety of contemporary science formative and summative assessments to determine, guide, and inform science instruction and then use the results

of these assessments to improve their practice and increase student achievement.

6. The program shall prepare candidates who create and maintain a psychologically, socially, and ethically safe and supportive learning environment and a science teaching environment that conforms to the National Science Teachers Association's National Science Safety Standards. To this end, the program will include instruction and training on the safe handling, distribution, disposal and storage of chemicals and other laboratory equipment and the safe and ethical treatment of animals in the classroom.

7. The program shall prepare candidates through authentic experiences who participate in the professional community and improve practices through their personal actions, education, and development.

Authority O.C.G.A. § 20-2-200