UMBC UGC New Course Request: EDUC431

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COURSE INFORMATION:

Course Number(s)	EDUC 431
Formal Title	Methods for Teaching STEM in the Middle Grades
Transcript Title (≤30c)	Teaching STEM in the Middle Grades
Recommended Course Preparation	N/A
Prerequisite **NOTE:** Unless otherwise indicated, a prerequisite is assumed to be passed with a "D" or better.	EDUC 410 and EDUC 430 with a "C" or better in both courses.
Credits	3
Repeatable?	Yes X☐ No
Max. Total Credits	3 This should be equal to the number of credits for courses that cannot be repeated for credit. For courses that may be repeated for credit, enter the maximum total number of credits a student can receive from this course. E.g., enter 6 credits for a 3 credit course that may be taken a second time for credit, but not for a third time. Please note that this does NOT refer to how many times a class may be retaken for a higher grade.
Grading Method(s)	XReg (A-F) ☐ Audit ☐ Pass-Fail

PROPOSED CATALOG DESCRIPTION (no longer than 75 words**):**

This course introduces pedagogical practices associated with the teaching and learning of integrated STEM practices at the middle levels. The course addresses ideas that include (1) middle grades science, mathematics, engineering and technology (STEM) content, (2) understanding and developing middle grades students' thinking; (3) designing, selecting, and sequencing instructional tasks, and (4) assessments for learners in the middle grades. Course must be taken concurrently with EDUC 411 and EDUC 454.

RATIONALE FOR NEW COURSE:

The Maryland State Department of Education (MSDE) has added middle school (grades 4-9) to its areas of teacher certification. In order to be competitive within the State and serve the UMBC students who want to specialize in STEM education at the middle school level, the education department is proposing a new Middle School STEM Education degree. EDUC 431 is needed for the new degree, and fits into the curriculum as a key pedagogical content course for students participating in Phase I of their internship (student teaching). This course is a 400 level course because it provides advanced knowledge required for program completion. Students who enroll must be accepted into Phase I of internship and have departmental permission. Students in the course will be graded using the regular grading scale and be required to earn a B or better in the course to advance to the second phase of the internship. The course is not offered with a repeatable option.

ATTACH COURSE OUTLINE (mandatory):

Department of Education
University of Maryland Baltimore County
EDUC 431
Methods of Teaching Middle School STEM

Fall 20XX

Dr. Instructor
Office: 410 455-3348
Class location 208 Sherman Hall
Office hours: By appt. .
Instructor email:

THE UMBC DEPARTMENT OF EDUCATION MISSION is to research teaching and learning, and to develop caring, thoughtful, knowledgeable, and skilled teachers who are responsive to children, families and the community. We expect our graduates to be leaders in their schools as well as advocates for democracy and social justice.

The middle school STEM methods course is built on the premise that teaching STEM is about more than "content" and addresses the complexity of social and cultural factors that operate in schools and their surrounding communities, as well as in science at-large. The course embraces the notion of teachers as life-long learners. This course is therefore just a beginning of a journey that will feature increasing competency as a teacher of science.

National Council of Teachers of Mathematics (NCTM) and National Science Teacher Association (NSTA) Standards for Preparation of Mathematics and Science Teachers are addressed in this course. Descriptions of these standards are found at the end of the syllabus. The course focuses on helping teachers address the Common Core State Standards for Mathematics (CCSSM) and Next Generation Science Standards (NGSS).

Course Objectives and Outcomes

Learning experiences in this course are framed around your current science, mathematics and pedagogical knowledge, skills, and dispositions.

During this course, you will:

- become familiar with current resource materials such as the Maryland Voluntary Curriculum Standards, district objectives, College and Career Readiness curriculum standards, NCTM standards and numerous science curriculum programs,
- enact inquiry-oriented activities by engaging in investigations involving exploration and discovery,
- develop a deep understanding of the nature of mathematics, the nature of science and their relationship with your teaching,
- gain experience in preparing, teaching, and analytically reflecting on middle school STEM lessons while working with students in local schools, and
- develop long-range teaching skills by preparing an in-depth science curriculum project.

EDUC 431 will be organized around the driving question:

How can I establish a learning community to support my teaching of middle school STEM?

This driving question is addressed by focusing upon a series of "sub questions"

- How do I know what to teach?
- How do I engage my students?
- How do I know what my students know?
- How do I connect class to the community?

Course Reading Material

1. Hattie, J. (2012). *Visible learning for teachers: Maximizing impact on learning*. Routledge.

Course readings (that can be found in Blackboard, course documents).

On-line resources we'll use extensively:
2.A Framework for K-12 Science Education: Practices, Crosscutting Concepts and Core Ideas
http://www.nap.edu/catalog.php?record_id=13165

3.Achieve, Inc. on behalf of the twenty-six states and partners that collaborated on the NGSS. (2013). *Next Generation Science Standards*. They are available on-line at
http://www.nextgenscience.org/

4. National Council of Teachers of Mathematics, Common Core State Standards for Mathematics
http://www.nctm.org/ccssm/

5. Leadership in Mathematics Education Network, Communicate, Support Motivate
http://www.mathedleadership.org/ccss/materials.html

6. Maryland Curriculum Standards
http://mdk12.msde.maryland.gov/instruction/curriculum/

7. Sites Associated with Universal Design for Learning
CAST: Center for Applied Special Technology http://www.cast.org/index.html
National Center on Universal Design for Learning http://www.udlcenter.org/

8. Site associated with Standards for assessing Pre-service Science Teachers
http://www.nsta.org/pd/ncate/docs/2012NSTAPreserviceScienceStandards.pdf

9. Science Safety website
http://mdk12.org/instruction/curriculum/science/safety/ or
Alternative site: http://www.csss-science.org/downloads/scisafe.pdf

Blackboard

In this era of technology, and with the goal of fostering a community of learners, we will use Blackboard in this course. Some readings will be posted there and you will be expected to access it frequently to post your own assignments and to read your classmates' writings. Therefore you need to have good access to the Internet to participate on-line.

The class is based on the following ideas.
• The class is a community. To make it work, we ALL must be prepared and ready to participate every time we meet.

• Teachers need to learn to manage time both in and out of class. Therefore, you will be expected to hold to time constraints when presenting or contributing in class.

• Teachers are expected to be in school nearly every day and to be on time. Therefore, one excused absence is allowed under normal circumstances. After that, each absence will impact your grade, as will excessive lateness or leaving early.

Academic Integrity

By enrolling in this course, each student assumes the responsibility of an active participant in UMBC's scholarly community in which everyone's academic work and behavior are held to the highest standards of honesty. Cheating, fabrication, plagiarism, and helping others to commit these acts are all forms of academic dishonesty and they are wrong. Academic misconduct could result in disciplinary action that may include suspension or dismissal.

Classroom Accommodations for Students with Disabilities:
If you are a student with a documented disability who requires an academic adjustment, auxiliary aids, or similar accommodations, please contact the Office of Student Support Services at 410-455-3250.

Assignment Descriptions

Classroom Artifact: An artifact is a physical representation constructed by the learner that represents their understanding of the key idea(s) presented during the last class meeting. Each artifact consists of two portions, the physical representation (e.g. picture, diagram, poem, etc.) and a short written paragraph that describes/connects how the physical representations reflect the key idea(s). Artifacts associated with the first 2 class meetings will be modeled by the professor.

Content Expertise: The candidates Content Expertise statement is a self-assessment intended to allow the candidates to articulate what experiences have prepared them to teach the science discipline in which they are being certified. The statement needs to include a summary of academic preparation and performance and all other activities or experiences that have contributed to your knowledge in the content area. These experiences may include such things as college courses, lab experiences, internships, etc. Using the Content Analysis table recommended by NSTA for secondary science the candidate must complete each table cell for "Unifying concepts" plus the "Core competencies", "Advance Competencies" and "Supporting Competencies" associated with their area of certification.

Philosophy Statement: Construct a well-developed articulation of your beliefs about teaching and learning in science and your approach to optimizing student performance. Your philosophy should be interwoven with theory and research that extends and substantiates points. The philosophy statement should be cohesive and succinct (approximately 2 pages in length) and should include connections to:

- General beliefs about how students learn
- Aspects of the Nature of Science (NOS)
- Core Science and Engineering Practices
- Student Equity

Course Requirements and Grading

Note: Since this course is intended to help you become the best teacher you can be, it will be graded with a mastery perspective. The percentages listed here are approximate, but will give you a sense of the relative weight of each assignment.
Assignments to be posted on TK-20 under course folder.
** Teaching portfolio elements on TK20

Weight	Assignment Description	Due Date
5%	Class Artifact (An Artifact is physical representation constructed by the student that captures the key idea(s)	_____

of the prior class meeting).

10%	Philosophy Statement	_____
10%	Content Expertise	_____
10%	Safety and Legal Obligation Test	_____
10%	Local area resources	_____
10%	Interdisciplinary Instructional Activity:	
30%	# Focus Lessons PPT. presentations	
	• Classroom management	mid Sept
	• Evidence of student learning	mid Oct
	• Differentiated instruction	mid Nov
20%	# Final (Unit Plan)	Finals week
	• Unit Idea/Standards	
	• Pre/Post	
	• Outline/Chart	
	• Sample Lesson plan	

Class Descriptions

Due this week	In-class discussion and activities	Readings (To be discussed in class)
Week 1	**Question:** How do I know what to teach? **Instructional activity:** What is science card exchange What is the nature of Mathematics **Artifact:** None	Class expectations and Syllabus
Week 2	**Question:** How do I know what to teach? Student Presentations of Assigned NGSS Appendix. Intro to NCSM Toolkits Toolkit 1 (Content) Training **Interdisciplinary Instructional Activity:** - Lesson design focusing cross-cutting themes **Artifact:**	Next Generation Science Standards • Front Matter, • Structure • Assigned Appendices: A, C, F, G, H NCSM Toolkits (section X) Hattie Part 1 (pp. 1 – 34)
Week 3	**Question:** How do I know what to teach? **Interdisciplinary Instructional Activity:** - Lesson design focusing disciplinary standards **Artifact:_**	Next Generation Science Standards Select one DCI - look up the same idea (or as close as possible) on the current MD state standards. Be ready to discuss how they are presented. National Council of Teachers of Mathematics, Common Core State Standards for Mathematics

Week 4	**Enactment 1 presentation (Classroom Management)** **Philosophy statement due** **Artifact:__**	Take a lesson from the mentor teacher and talk about what they taught and the adaptations they made. • Slide 1-Lesson Plan from mentor/or self • Slide 2—What went well with evidence • Slide 3--Missed Opportunities/what would they do differently next time with evidence • Slide 4—Reflection on Mentor feedback.
Week 5	**Question:** How do I engage my students? – **Unit plan Idea due.** **Interdisciplinary Instructional Activity:** Lesson design to maximize engagement **Artifact:_____**	UDL: Focus on principles • Multiple means of Representation • Multiple means of action and expression. • Multiple means of Engagement. • Register for a CAST membership: • Review UDL websites http://www.udlcenter.org/
Week 6	**Question:** How do I engage my students? – **Prior Knowledge** **Interdisciplinary Instructional Activity (3):** Lesson design focusing on eliciting student prior knowledge **Artifact:** _____	Annenberg Foundation http://www.learner.org/ "Basic" Constructivism reading "Basic" Conceptual Change reading
Week 7	**Question:** How do I engage my students? – **Collaborative learning Communities** **Interdisciplinary Instructional Activity (4):** - Lesson design focusing on supporting group interactions – **Artifact:** _____	Hattie Part 2 (Chapters 4 & 5) • Chpt. 4 – Preparing the lesson • Chpt. 5 – Starting the lesson
Week 8	**Enactment Presentation #2 Focus on Student Learning** **Unit plan Pre/Post test due**	Discuss a lesson You led and talk about how it went and the adaptations you would make. • Slide 1-Lesson Plan and highlight the content standard. • Slide 2—Artifacts of student work: Talking points--What were your informal and formal assessments and what did they measure. • Slide 3—Critique of student work: Look at the data. In general, how did the entire class do? Then give one example of full understanding and explain why and one example of partial understanding and explain why and how you could have taught this differently. • Slide 4--Reflection on Mentor feedback.

Week 9	**Question:** How do I maintain my student's engagement? – **Scaffolding and making thinking visible** **Content Expertise Due** **Interdisciplinary Instructional Activity (5):** Lesson design focusing on scaffolding student learning and making thinking visible. **Artifact:** _____	Hattie, Part 2 (Chpt. 6) • Chpt.6 – The flow of the lesson: Learning
Week 10	**Question:** How do I manage and support classroom activities and discussions? **Science Safety test – graded in class.** **Interdisciplinary Instructional Activity (6):** Lesson design focusing on facilitating small and large group inter-actions **Artifact:** _____	MD Science safety Module http://mdk12.org/instruction/curriculum/science/safety/ http://www.csss-science.org/downloads/scisafe.pdf
Week 11	**Question:** How do I know what my students know? **Unit Plan: Outline/Chart and Sample Lesson plan due** **Interdisciplinary Instructional Activity (7):** Lesson design focusing on formative feedback and assessment. **Artifact:** _____	Hattie, Part 2 • Chpt. 7 – The flow of the lesson: the place of feedback
Week 12	**Enactment Presentation #3 Differentiated Instruction** **Artifact:** __	Discuss a lesson **You** led and talk about how it went and the adaptations you would make. • Slide 1-Lesson Plan and point out a minimum of two populations that you need to differentiate for in your classroom • Slide 2—Adaptations: How did you differentiate instruction for each of the populations that you pointed out and why? • Slide 3—Evidence of the level of success of those

		adaptations for each population with evidence. • Slide 4--Reflection on Mentor feedback. (Signed form) Informal Assessment #3 by mentor/supervisor.

Week 13	**Question:** How do I know what my students know? **Interdisciplinary Instructional Activity (7):** Lesson design focusing on summative assessment and using data to inform instruction **Artifact:** _____	Hattie, Part 2 chpt. 8 • Chpt. – 8 The end of the lesson
Week 14	**Question:** How do I connect the class to the community? **Class Project:** Local area resources **Artifact:** _____	Students should be prepared to make a 10 minute presentation associated with their local community/context project. Please provide a 1 page handout to distribute to all class members that includes: o Local area resource o Contact information o Services provided o Appropriate grade level/content area o Limitations and Benefits
Week 15	**Curriculum Unit Plan Presentations** **Artifact:** _____	Hattie, Part 3 chpt. 9 • Chpt. – 9 Mind frames of teachers, schools leaders and systems

Assessment Rubrics

Artifact Rubric

Criteria	Not present or Not Acceptable (0 pts)	Acceptable (1 pt)
A "physical object" that addresses a key idea/practice from the targeted lesson is provided.		
A paragraph caption is included		
Paragraph caption explains how the artifact represents the key idea from the lesson		
Paragraph caption describes why the key idea is significant/important		
Paragraph caption provides a connection between design challenge and the key idea represented by the artifact		
Artifact presentation is succinct and too the point (30 – 90 secs).		
eativity bonus		

Total points = _____

Content Expertise Rubric

	Limited 1	**Developing 2**	**Proficient 3**	**Exemplary 4**
Academic Preparation and Performance **NSTA 1A** The teacher understands the major concepts, principles, theories, laws, and interrelationships of their fields of licensure and supporting fields as recommended by the National Science Teachers Association.	Evidence of minimal content expertise gained from academic preparation. Table is incomplete or missing for Sections associated with • Unifying Competency, • Core Competencies • Advance Competencies	Evidence of comprehensive content expertise in specific science discipline gained from academic preparation. Includes completion of Table for Sections associated with • Unifying Competency, • Core Competencies • Advance Competencies	Same as level 2 plus: Any competencies not connected to academic experiences are addressed Either by informal experiences or plan for future experiences. Includes reflection on specific competency for which they are most and least comfortable but explanation is weak or lacking	Same as level 3 plus Includes reflection on specific competency for which they are most and least comfortable and why.

	Limited 1	Developing 2	Proficient 3	Exemplary 4
Academic Preparation and Performance **NSTA 1B** The teacher understands the central concepts of the supporting disciplines and the supporting role of science-specific technology.	Evidence of minimal content expertise gained from academic preparation. Table is incomplete or missing for Sections associated with • Supporting Competencies	Evidence of comprehensive content expertise in specific science discipline gained from academic preparation. Includes completion of Table for Sections associated with • Supporting Competencies Description of Research Experience(s) and appropriate evidence that demonstrate ability for designing, conducting, reporting, and analyzing research findings. Description of experience(s) with technology to support their understanding of scientific concepts and practices.	Same as level 2 plus: Any competencies not connected to academic experiences are addressed Either by informal experiences or plan for future experiences. Includes reflection on specific competency for which they are most and least comfortable but explanation is weak or lacking	Same as level 3 plus Includes reflection on specific competency for which they are most and least comfortable and why.
	Interns must obtain a score of at least Proficient (3) for all criteria in order to meet program completion requirements.			

To be completed during Phase 2

NSTA Standards 1A and 1B if <u>NOT</u> rated proficient prior to the start of phase 2 internship. (Use same rubric as original assignment)				
NA **1A: Previously rated proficient or above**	**Limited** **1**	**Developing** **2**	**Proficient** **3**	**Exemplary** **4**
NA **1B: Previously rated proficient or above**	**Limited** **1**	**Developing** **2**	**Proficient** **3**	**Exemplary** **4**

Standard 6: Professional Knowledge and Skills

Effective teachers of science strive continuously to improve their knowledge and understanding of the ever changing knowledge base of both content, and science pedagogy, including approaches for addressing inequities and inclusion for all students in science. They identify with and conduct themselves as part of the science education community.

	Limited **1**	**Developing** **2**	**Proficient** **3**	**Exemplary** **4**
6a) Engage in professional development opportunities in their content field such as talks, symposiums, research opportunities, or projects within their community.	Summary of PD is limited to Date, time and topic	Same as 1 but also includes a reflection of how the PD opportunity addresses a specific scientific concern for their disciplinary understanding	Same as 2 but the reflection also **<u>explicitly connects</u>** the PD opportunity between disciplinary understanding with classroom practices.	Same as 3 but multiple PD opportunities are described.
6b) Engage in professional development opportunities such as conferences, research opportunities, or projects within their community.	Summary of PD is limited to Date, time and topic	Same as 1 but also includes a reflection of how the PD opportunity addresses a specific pedagogical concern	Same as 2 but also includes a description of how the practices learned at the PD have been applied (or will be applied) in their instruction.	Same as 3 but multiple PD opportunities are described.

Teaching Philosophy Rubric

	Limited **1**	**Developing** **2**	**Proficient** **3**	**Exemplary** **4**
General Statement of teaching and learning	Minimal description of "how students" learn.	Describes the beliefs and assumptions that underlie learning and your approach to teaching.	A well-developed description of the beliefs and assumptions that underlie learning and your approach to teaching. Includes a general connection to psychological principles/theories.	A well-developed description of the beliefs and assumptions that underlie learning and your approach to teaching. Includes connection to specific key psychological principles/ theories.
Nature of Science *(NOS)*	Statement only includes a minimal connection to the *Nature of Science*	Statement includes a general description of *Nature of Science* and why it's important to include (or exclude). but does not provide a clear connection for instructional practices.	Statement includes a well-developed description of *Nature of Science*, why it's important to include (or exclude). Connection to instructional practices is general.	Statement includes a well-developed description of *Nature of Science*, why it's important to include (or exclude). Connection to instructional practices is explicit and well developed
Science and Engineering Practices	Statement only includes a minimal connection to the integration of *Science and Engineering Practices*	Statement includes a general description of *Science and Engineering Practices* and why it's important to include (or exclude). but does not provide a clear connection for instructional practices.	Statement includes a well-developed description of *Science and Engineering Practices* and why it's important to include (or exclude). Connection to instructional practices is general.	Statement includes a well-developed description of *Science and Engineering Practices* and why it's important to include (or exclude). Connection to instructional practices is explicit and well developed

Equity Pedagogy (UMBC 3.1.3; 3.1.4; 4.10)	Does not demonstrate an expectation that all children can learn.	Demonstrates minimal expectations that all children can learn science	Demonstrates expectations that all children can learn science and provides a general connection to "College and Career Readiness"	Demonstrates expectations that all children can learn science and provides a general connection to "College and Career Readiness"
Organization and Presentation	Content is unorganized and not formatted or written in a professional manner.	Content is organized, but contains errors.	Content is organized and contains minimal errors.	Content is well organized and professionally presented.