

ATTACHMENT 4A-1

LETTER OF NOTIFICATION - 10

GRADUATE CERTIFICATE PROGRAM

(12-18 SEMESTER CREDIT HOURS)

1. Institution submitting request:

University of Arkansas

2. Contact person/title:

Sharon Gaber/Vice Chancellor for Academic Affairs and Provost

3. Phone number/e-mail address:

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4. Proposed effective date:

August 2012

5. Name of proposed Graduate Certificate Program (Program must consist of 12-18 semester credit hours from existing graduate courses).

STEM Education for Early Childhood (K-4)

6. Proposed CIP Code:

13.1202

7. Reason for proposed program implementation:

The new certificate program for a concentration in STEM (Science, technology, engineering and mathematics) Education for the 5-year MAT K-4 Early Childhood Program will help the University of Arkansas help meet the demand for highly qualified teachers at the early childhood and elementary levels with knowledge of each STEM discipline and how they can be effectively integrated.

8. Provide documentation that proposed program has received full approval by licensure/certification entity. (A graduate certificate offered for teacher licensure must be approved by the Arkansas Department of Education prior to consideration by the Coordinating Board).

At this time, there is no licensure/certification endorsement in STEM Education provided through the Arkansas Department of Education. However, there have been ongoing discussions and plans are being made to develop such an endorsement. The University of

Arkansas would be proactive in developing a Graduate Certificate in STEM Education to prepare a cadre of teachers for future licensure endorsements.

9. Will this program be offered on-campus, off-campus, or via distance delivery?

On campus

10. Provide the following:

- a. Curriculum outline - List of required courses
 - i. TEED 4033 Introduction to STEM Education
 - ii. TEED 5023 Creativity and Innovation in STEM Education
 - iii. CIED 5032 Curriculum Design
 - iv. CIED 5203 Teaching Problem-Based Mathematics in the Elementary Grades
 - v. CIED 5213 Teaching Problem-based Science in the Elementary Grades

b. New course descriptions

i. TEED 4033 Introduction to STEM Education

This introductory course in integrative STEM education focuses on the development and introduction of STEM content and pedagogy for the PK-12 classroom. The course includes an introduction to the nature of each of the STEM education disciplines, and follows with an exploration of the pedagogies unique to the fields of science, technology, engineering, and mathematics (STEM) education and insights into teaching strategies that can be used to deliver instruction in an integrative fashion.

ii. TEED 5023 Creativity and Innovation in STEM Education

This introductory course in technology and engineering education focuses on the development and introduction of technology and engineering-based activities to support science and mathematics instruction in the elementary classroom. Through hands-on, problem based learning challenges, students will develop an understanding of the design process and the integration of science, technology, engineering, and mathematics (STEM) often used to solve real-world problems.

iii. CIED 5203 Teaching Problem-based Mathematics in the Elementary Grades

This graduate level course focuses on sharing, modeling and practicing strategies to support the meaningful integration of science, technology, engineering and mathematics (STEM) with the emphasis on mathematics in the K-4 classroom. A strong foundation for integrating the STEM disciplines through a problems-based approach within the elementary curriculum will be developed by providing students with theoretical frameworks, research, resources, and methods related to appropriate and effective classroom practice

iv. CIED 5213 Teaching Problem-based Science in the Elementary Grades

This graduate level course focuses on sharing, modeling and practicing strategies to support the meaningful integration of science, technology, engineering and mathematics (STEM) with the emphasis on science in the

K-4 classroom. A strong foundation for integrating the STEM disciplines through a problems-based approach within the elementary curriculum will be developed by providing students with theoretical frameworks, research, resources, and methods related to appropriate and effective classroom practice.

- c. Program goals and objectives
 - i. Develop a theoretically informed argument for embedding mathematical and scientific thinking strategies across the curricula;
 - ii. Demonstrate a basic knowledge of the national standards in the fields of science, , technology, engineering and mathematics education; as well as basic knowledge of the Common Core Standards;
 - iii. Demonstrate the ability to synthesize relevant information regarding the use of STEM thinking in elementary or secondary education;
 - iv. Utilize the vocabulary, primary concepts, definitions, and models applicable to STEM education;
 - v. Demonstrate an ability to collect, evaluate, synthesize, and share real-world data relevant to curricula in elementary or secondary education;
 - vi. Demonstrate an ability to solve problems, evaluate the efficacy of possible solutions, and discuss strategies and processes needed for effective problem solving;
 - vii. Demonstrate the ability to work in collaborative design teams to meet given criteria and solve design problems;
 - viii. Develop innovative and alternative teaching methods and learning activities that promote STEM education;
 - ix. Apply STEM cognitive tools (i.e., scientific model, design loop, etc.) and resources toward solving human and environmental problems;
 - x. Develop confidence in the use and development of design models and engineering constraints;
 - xi. Analyze attributes, strengths, and weaknesses of current STEM education programs, initiatives and policies at the local, state, and national levels; and,
 - xii. Develop confidence in the use of appropriate technology for data collection, analysis and display;
 - xiii. Develop the ability to work in collaborative design teams to meet given criteria and solve science-related problems;

- d. Expected student learning outcomes
 - i. Demonstrate an ability to use a variety of pedagogical strategies to enhance STEM thinking in elementary students;
 - ii. Demonstrate knowledge of the historical background and development of the fields of science, mathematics, technology education, and engineering.
 - iii. Apply technical tools and resources toward solving human and environmental problems;
 - iv. Utilize the fundamentals of design and engineering in the development and delivery of curriculum;
 - v. Utilize the vocabulary, primary concepts, definitions, and models applicable to scientific investigations and engineering and design challenges;
 - vi. Demonstrate the ability to communicate engineering and design concepts with colleagues and students using oral, written, artifact-based, and graphic channels of communication;

- vii. Develop and deliver lessons related to the content of this course while paying special attention to standards, behavioral or performance objectives, lesson content, teaching strategies, lesson activities, and assessment strategies.
- viii. Develop an understanding and appreciation for the nature of science and scientific inquiry through solving real-world problems;
- ix. Apply science, technology, engineering and mathematics toward solving human and environmental problems;
- x. Understand how the unique developmental needs of young children are met through an integrated problem-based approach;
- xi. Recognize how an integrated approach can enrich the learning environment and build connections between STEM content areas;

- xii. Select and experience a wide range of instructional practices, approaches, strategies, and methods for integrating curricula that focus on a problems-based approach, while accommodating for the developmental, cultural, and linguistic differences in students;
- xiii. Develop skills and experience in writing grants for the purpose of implementing funded integrated STEM curricula in the classroom.

11. Identify off-campus location.

N/A

President/Chancellor Approval Date:

Board of Trustees Notification Date:

Chief Academic Officer:

Date: