**ED 312: Methods and Materials for Teaching Science in the Elementary Classroom**



**Dr. Teresa Banks, Course Instructor**

**Office Hours: Virtual- Monday-Thursday 9:00a -1:00p**

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**Course Days: Tuesday & Thursday 3p-5:05p**

**COURSE OVERVIEW:** This course is designed for teaching candidates the appropriate methods and materials for teaching Science in the Elementary School. Included will be development of lesson plans, teaching units as well as appropriate theory, research and best practices for teaching science interactively in the elementary classroom. Field experiences that include micro-teaching units in the classroom are included. **Prerequisites: ED 280: Introduction to Teaching, ED 380: Instructional Planning and Adapting Instruction, SC 15: Survey of Biological Science, and SC 261: Survey of Physical Science.**

**COURSE HOURS:** 3

**REQUIRED TEXT:** *Teaching Children Science: A Discovery Approach 9th* Ed. Derosa, D & J. Abruscato Pearson Publication

**ADDITIONAL REQUIRE READING:**

National Science Education Standards (<http://www.nap.edu/catolog.php?record_id=4962#toc>)

National Science Teacher Association Standards ( NSTA) (<http://www.nsta.org/preservice>)

Next Generation Science Standard (<http://www.nextscience.org/next-generation-science-standards>)

**COURSE OBJECTIVES:** The purpose of this course is to provide you, the future teacher, with the skills, knowledge, and resources for providing quality science learning experiences for all students. This begins with an emphasis upon you as a science learner. Over time, the shift will move toward you as a science teacher. Specific objectives addressed during the course include: a. Articulate and refine personal understandings of science and science teaching b. Develop deeper understandings of the nature of science and specific science content c. Demonstrate proficiency with identifying the essential features of inquiry-based science teaching and the variations within those features d. Create developmentally appropriate lessons that demonstrate the effective application of important ideas and skills, including inquiry and process skills e. Collaborate with other education professionals while examining issues related to teaching science for all students, including culturally-relevant science learning and social justice issues related to science f. Identify instructional approaches that facilitate learning by students from populations typically und

**COURSE PERFORMANCE OUTCOMES:** New teachers are required to take the Praxis Principles of Learning and Teaching test. During this course, each student will demonstrate their progress toward becoming proficient in the following standards, as set forth on the Praxis:

I. **Students as Learners**

A. Students as diverse learners

**II. Instruction and Assessment**

A. Instructional strategies

B. Planning instruction

C. Assessment strategies

**IV. Profession and Community**

1. The reflective practitioner

**LINKAGE OF THE HTM AND GENERAL COURSE GOALS**

Through The broad-based curriculum consisting of performance-based assessment and research-based instruction and strategic field experiences, the teacher education programs at Mississippi Valley State University provide content, professional, pedagogical knowledge, skills, and dispositions to enable professional educators and to help students reach their full potential. The following Mississippi Valley State University Conceptual Framework represents the link between the conceptual framework and course goals:

**Outcome: Content**

**(Scholar)-** Candidate Proficiencies- Knowledge (Scholar)

1. 1.1 Candidate synthesizes in-depth knowledge of content in specific discipline with research based best practices in the teaching and learning process.
2. 1.2 Candidate plans instruction and integrates technology appropriately based on best practices.
3. 1.3 Candidate selects reliable and valid assessments to measure student performance.
4. 1.4 Candidate knows the theoretical, historical, and philosophical foundation of diversity and equity.

**Outcome: Processes and Skills (Facilitator Reflective Thinker)** Candidate Proficiencies- Skills

1. 2.1 Candidate regularly reflects on the state, national, and professional standards as a basis for continuously improving teaching and learning.
2. 2.2 Candidate designs and implements unit and daily lesson plans that incorporate rigorous instructional strategies and infuse technology appropriately to enhance student learning.
3. 2.3 Candidate administers formative and summative assessments to measure student learning outcomes and to facilitate data-based decisions about instruction
4. 2.4 Candidate develops adaptive instructional plans to meet the educational and social needs of all studentsin collaboration with community and parental support.

**Outcome: Dispositions (Responsible Professional)- Candidate Proficiencies- Dispositions**

1. 3.1 Candidate actively collaborates with relevant P-20 learning communities and professional education associations as evidence of a professional commitment to professional learning and development
2. 3.2 Candidate values, respects, and promotes learning for all students and incorporates instructional technology.
3. 3.3 Candidate systematically analyzes individual student outcomes and makes appropriate decisions for student learning.
4. 3.4 Candidate models professional, responsible, and ethical behaviors to support social justice and equity in a diverse society.

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| **Course Topics and/or Student Learning Outcomes** | **Activities** | **Assessments (including Performance based)** | **Standard Alignment** |
| 1.Integrate content standards in a variety of curricula that are developmentally appropriate, interesting, and relevant to student’s lives, organized around inquiry, and connected with other school subjects. | Field trip  Innovation generation  Science journal article | Lesson plans  Science literacy assignment  Discussions  Journal critiques | HTM 1.2,2.1,2.2,3.4  INTASC 1a,1b,3e,6f  ISTE 1c |
| 2. Create and teach lessons that reflect accurate knowledge of science content, the nature of science, science process skills, use of technology in science teaching, assessment, and science pedagogy. | 5-E lesson plan activity  Science Fair | Lesson plan rubric  Science paper  Science Fair project | HTM 1.2. 2.2,2.3,2.4  INTASC 1a,1b,2c,5a,6f,8a  ISTE 1b,1c,2c,4a,4b,4c |
| 3. Reflect upon their experience noting area of strength and weaknesses and develop plans to improve the practice. | DOK and Blooms taxonomy | MAAP test practice | HTM 1.1,1.3,2.1  INTASC 1a.1b.7a  ISTE 4a,4b,4c |
| 4. Choose from a variety of activity types to teach science in a way to address student needs including collaboration with colleagues, other school professionals, and the community. | Field Experience  Science Literacy | Field observation reflection  Science literacy reflections | HTM 1.2,1.3,2.1,2.2  INTASC 1a,1b,2c,3e,5a,6I  ISTE 4a,4b,4c,5c.7c |

**FIELD EXPERIENCE and the COURSE:** While you are enrolled in this course, you will also be observing and teaching elementary classrooms. These field experiences are critical as you develop into a professional educator. They will provide you with an opportunity to explore different models of instruction and assessment, and an opportunity for you to expand your knowledge of science instruction.

**PHILOSOPHY OF SCIENCE EDUCATION:**

Throughout a student’s education, he/she will learn to like or dislike science or even to be afraid of science.  An educator is in a key position to influence a child’s attitude toward science.  By continuing a child’s natural curiosity, science can be the most fascinating subject for every child at every age!  Passive activities such as reading a book or answering questions at the end of the chapter will not stimulate the student’s interest.  By providing an inquiry- based approach to science, the science educator will help to channel the student’s energy, curiosity, and interest into a lifelong interest in the world of science.

Equity pedagogy is a very important consideration in the science classroom. The science educator must create an environment that is encouraging and filled with opportunities for all students to succeed.  There is an under-representation of minorities and women in the scientific and technological fields.  It is left to the educators a challenge to develop methodologies that will allow the learning process to occur for all students in the science classrooms across the country.

Fulfilling the theme of the College of Education conceptual framework, this course will contribute to the development of education and clinical professionals who facilitate learning and promote change in environments that both reflect and value diversity.

Why take an elementary science methods course?

(Purpose) Most preservice elementary teachers have had little undergraduate preparation in science. If you have taken a science course, it was most likely taught through lecture and with no laboratory experience. The result for non-science majors is often confusion and possibly fear of science. Lecture-type courses which stress the memorizing information, do not prepare you to teach science in the elementary school. Therefore this course has three purposes:

1. To enhance your knowledge of concepts in science which are commonly taught in elementary schools.

2. To help you develop strategies for conducting inquiry-based science with elementary school children.

3. To enable you to use authentic assessment for inquiry-based science. Often teachers are afraid to teach science because they "do not know all the answers." If you are willing to investigate along with your students, this fear of not being 'the expert' should be dissipated.

How will this course be taught? (Processes) It is our firm belief that teaching strategies must be modeled in methodology classes. A teaching strategy is an approach to a lesson designed to achieve an intended outcome. Therefore, if you merely want your students to memorize the water cycle you would not use an inquiry-based strategy. Strategies are grouped according to the outcome you are intending to achieve. This grouping is not something that is fixed – you can organize the strategies in any way that you choose. Inquiry is the means to discovery, but we must acknowledge that because everyone comes to class with different experiences and personal theories, their discoveries could be quite different. However, inquiry requires that there is a question or something that you wonder about. You probably have dozen of questions that you ask yourself every week that relate to science and the nature world. Inquiry in elementary school means fostering curiosity in children, helping them develop questions, and giving them the tools to investigate their ideas.

Once you have selected the strategy to be used according to what you are trying to achieve in the lesson, then you will be called upon to use your teaching 'skills.' This course will also model the requisite skills, which includes clarity of purpose; maintaining the 'flow' in your lesson; managing the distribution of equipment, etc.; questioning techniques; giving directions; safety awareness; summarizing and bringing closure to lessons; maintaining order.

**THE POLICY FOR ABSENCES/TARDIES IS AS FOLLOWS:**

**1. The first absence is a gift – it should be used wisely.**

**2. *Every* absence after the first will reduce average by 2 points.**

**3. Two late arrivals or early departures (or a combination of a late arrival**

**and an early departure) are equivalent to one absence.**

**4. Missing over half the class (either by being tardy or leaving early) constitutes an absence.**

**5. In the event of an extenuating circumstance (example: medical emergency), a collective decision by the instructors will be made regarding accountability. Satisfactory evidence of emergencies**

**may be required.**

**ACADEMIC RESPONSIBILITIES AND ACCOUNTABILITY:**  This syllabus represent a learning contract. Your success in the course is dependent upon successful completion of course requirements, assignments and tasks while maintaining high academic integrity. Please note: Classroom discussion will enable each student to develop his/her teaching style and philosophy more firmly about teaching in an elementary classroom. Participation in classroom discussion and activities is absolutely expected to receive all participation points. Material presented in class is not necessarily in the textbook. All assignments are due the day requested, regardless of the attendance of the student.

**AMERICAN WITH DISABILITIES ACT**: Mississippi Valley State University does not discriminate based on disability in the recruitment and admission of students, the recruitment and employment of faculty and staff, and the operation of any of its programs and activities, as specified by federal laws and regulations. *The student has the responsibility of informing the course instructor (at the beginning of the course) of any disabling condition, which will require modification to avoid discrimination*. Faculty members are required by law to provide "reasonable accommodation" to students with disabilities, so as not to discriminate based on that disability. Student responsibility primarily rests with informing faculty at the beginning of the semester and in providing authorized documentation through designated administrative channels.

**CHEATING AND PLAGARISM:** Cheating in any fashion will not be tolerated, including but not limited to plagiarizing another’s words, work or ideas on individual class assignments.

To address the situation of plagiarism, the University has implemented *Turnitin* to fight plagiarism and improve reading, writing, and research skills. *Turnitin* is a comprehensive plagiarism prevention system that lets faculty quickly and effectively check all students’ work. Results are based on exhaustive searches of billions of pages from both current and archived instances on the Internet.

Plagiarism will result in at least a failing grade for the assignment(s) and/or course.

**COURSE ASSIGNMENTS OVERVIEW**

1. **Nature of Science paper POINTS: 50pts DUE DATE: January 26**

This paper should be 3-5 pages using Times Roman 12-point font and double-spaced. A grading rubric for this paper is available on page 10 of this Syllabus. Your paper should include:

• A clear definition of “science”

• Discussion about what science is “not”

• Discussion about science processes

• Discussion about the role of science in society

• Discussion about how this assignment has changed the way you view science

• Clear ideas about how you will incorporate this new knowledge into your classroom instruction

**2)Two Journal Article (Refereed) POINTS: 30 pts each DUE DATES: February 2 & 23**

You will read two science articles from a referred source such as National Science Association, Science in School, or Science magazine to name a few. You will write a reflection for each article using the journal article critique provided (See page 8-9 for guide).

**3) Two Inquiry- Based Science Lesson Plans POINTS: 40pts each DUE DATE: March 16**

The effective teaching of science requires a thoughtful combination of direct experiences for students, a shifting of roles by the teacher, a clear sense of purpose, and a skillfully orchestrated discussion. A complete lesson plan includes student performance objectives, Science Core Curriculum connections, outline of lesson sequence, list of materials, and a student record sheet. You will present one lesson during class.

**4) Science Fair Project POINTS:100 DUE DATE: March 23**

You will design a scientific experiment and present the results to the entire class. This is an individual activity and is your chance to demonstrate your competence at learner-centered scientific inquiry.

**5) Science Literature Books POINTS: 60 DUE DATE: April 1**

You will select five (5) Science literature books to present in power point formation. You will discuss the science domain the book address, grade level the book will be used to teach, the science standards associated with book and one activity that can be taught. This should be done for each book.

**6) Field Placement assignment - Bozeman Science – NGSS (videos) POINTS: 60 DUE DATE: April 15**

<http://www.youtube.com/watch?v=o9SrSBGDNfU&list=PLllVwaZQkS2rtZG_L7ho89oFsaYL3kUWq&index=1>

This series of 60 brief videos covers the practices and concepts found in the NGSS as well as disciplinary core ideas for the physical, life, and earth sciences. Learn about integrating concepts in engineering, technology, and society. This is an especially useful collection of videos that will help you become familiar with the NGSS as well as give you ideas for teaching STEM topics. Part one: You will watch all 60 video clips and prepare a power point presentation document by summarizing what you have learned from the videos. How did the videos help you understand the standards? How did the videos help you understand and connect to each of the science domains: Life science, earth and space and physical science? Part two of the assignment involves you developing a quiz from the videos which will include 2) short answer questions, 4) true or false questions, 4 fill-in the blank questions, and 4) matching questions. Beneath each question you will list the DOK level as well as the Blooms taxonomy level.

Disclaimer: The Instructor reserves the right to adjust the course schedule and assignments as needed. All assignments will be unloaded in Canvas except in-class assignments and all quizzes are given in Canvas.

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| Week/Date | Topic/Discussion | Assignment due |
| 1. January 12&14 | Review syllabi and assignments discuss filed placement forms  For next week: Read Chapter one |  |
| 2. January 19 &21 | Review Chapter one Inquiry: The Path; Discovery: The Destination: and NGSS | Read Chapter two |
| 3. January 26 &28 | Review Chapter Two: Science Practices and Inquiry Skills  In-Class assignment: Inquiry Activity  Quiz one: January 28 | Read Chapter three  Nature of Science paper due |
| 4. February 2 & 4 | Video analysis- No class in-class meeting this week | Journal article critique one due |
| 5. February 9 &11 | Chapter three: Planning Units and Lessons  Developing 5-E model  Quiz two: February11 | Read Chapter four |
| 6. February 16 & 18 | Chapter four: Creating environments for Discovery  DOK and Blooms Taxonomy | Read Chapter five |
| 7. February 23 & 25 | Chapter Five: Assessment of understanding and Inquiry  Writing Lesson plans | Journal article critique two due |
| 8. March 2 & 4 | Mid-Term exam March 2 | Read Chapter six |
| 9. March 9 & 11 | Chapter six: Integrating Science and Engineering  Website evaluations |  |
| 10. March 16 & 18 | Lesson plan presentations | Lesson plans |
| 11. March 23 & 25 | Science Fair experiment presentations | Science experiments |
| 12. March 30 & April1 | Virtual field trip  Presentation of literature books | Science literature book assignment |
| 13.April 6 &8 | In class Video reflection (Study Jams) reflection  5-E model from Study jam topic |  |
| 14. April 13 & 15 | Discuss field experience activity  Quiz three | Field Experience due |
| 15. April 20 & 22 | Course review  Field trip activity |  |
| 16. April 27 | Final Exam |  |

References:

1. Carin, A. &J. Bass: *Methods for Teaching Science as Inquiry* (9th Ed) 2005. Pearson Merrill Prentice Hall
2. Science and Children. National Science Teacher Association http:/ [www.nsta.org](http://www.nsta.org)
3. Journal of Research in Science Teaching. National Association for Research in Science Teaching. <Http://www.narst.org>