Course Prefix and Number: TKT 4483/6483

Course Title: Methods of Teaching STEM in the Middle School

Credit Hours: Three (3) semester hours

Type of Course: Lecture

Catalogue Description: A study of objectives, materials, and methods appropriate for teaching STEM in the middle school.

College of Education Conceptual Framework:

The faculty in the College of Education at Mississippi State University are committed to assuring the success of students and graduates by providing superior learning opportunities that are continually improved as society, schools, and technology change. The organizing theme for the conceptual framework for the College of Education at Mississippi State University is educational professionals - dedicated to continual improvement of all students’ educational experiences. The beliefs that guide program development are as follows:

1. KNOWLEDGE - Educational professionals must have a deep understanding of the organizing concepts, processes, and attitudes that comprise their chosen disciplinary knowledge base, the pedagogical knowledge base, and the pedagogical content knowledge base. They must also know how to complement these knowledge bases with the appropriate use of technology.

2. COLLABORATION - Educational professionals must continually seek opportunities to work together, learn from one another, forge partnerships, and assume positions of responsibility.

3. REFLECTION - Educational professionals must be willing to assess their own strengths and weaknesses through reflection. They must also possess the skills, behaviors, and attitudes necessary to learn, change, and grow as life-long learners.

4. PRACTICE - Educational professionals must have a rich repertoire of research-based strategies for instruction, assessment, and the use of technologies. They must be able to focus that array of skills on promoting authentic learning by all students or clients, while exhibiting an appreciation and commitment to the value and role of diversity.
Course Objectives:

1. To develop an understanding of the history and development of STEM in the middle school framework. (InTASC #1, CFPO #3)

2. To develop an understanding of the competencies needed to teach the STEM in the middle school framework and be able to demonstrate these competencies successfully. (InTASC #1, CFPO #3)

3. To develop an understanding of the purposes and goals of STEM and be able to develop appropriate lesson plans using the Understanding by Design template. (InTASC #1-9, CFPO #2, 3, 6, 8-12)

4. To develop an awareness of diverse needs, interests, and abilities of middle school students and be able to select appropriate methods of teaching and assessing for that age group. (InTASC #1-8, CFPO #2, 3, 9-12)

5. To interpret minimum specifications of hardware and demonstrate proper procedures used to install hardware/software, manage, and troubleshoot in a networked environment. (InTASC #1, CFPO #3, 11)

6. To understand the role of professional associations as they apply to professional development in the area of STEM in the middle school. (INTASC # 9, 10, CFPO #1)

7. To demonstrate effective teaching by modeling micro-lessons in STEM in the middle school areas. (InTASC #1-8, CFPO #2, 3, 5, 7, 8, 10-12)

8. To demonstrate knowledge of appropriate assessment in STEM in the middle school areas. (InTASC #8, CFPO #3, 4, 10, 11)

Topics to be Covered:

1. Licensure requirements (MDE, 2008) (1 hour)

2. Teaching orientation, ethics, personality development and emerging careers (STEM, 2011; Einsiedel, 2009; Klaus, et al., 2007; Cole, 2011; CNET, 2011; VARK, 2011; States, 2011; USBLS, 2011) (3 hrs.)
   a. Objectives and content
   b. Instructional strategies for teaching orientation and ethics
   c. Evaluating learning

3. Teaching technology literacy (Morrison & Wells, 2010; Baldauf, 2012; Parsons & Oja, 2012; Shelly & Vermaat, 2012) (5 hrs.)
   a. Objectives and content
   b. Instructional strategies for teaching technology literacy
c. Evaluating learning

4. Teaching the design process and how it is used to develop products (Chopra, 2011; Grover, 2009; CAD, 2011; Google Sketchup 8, 2011; Design, 2011) (5 hrs.)
   a. Objectives and content
   b. Instructional strategies for teaching the design process
   c. Evaluating learning

5. Teaching emerging technologies (STEM, 2011; Einsiedel, 2009) (3 hours)
   a. Objectives and content
   b. Instructional strategies for teaching emerging technologies
   c. Evaluating learning

6. Teaching 3-D models with CAD software and how it is used in the drafting and design industry (STEM, 2011; Chopra, 2011; CAD, 2011; Google Sketchup 8, 2011; Design, 2011) (5 hours)
   a. Objectives and content
   b. Instructional strategies for teaching CAD software
   c. Evaluating learning

7. Teaching sustainable design and technology and the impact on industry. (STEM, 2011; Chopra, 2011; CAD, 2011; Google Sketchup 8, 2011; Design, 2011) (5 hours)
   a. Objectives and content
   b. Instructional strategies for teaching the sustainable design process
   c. Evaluating learning

8. Teaching power and energy, how it is used in industry and the effects it has on the environment. (STEM, 2011; Boyle, 2004; Clean, 2010; Dept. of Energy, 2011; EIA, 2011; Energy, 2011; EduGreen, 2011; TVA, 2011) (4 hours)
   a. Objectives and content
   b. Instructional strategies for teaching about the power and energy industry and how it impacts the environment.
   c. Evaluating learning

9. Teaching robotics and how it is used in industry. Simulate robotics programming. (STEM 2011; NASA, 2011; RoboMind, 2011; Robotics, 2011; Virtual, 2011) (5 hours)
   a. Objectives and content
   b. Instructional strategies for teaching robotics and how it is used in industry.
   c. Evaluating learning

10. Teaching financial and economic literacy, the purpose and importance of credit, and the role financial decisions have in your personal life. (STEM, 2011; Garman & Forque, 2010; Tyson, 2009; Ramsey, 2009; Dollar, 2011) (5 hours)
    a. Objectives and content
    b. Instructional strategies for teaching financial and economic literacy
    c. Evaluating learning
11. Teaching workplace skills (STEM, 2011; Klaus, et al, 2007) (4 hours)
   a. Objectives and content
   b. Instructional strategies for teaching workplace skills
   c. Evaluating learning

Texts:

Research and curriculum unit for workforce development vocational education. (2011). STEM: 
http://www.rcu.msstate.edu/Curriculum/CurriculumDownload.aspx

Methods of Instruction:

Instructional methods will include teacher and student active components. Lecture, discussion, 
demonstration, projects, project-based learning, cooperative learning will all be used. Students 
will apply learning by planning a unit plan and teaching one of the lesson plans. Technology 
required of middle school students will be infused throughout the course.

Suggested Student Activities:

1. The student will read articles from professional publications that have significance to each 
unit in the STEM in the middle school framework, maintain a reading weblog, and post 
reflections to a reading blog (Obj. 8).

2. The student will complete a learning log for each module (Obj. 1).

3. The student will complete assignments related to instructional strategies that infuse STEM 
and meet the learning needs and preferences of middle school students. They will complete 
a wiki that will be used to present their work (Obj. 2, 4).

4. The student will complete selected assignments and quizzes in required framework 
applications to show mastery of those applications (Obj. 2, 5).

5. The student will plan a unit of instruction within the STEM in the middle school content 
area using the Understanding by Design template (Obj. 3, 6).

6. The student will develop all assessment tools required to deliver the unit plan developed for 
STEM in the middle school content area (Obj. 10).

7. The student will deliver one lesson planned in the unit plan that infuses STEM in instruction 
(Obj. 9).

8. The student will critique his/her own teaching delivery and that of other students (Obj. 7).

9. The student will complete a group assignment using a wiki (Obj. 6).
Honor Code:

Mississippi State University has an approved Honor Code that applies to all students. The code is as follows:

"As a Mississippi State University student I will conduct myself with honor and integrity at all times. I will not lie, cheat, or steal, nor will I accept the actions of those who do."

Upon accepting admission to Mississippi State University, a student immediately assumes a commitment to uphold the Honor Code, to accept responsibility for learning, and to follow the philosophy and rules of the Honor Code. Students will be required to state their commitment on examinations, research papers, and other academic work. Ignorance of the rules does not exclude any member of the MSU community from the requirements or the processes of the Honor Code. For additional information please visit: http://students.msstate.edu/honorcode/

Academic misconduct will be dealt with in accordance with the guidelines and procedures outlined in the Academic Misconduct Policy, which may be accessed on the web at http://www.msstate.edu/dept/audit/PDF/1207.pdf.

Technology:

Instructional technology is used to prepare materials for the course including lesson plans, instructional aids, projects, journals, etc. In delivery of the lesson, students learn to use electronic presentation technology, the SmartBoard, the document camera, the Internet. They use electronic databases as well as the Web for research; they post and retrieving information electronically.

Diversity Statement:

Diversity is specifically addressed in Instructional Objectives # 3 and 6 and specifically in Topics # 3, 4, and 5.

Students with Disabilities:

Students with disabilities are encouraged to discuss their needs with the instructor, preferably during the first week of the semester. All reasonable accommodations will be made to see that disabilities do not restrict a student's opportunity to learn. Help is also available from Student Support Services (http://www.sss.msstate.edu/disabilities/, 01 Montgomery Hall, 325-3335).

Field Component:

There is no field component.
Evaluation of Student Progress:

Undergraduates:

- Quizzes and exams: 15%
- Learning log and blog postings: 10%
- Group wiki assignment: 10%
- UBD unit/lesson plan/delivery/critique: 20%
- UBD unit/lesson materials and assessment: 20%
- Instructional strategies assignment wiki: 10%
- Daily assignments: 15%

Graduates:

- Quizzes and exams: 15%
- Learning log and blog postings: 10%
- Group wiki assignment: 10%
- UBD unit/lesson plan/delivery/critique: 15%
- UBD unit/lesson materials and assessment: 15%
- Instructional strategies assignment wiki: 10%
- Daily assignments: 15%
- Graduate research assignment: 10%

(Graduate students will complete a ten-page research paper on a contemporary topic related to STEM in middle school as approved by the instructor. Graduate students will present the paper to the class.)

Grading Scale:
- 90 - 100: A
- 80 - 89: B
- 70 - 79: C
- 60 - 69: D
- <60: F

Bibliography:

Books


**Web Sites**


