EDUC 4053 Teaching Science in Elementary School

COURSE SYLLABUS: Fall 2020

INSTRUCTOR INFORMATION

Instructor: **Dr. Timothy Hinchman**
Physical Office Location: **330 Bridwell Hall**
Virtual Office: **Available through D2L Virtual Classroom and Zoom**
Office Hours: Tuesday and Thursday 8am-10:30am (others available by appointment)
University Email Address: timothy.hinchman@msutexas.edu
Preferred Form of Communication**:** Email
Communication Response Time: Within 24 hours Monday- Friday, Within 48 hours on the weekend.

Course Description

This field-based course focuses on elementary school science pedagogy with emphasis on instructional strategies and models, the use of technology in the learning/teaching process, effective practices, professionalism, curriculum, and lesson design. Different teaching strategies include: appropriate use of creative approaches to the learning/teaching process, cooperative learning, direct instruction, inquiry, concept attainment, etc. An important component of this field-based block of classes is the course time spent in active participation in field (classroom) experiences.

Textbook(s)

One of the following textbooks are recommended:

- Contant, T. L., Tweed, A. L., Bass, J. E., & Carin, A. A. (2018). *Teaching science through inquiry based instruction*. New York: Pearson.
- Peters, J. M., & Stout, D. L. (2011). *Science in elementary education: Methods, concepts, and inquiries*. Boston: Pearson Education.

Competency List

This course will build mastery of the following competencies:

1. Demonstrate knowledge of the Science domain of the *Texas Prekindergarten Guidelines* and of the Texas Essential Knowledge and Skills (TEKS) for Science (Kindergarten through Grade 6), as well as ways to scaffold and sequence skills and concepts to teach science to young children.

2. Apply knowledge of how to plan and implement inquiry-based science lessons that are responsive to children's diverse interests, knowledge, skills, and experiences and that promotes children's development of scientific knowledge, inquiry, and skills.

3. Demonstrate knowledge of developmentally appropriate strategies for encouraging children to explore and make discoveries about their world (e.g., exploratory play, using senses, using simple tools or technology to gain information about environment, incorporating children's literature, making predictions and/or drawing conclusions on the basis of observation).

4. Demonstrate knowledge of instructional resources, tools and materials, including technology, for teaching science and procedures for ensuring the proper use of safety equipment and safe practices during classroom science activities.

5. Apply knowledge of key concepts of physical science, Earth and space science, and life science to select strategies and methods for developing children's knowledge and skills in these areas through a variety of developmentally appropriate, meaningful, authentic learning experiences and real-world applications.

6. Apply knowledge of developmentally appropriate strategies for encouraging students to view themselves as competent scientific explorers and activities for promoting students' ability to think and communicate scientific knowledge through written expression (e.g., providing opportunities to observe and describe objects and phenomena; engaging in simple investigation; applying skills such as collecting, classifying, and interpreting data; recognizing patterns and drawing conclusions).

7. Demonstrate knowledge of developmentally appropriate strategies and procedures for implementing scientific inquiry methods in classroom laboratory and outdoor investigations, including understanding and applying terminology common to scientific investigations.

8. Demonstrate knowledge of types of digital tools and resources and strategies for using them to enhance teaching effectiveness, create learning experiences that facilitate creativity, and promote student achievement across the content areas.

9. Demonstrate knowledge of developmentally appropriate digital tools and resources and strategies to help children explore real-world issues, solve authentic problems, develop global awareness, participate in local and global learning communities, and develop the ability to pursue and manage their own learning, while understanding safety and privacy risks.

Student Competencies

Upon completion of this course, the student will be able to:

- understand that science involves observing, analyzing, and investigating the natural world.
- explain how science educational initiatives emphasize student-centered inquiry and conceptual understanding.
- identify the basic structure of inquiry-based practices.
- select the science concepts, procedures, and skills that they will use during inquiry-based instruction.
- determine the best model for conducting inquiry-based instruction.
- create a positive classroom environment where learning is rigorous, yet engaging, trust is evident and everyone believes that they can learn.
- understand that a positive classroom environment is essential in promoting active inquiry-based learning.
- lead their class to a deeper understanding of science concepts using various approaches.
- change their classroom alternative conceptions and misconceptions of science concepts through various instructional practices.
- earn certification in TEA Science Safety Training for Elementary School through Gateway Courses.

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- learn about Science Classroom Safety, the law, and how it applies to the science teacher.
- develop formative assessment processes that will be used as a feedback loop to help learning move forward.
- develop summative assessments that will provide evidence of student knowledge and understanding at the learning cycle's end.
- develop authentic assessments which are designed to measure understanding of several learning targets.
- apply key concepts of physical, earth/space, and life sciences to develop lessons using strategies and methods that increase understanding through authentic learning experiences.
- utilize digital tools, resources, and strategies to enhance their teaching effectiveness.
- create a learning experience that facilitates creative and critical thinking skills across the curriculum.

COURSE REQUIREMENTS

Minimal Technical Skills Needed

Must be able to use Microsoft and Google Suites.

Instructional Methods

This is a hybrid-flex course. Learning activities include assorted activities, lectures, readings, videos, written assignments, and key assessments.

Student Responsibilities or Tips for Success in the Course

To be successful in this course, plan to spend at least **120** hours to read/listen/watch online content, conduct forum discussions, complete assignments, and study the course material.

GRADING

Final grades in this course will be based on the following scale:

A = 90%-100%

B = 80%-89%

C = 70%-79%

D = 60%-69%

F = 59% or Below”

Competency Assessments

Written Assignments

Each module will have a written assignment that will assess your ability to synthesize and apply the module’s learning goal.

The module written assignment is an assessment of your knowledge of the material required for the competency. A rubric score of 70% or higher is required to demonstrate mastery of each learning goal.

If you score less than 70% on any written assignment, you will have an opportunity to review the material and redo the assignment. If you have not passed the module in two attempts, you will work with Dr. Hinchman to determine another method of fulfilling the program requirements in this subject. In order to demonstrate competency, a rubric score of 70% or higher is required.

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Performance-Based Key Assessment – *Inquiry-Based Instruction, Unwrapping TEKs, and 5E Lesson Plan*

The performance assessment for this course is a portfolio consisting of the foundations in inquiry-based instruction. Students will research, identify, and model instructional practices that are promote inquiry-based instruction in a mainstream science classroom setting

All grade levels are examined within the TEKs to determine what knowledge, skills, and abilities are addressed at the different grade levels. Students are to determine how the standards are connected.

Students will identify the basic structure of inquiry-based practices. They will explore the National Science Education Standards Overview followed by the Biological Sciences Curriculum Study (BSCS) 5E Instructional Model.

Students will then dive deeper into inquiry-based instructional practices. They will explore research based using inquiry-based instructional practices. They will examine teachers using inquiry-based practices and read research regarding this practice.

Students will explore the TEK or TEKs you will be teaching in your observation. They will first identify the key verbs (skills) and nouns (concepts) contained within the assigned TEK. They will use a graphic organizer to reorganize the concepts and the skills. They will examine the list of identified skills, and discuss the level of thinking associated with each using Blooms taxonomy. They will identify the big idea in the TEK, any essential questions that serve as the instructional focus, and use this information to write the following 5E Lesson Plan.

Students will write an inquiry-based science lesson plan using the 5E instructional delivery. The TEK should be assigned by their mentor teacher and they will work with their university supervisor to write an engaging lesson plan for the assigned field class.

The final project is an assessment on your ability to synthesize and apply the concepts learned in the modules. A score of 80% or higher is required to demonstrate competency on each section of the final project.

TECHNOLOGY REQUIREMENTS

LMS

All course sections offered by MSU have a corresponding course shell in the D2L Online Learning Management System (LMS). Below are technical requirements and associated system check.

D2L Technical Requirements

ACCESS AND NAVIGATION

You will need your user name and password to log into the course. If you do not know your user name or have forgotten your password, contact helpdesk@mwsu.edu. For more information on the MSU's IT services, see Information Technology.

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COMMUNICATION AND SUPPORT

If you have any questions or are having difficulties with the course material, please contact Dr. Hinchman.

Technical Support

If you are new to D2L or if you are having technical difficulty with any part of D2L, please contact Distance Education. Other support options can be found here:

https://community.brightspace.com/support/s/contactsupport

Interaction with Instructor Statement

Expect responses to email within **24** hours and feedback on your final project within **48** hours.

COURSE AND UNIVERSITY PROCEDURES/POLICIES

Course Specific Procedures/Policies

In order to demonstrate competency, you must achieve 70% or higher on each required competency/module.

Syllabus Change Policy

The syllabus is a guide. Circumstances and events, such as student progress, may make it necessary for the instructor to modify the syllabus during the semester. Any changes made to the syllabus will be announced in advance.

University Specific Procedures

Student Conduct

Students are expected to uphold and abide by certain standards of conduct that form the basis of the Student Code of Conduct. These standards are embodied within a set of core values that include integrity, social justice, respect, community, and responsibility. When members of the MSU community fail to exemplify these values, campus conduct proceedings are used to assert and uphold the Student Code of Conduct. The Code of Student Conduct is described in detail in the Student Handbook.

Students should also consult the Rules of Netiquette for more information regarding how to interact with students in an online forum: https://www.britannica.com/topic/netiquette

Electronic Network Access

Students using the university network facilities and services will indemnify and hold harmless the university against any and all actions or claims of infringement of intellectual property rights arising from the use of a network-based service or facility provided by the university. Network access is provided by password control. All passwords are managed and controlled by Information Systems. See Student Handbook for specific policies on electronic network access.

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Academic Dishonesty

Students at MSU are expected to maintain high standards of integrity and honesty in their scholastic work. For more details and the definition of academic dishonesty see the Student Handbook.

Students with Disabilities-- ADA Statement

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. It is the policy of Midwestern State University that no otherwise qualified person, on the basis of disability, be excluded from participation in, be denied the befits of, or be subject to discrimination under any education program, activity, or employment of the university. If you have a disability requiring an accommodation, please contact:
Office of Student Disability Resources and Services

Nondiscrimination Notice

MSU will comply in the classroom, and in online courses, with all federal and state laws prohibiting discrimination and related retaliation on the basis of race, color, religion, sex, national origin, disability, age, genetic information or veteran status. Further, an environment free from discrimination on the basis of sexual orientation, gender identity, or gender expression will be maintained.

Campus Concealed Carry Statement

MSU is committed to providing a safe and secure learning, working, and living environment for students, faculty, staff, and visitors, and to respecting the right of individuals who are licensed to carry a handgun where permitted by law. Individuals who are licensed to carry may do so on MSU's campus premises except in locations and at activities that are prohibited. The carrying of any handgun by an unlicensed person or the open carry of a handgun is not permitted in any place on MSU's campus premises. For more information on Carrying Concealed Handguns, see the Student Handbook.

COURSE OUTLINE

COURSE OUTLINE/CALENDAR			
Module Topic	**Materials to Read and Review**	**Assignments**	**Due Date**
Course Overview and Syllabus	• Download and Read Syllabus and Course Outline • Read D2L Help		
M1 – The Nature of Science and Science Education	• Register for an account with the Flinn Scientific Courses • Complete the Flinn Lab Safety Training Course	**Module 1: Nature of Science and Science Education Writing Assignment #1**	**Wednesday 8/26/2020 @ 11:30pm**

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	• Upload the Flinn Science Safety Training for (up to) Middle School Certificate of Completion to the D2L Dropbox • Watch and take notes on the Annenberg Learner: Can We Believe Our Eyes? Video • Watch and take notes on the Bozeman Science Video : The Nature of Science • Watch and take notes on the Crash Course Video on The Scientific Methods • Watch and take notes on It's Okay to Be Smart Video on Fact vs. Hypothesis vs. Law • Download and Print the NSTA Cross Cutting Concept Matrix • Read the Framework for K-12 Science Education • Bookmark the Texas Essential Knowledge and Skills for Science Subchapter A. Elementary website • Watch and Take Notes on Scientific Literacy - Neil deGrasse Tyson Video • Watch and Take Notes on Scientific Literacy- Andrew Zwicker	**Flinn Lab Safety Certificate** **Module 1: Nature of Science and Science Education Writing Assignment #2**	**Wednesday 8/26/2020 @ 11:30pm** **Saturday 8/29/2020 @ 11:30 pm**
M2 – TEK Alignment and Content Knowledge	• Download a copy of the Science TEKs Graphic Organizer to create an overview of the Science TEKs. • Download a copy of the Science T-Chart • Complete the EDUC 4053 Content Pre-Test	**Module 2 Assignment #1: TEKs Graphic Organizer** **Module 2 Assignment #2: TEKs T-Chart (final submission after Pre-Test)**	**Wednesday 9/2/2020 @ 11:30pm** **Saturday 9/5/2020 @ 11:30pm**

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M3 – Inquiry Based Instruction	• Watch and Take Notes on the Annenberg Video: Lessons From Thin Air • Read the NSRC article on "How Children Learn" • Read about the National Science Education Standards Overview • Read about the BSCE 5E Instructional Model • Want and Take Notes on the 3 Videos on the 5E Instructional Model\ • Read and Outline the Information on the Website: Why Use The 5E Model For Science Instruction? • Read the Co-Constructing Inquiry-Based Science with Teachers: Essential Research for Lasting Reform (Keys & Bryan, 2000). • Watch and Take Notes on the John Spencer Video on What is Inquiry-Based Learning? • Watch and Take notes on Activate Your Classroom Video on 4 Steps to Engaging Students with Effective Questioning • Watch and Take notes on TEDx Video on What Happens When Classrooms meet HOT? • Watch, Read, and Take Notes on the following • Asking Questions to Improve Learning • STEM in Early Learning - Using Open-Ended Questions to Encourage Learning • Claims, Evidence, & Reasoning: Planning	**Module 3: Inquiry Based Instruction Writing Assignment #1** **Module 3: Inquiry Based Instruction Writing Assignment #2**	**Saturday 9/12/2020 @ 11:30pm** **Saturday 9/19/2020 @ 11:30pm**

M4 – Creating an Inquiry-Based Classroom Environment	• Watch and take notes on the Edutopia Video on Creating a Positive Learning Environment • Read the 11 Ways to Make an Inquiry-Based Classroom from Teachhub.com • Read about the 4 Phases Of Inquiry-Based Learning: A Guide For Teachers • Watch the Edutopia Video on Inquiry-Based Learning in the Classroom • Read and Watch the Videos on Elementary Series: What the Youngest Learners Can Do from Ambitious Science Teaching • Overview Video • Strategy Video #1- Agree/Disagree T-Charts • Strategy Video #2- Model Claims Evidence Reasoning • Watch and take notes on the NSTA Video on Using Technology to Teach Science	**Module 4: Creating an Inquiry-Based Classroom Environment Writing Assignment #1**	**Wednesday 9/23/2020 @ 11:30pm**
M5 – Teaching Science for Understanding	• Read and review the information on CSU's Contemporary Application of Constructivism and Learning Theories in Instructional Design • Watch and take notes on Edutopia Video on Inquiry-Based Learning in the Classroom • Watch and take notes on US Gov: Scaffolding in the Classroom • Watch and take notes on Wilkinson:	**Module 5: Differentiation, Accommodations, and Modification Dropbox** **Module 5: Teaching Science for Understanding Writing Assignment #1** **Module 5: Teaching Science for Understanding Writing Assignment #2** **Module 5 -Teaching Physical Science for Understanding**	**Wednesday 9/23/2020 @ 11:30pm** **Saturday 9/26/2020 @ 11:30pm** **Wednesday 9/30/2020 @ 11:30pm** **Saturday 10/10/2020 @ 11:30pm**

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	Constructivism in the Classroom • Upload your completed Teaching Science for Understanding Writing Assignment #1 to the D2L Dropbox. • Read and reference the "Children's Idea" Section from the following Annenberg Learner resources • Watch and take notes on the Education Week: Differentiating Instruction • Watch and take notes on the Understood Video on Accommodations vs Modifications • Review the Understood: The Difference Between Accommodations and Modification Website • Complete the Sub-modules on: • Teaching Physical Science • Teaching Life Science • Teaching Earth/Space Science	**Module 5 -Teaching Life Science for Understanding** **Module 5: Teaching Earth Space Science for Understanding**	**Saturday 10/24/2020 @ 11:30pm** **Saturday 11/7/2020 @ 11:30pm**
M6 – Safety and Technology in the Science Classroom	• Watch and Take Notes on Lab Safety Video • Watch Cringe Worthy Lab Safety Video • Complete the Science Classroom Safety & the Law course • Watch and Take Notes on Preparing Tomorrow's Science Teachers to Use Technology: Guidelines for Science Educators • Watch and Take Notes on Science Learning Tools	**Module 6: Science Classroom Safety and the Law** **Module 6 Writing Assignment- Technology in the Science Classroom**	**Saturday 10/17/2020 @ 11:30 pm** **Saturday 10/31/2020 @ 11:30pm**

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	• Watch and Take Notes on The Value of Digital Tools in Science Classes • Watch and Take Notes on How to Integrate Technology		
Module 7: Key Assessment	**Science TEKs UnWrap, 5E Lesson Plan, Observation and Reflection**	**REQUIRED ASSIGNMENT:** • **TEKs Unwrapping** • **5E Lesson Plan** • **T-Tess Assessment** • **Reflection**	**Date Dependent on Classroom Observation (will vary)**
Module 8: Comprehensive Unit Plan **Module 9: Final Assessment**		**REQUIRED ASSIGNMENT:** • Comprehensive Unit Plan **Required Assignment:** • **Constructed Application of Science Content and Pedagogy**	**Friday 12/4/2020 @ 11:30pm** **Monday 12/8/2020 11:30pm**

References/Scientifically-Based Research/Additional Readings:

Atzori, P. (1996). Discovering CyberAntarctic: A Conversation with Knowbotics Research. *CTHEORY*. Available at: http://www.ctheory.com/

Brown, J.S., Collins, A. & Duguid, S. (1989). Situated cognition and the culture of learning. *Educational Researcher*, 18(1), 32-42.

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Derry, S. (1992). Beyond symbolic processing: Expanding horizons in educational psychology. *Journal of Educational Psychology*, 413-418.
Derry, S. (1996). Cognitive Schema Theory in the Constructivist Debate. In *Educational Psychologist*, 31(3/4), 163-174.
Driver, R., Aasoko, H., Leach, J., Mortimer, E., Scott, P. (1994). Constructing scientific knowledge in the classroom. *Educational Researcher* , 23 (7), 5-12.
Ernest, P. (1995). The one and the many. In L. Steffe & J. Gale (Eds.). *Constructivism in education* (pp.459-486). New Jersey: Lawrence Erlbaum Associates,Inc.
Fosnot, C. (1996). Constructivism: A Psychological theory of learning. In C. Fosnot (Ed.) *Constructivism: Theory, perspectives, and practice*, (pp.8-33). New York: Teachers College Press.
Gergen, K. (1995). Social construction and the educational process. In L. Steffe & J. Gale (Eds.). *Constructivism in education*, (pp.17-39). New Jersey: Lawrence Erlbaum Associates,Inc.
Hanley, Susan (1994). On Constructivism. Available at: http://www.inform.umd.edu/UMS+State/UMD-Projects/MCTP/Essays/Constructivism.txt
von Glasersfeld, E. (1996).Introduction: Aspects of constructivism. In C. Fosnot (Ed.), *Constructivism: Theory, perspectives, and practice*, (pp.3-7). New York: Teachers College Press.
Vygotsky, L. (1978). *Mind in Society: The Development of Higher Psychological Processes* MA: Harvard University Press.
Wilson, B. & Cole, P. (1991) A review of cognitive teaching models. *Educational Technology Research and Development*, 39(4), 47-64.
Wilson, B. (1997). The postmodern paradigm. In C. R. Dills and A. Romiszowski (Eds.), *Instructional development paradigms*. Englewood Cliffs NJ: Educational Technology Publications. Also available at: http://www.cudenver.edu/~bwilson/postmodern.html

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