Eastern Illinois University
Early Childhood, Elementary, and Middle Level Education Department
ELE 3290.001: Science in the Elementary and Middle School

Semester: Fall 2017
Instructor: Denise E. Reid
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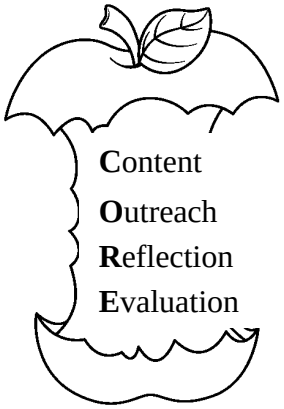
Office Hours: M/W 11:30 – 1:30 p.m.
Class Meetings: M/W 8:00 – 9:40 a.m. in Buzzard Hall 2430
Final Exam: Thursday, December 14th 8:00 – 10:00 a.m.



Unit Theme: Educators as Creators of Effective Educational Environments: Integrating diverse students, subjects, strategies, societies and technologies.

Catalog Description: Science in the Elementary and Middle School. Exploration of the nature, processes, and products of science and their relationships to society, the world, and the school curriculum. Field-based experiences will be in conjunction with ELE/MLE 4100. (3-0-3)

Prerequisites: Concurrent enrollment in ELE/MLE 4100, or permission of department chair. University Teacher Education requirements apply and department requirements for enrollment must be met.

Purpose of the Course: To involve teacher candidates in the process of learning about the nature of science; a sample of its content and the methods used to teach the content. Using theories of how children learn as a basis for instruction, the teacher candidates develop their skills at teaching science processes through discovery, guided discovery, and inquiry lessons. Teacher candidates will also understand the importance of assessment and evaluation, and will develop various means of assessment. ***Teacher candidates will integrate technology in their lessons, projects, and science units.***

Course Texts:
Bang-Jensen, V. & Lubkowitz, M. (2017). *Sharing books, talking science: Exploring scientific concepts with children's literature.* Portsmouth, NH: Heinemann.

Froschaeur, L. ed. (2016). *Bringing STEM to the elementary classroom.* Arlington, VA: NSTA (National Science Teachers Association) Press.

Supplemental Materials: LiveText Account & Course packet.

Learning Model:
<u>The Information-Processing Models</u>

- Information-processing models emphasize ways of enhancing the human being's innate drive to make sense of the world by acquiring and organizing data, sensing problems and generating solutions to them, and developing concepts and language for conveying them (pp 10-13).

- **Scientific Inquiry Model:** The *scientific inquiry model* builds learning around investigations. The National Research Council (NRC) states firmly that science education should focus on only a few important concepts from each discipline at any given grade level---and the learning process should be built around in-depth inquiries into topics selected because they contain those concepts. The framework for K-12 science from the NRC also emphasizes "cross-cutting" concepts---ones that are common to the disciplines and should be learned both to better understand the disciplines and because they have great organizing power. The framework is also unified by continuous hands-on experience. (pp. 71-72)

There are different levels of inquiry, from guided to full inquiry. One teaching and learning model that supports inquiry and provides a framework to help teachers become more effective in using inquiry approaches is the Learning Cycle Model. The original Learning Cycle Model was developed by Professor Robert Karplus and colleagues at the University of California-Berkeley and consisted of three components: exploration, concept introduction, and concept application. The current model has been modified by BSCS and has five components: Engagement, Exploration, Explanation, Expansion, and Evaluation. (Moyer, R. H., Hackett, J. K., & Everett, S. A. (2007). *Teaching Science as investigations: Modeling inquiry through learning cycle lessons.* Upper Saddle River, NJ: Pearson/Merrill Prentice Hall.)

The BSCS 5E Instructional Model http://www.bscs.org/curriculumdevelopment/features/bscs5es.html

Joyce, B., Weil, M., & Calhoun, E. (2015). *Models of teaching* (9th ed.). Boston: Pearson.

Dispositions: Teacher candidates in the Department of EC/ELE/MLE will exhibit professional ethical practices, effective communication, and sensitivity to diversity, and the ability to provide varied teaching practices evidenced in a supportive and encouraging environment. Failure to adequately meet dispositional requirements will lead to remedial requirements set forth by the instructor. http://www.eiu.edu/clinical/dispositions.php

Live Text Assessment and/or Practicum Requirements: For those classes with Live Text and/or Practicum- If the portfolio, practicum, and/or Live Text requirements are rated by the instructor to have been completed in less than a satisfactory manner then no more than a "D" may be earned in the class regardless of the number of points earned.

Standards:
Course requirements and demonstrated competencies are aligned with the following standards:

- Illinois Professional Teaching Standards (IPTS): http://www.isbe.net/PEAC/pdf/IL_prof_teaching_stds.pdf
- Eastern Illinois University Professional Dispositions http://www.eiu.edu/clinical/forms/DispositionsforEIUcandidates.pdf
- Illinois Social Emotional Learning Standards (SEL) http://www.isbe.net/ils/social_emotional/standards.htm
- Association for Childhood Education International (ACEI): http://www.isbe.net/rules/archive/pdfs/20ark.pdf
- National Association for the Education of Young Children (NAEYC): http://www.ncate.org/Standards/ProgramStandardsandReportForms/tabid/676/Default.aspx
- Association for Middle Level Education: http://www.amle.org/AboutAMLE/ProfessionalPreparation/AMLEStandards.aspx
- International Society for Technology in Education http://www.iste.org/standards/standards/standards-for-teachers

Course Outcomes

1. The teacher candidate will exhibit a positive attitude toward providing meaningful experiences in science for elementary and middle level students.
2. The teacher candidate will demonstrate an understanding of the nature of science, the learner, and the learning environment.
3. The teacher candidate will demonstrate a working knowledge of appropriate science learning and hands-on inquiry experiences for children.
4. The teacher candidate will exhibit the ability to effectively utilize various types of materials, resources, and media to engage children in meaningful science experiments.
5. The teacher candidate will demonstrate knowledge of assessment and evaluation procedures for science.
6. The teacher candidate will demonstrate the ability to plan, implement, and assess science instruction for elementary and middle level students.
7. The teacher candidate will build and maintain positive relationships while collaborating with peers.
8. The teacher candidate will become familiar with the Next Generation Science Standards (NGSS).

Course Requirements	Demonstrated Competencies	Aligned Standards (ACEI, NAEYC, IPTS, SEL, Dispositions)

Participation	Performance includes presence, participation and preparation for group and whole class discussions, and participation in lab activities working cooperatively with peers. Focus is on practices and behaviors that allow the learner to grow professionally.	ACEI 2.2, 3.4, 3.5, NAEYC 1b, 6c AMLE D5d IPTS 2B, 2D, 2K8F, 8K, 9A, 9G, 9H SEL 2B – 2C, 3A.1b Dispositions: PEP, EC
Science notebook & Lab Sheets	Performance includes organizing science notebook in order to create a useful teaching resource. This resource will include handouts, assignments, lab sheets, demonstration lessons and a detailed Table of Contents. Focus is on developing a professional resource that can be used to plan and implement developmentally appropriate lessons using inquiry-based activities.	ACEI 2.1, 2.2 NAEYC 1a, 4b IPTS 2B, 2N, 6D, Dispositions: PEP, EC
Readings & written Responses (Textbook & Journal Articles)	Performance will include reading, reflecting, and preparing for discussion of content related to science teaching and learning (constructivism, inquiry, assessment, questioning, learning cycle model, developmentally appropriate practices, etc.) Focus is on increasing the participant's knowledge and understanding of the learning theory and processes related to science teaching methods.	ACEI 2.1, 2.2, 3.1, 3.3 NAEYC 4b - 4c, 5a IPTS 2F, 2I, 6E, 6S, 9A, Dispositions: PEP, EC
Quizzes & Tests	Tests will be provided as one form of assessment of teacher candidate's content knowledge related to planning and teaching effective science lessons. Focus is on demonstrating understanding of course content knowledge.	ACEI 2.2 NAEYC 5a IPTS 2A - 2F Dispositions: PEP
Science Unit*	Performance includes creating a science unit that is developmentally appropriate and inquiry based. The lesson plans will follow the learning cycle model. Lessons will allow elementary and middle level students to develop conceptual understanding. Appropriate informal and formal assessment activities will be included. Focus is on creating a developmentally appropriate inquiry-based science unit that fosters conceptual understanding.	ACEI 1.0, 2.1, 2.2, 3.1 - 3.4, 4.0, 5.2 NAEYC 4a - 4c, 3a, 5a - 5b AMLE A1b, A1c, B2a, B2b ISTE 2F, 5C, 6J IPTS 1C, 1I, 2B, 2G, 2I – 2K, 2N, 3B, 3I, 5A, 5L, 6E, 6H, 6Q, 7B, 7E, 9A, 9R Dispositions: PEP, EC, PTSL, SDE
Demonstration Lesson & Group Presentation	Performance includes working cooperatively with peers to select demonstration lessons around a theme. Each demonstration lesson will foster inquiry. Performance will include demonstrating understanding of the concept through effective questioning techniques for creating conceptual understanding and overall explanation of the concept.	ACEI 1.0, 2.1, 2.2, 3.3, 3.3, 3.4 NAEYC 5a - 5b IPTS 2B, 2I, 2K, 8B, 8N AMLE C4a, C4b, SEL 2B – 2C, 3A.1b Dispositions:

		PEP, EC, IWS
***LiveText Submission**	**All or a portion of the Science Unit will be submitted through LiveText for Unit and Program Assessment.**	

Core Assignments	Brief Description
Participation	Performance includes presence, participation and preparation for group and whole class discussions, and participation in lab activities working cooperatively with peers. Focus is on practices and behaviors that allow the learner to grow professionally.
Science Notebook & Lab Sheets	Performance includes organizing science notebook in order to create a useful teaching resource. This resource will include handouts, assignments, lab sheets, demonstration lessons and a detailed Table of Contents. Focus is on developing a professional resource that can be used to plan and implement developmentally appropriate lessons using inquiry-based activities.
Readings & Written Responses (Textbooks & Journal Articles)	Select articles from a professional journal that correspond with the relevant topics. Topics such as constructivism, inquiry-based learning, the learning cycle, using writing in science, authentic assessment, etc. Copy, read, highlight, and write reflective comments in the margins. Type a one page reflective commentary based on margin comments.
Quizzes & Tests	A midterm and a final will be given over the course content.
Science Unit	An inquiry-based science unit will be developed to meet NGSS and CCSS. The unit will include: topic research, teacher resources, student resources, and lesson plans following the learning cycle model.
Demonstration Lesson & Group Presentation	Performance includes working cooperatively with peers to select demonstration lessons around a theme. Each demonstration lesson will foster inquiry. Performance will include demonstrating understanding of the concept through effective questioning techniques for creating conceptual understanding and overall explanation of the concept. The lesson will be presented to peers and may include a presentation for elementary students.
Alternative Assignments	Performance in the alternative assignments promotes life-long learning. The alternative assignments require effective communication related to the experiences. Performance increases awareness of outside agencies, materials, and resources.
***LiveText Submission**	**All or portion of the Science Unit will be submitted through LiveText for Unit and Program Assessment.**

Alternative Assignments

Alternative Assignment	**Brief Description**	**Aligned Standards (ACEI, NAEYC, AMLE, IPTS, ISTE, SEL, Dispositions)**
Next Generation Science Standards (NGSS)	Teacher candidates will understand the dimensions of the framework of the Next Generation Science Standards including scientific and engineering practices, crosscutting concepts, and disciplinary core ideas (Physical Science, Life	ACEI 2.1, 2.2, 3.3 NAEYC 5a - 5b IPTS 2B, 2D, 5D, 9A

	Sciences, Earth & Space Sciences and Engineering, Technology, and Application of Science). Teacher candidates will create lessons to meet nILS (NGSS and CCSS).	Dispositions: PEP, EC
Examine a professional science journal (Science & Children, Science Scope, The Science Teacher, etc.)	Read the letter from the editor. What is his/her focus? Briefly describe the main features of the journal. Select one article to read. Write a brief summary. How could the classroom teacher use the information in this professional journal in his/her teaching? How could the classroom teacher use this information in her professional growth?	ACEI 2.1, 2.2, 3.1, 3.3, 5.1 NAEYC 1a, 5a IPTS 2F, 2I, 6E, 9D Dispositions: EC, PTSL
Take Home labs	Performance requires the teacher candidate to conduct long term laboratory activities that necessitate daily data collection. The activities relate to weather and an experiment involving osmosis and include integration with internet resources and health sciences.	ACEI 2.2, 3.3 NAEYC 5a – 5b IPTS 2B, 6E Dispositions: EC
Field Trips	Performance includes interaction with outside agencies to enhance educational experiences for all students. Activities at the nature centers include the integration of handicapped students into the learning environment, investigating environmental education, and methods of incorporating field studies as an integral part of the science curriculum.	ACEI 2.1, 2.2, 3.2 NAEYC 2c, 6c IPTS 1I, 3K, 3Q Dispositions: EC, PTSL

The instructor will provide detailed instructions and expectations for each assignment. Topics, assignments, readings and due dates are on the course calendar. The course calendar will be posted on D2L.

Next Generation Science Standards http://www.nextgenscience.org/
(NILS) New Illinois Learning Standards http://www.isbe.net/nils/science/default.htm

Course Assignments and Expectations: All assignments must be turned in by the due date, unless approved by instructor. Points will be deducted for late assignments. All assignments must be completed in an *exemplary* fashion in order to receive an A.

Grading Scale: A 100-93%, B 92%-84%, C 83%-75%, D 74%-66%, F 65% and below.

1. **Active Participation (30 points)** Class sessions involve interactive activities and presentation and discussion of material that is difficult to make up if absent, so regular attendance is expected. Participation includes the following: being in class on time (3-5 minutes early), looking at those who are speaking, working cooperatively with group members, being prepared for class, and being actively involved in labs and discussions. This also means that cell phones are turned off and there is no texting during class. If an emergency arises please notify the instructor if you are unable to attend class by leaving a message through e-mail. **Five points will be deducted for each unexcused class absence.**
2. **Douglas Hart Nature Center Field Trip Assignment (40 points)**
3. **Journal Article Readings (150 points-10 points each)** Read selected articles. Copy, read, highlight, and write reflective comments in the margins. Complete any accompanying written assignments. Be prepared to discuss the topic in class.
4. **Science Beliefs Quiz & Article (10 points)** Read the article about science misconceptions and complete the Science Beliefs Quiz.
5. **Professional Teaching Journal Critique (50 points)** Follow the criteria on the assignment handout.
6. **Next Generation Science Standards (NGSS) Assignment – (20 points)**
7. **Science Demonstration Lesson – Science Extravaganza at Arthur Elementary School and Mattoon Middle School (40 points – 20 points each)** Locate an interesting science demonstration lesson (discrepant

event), and write lesson plan following the model presented by instructor. Send a copy of the demonstration lesson plan to class members and instructor through D2L**.**

8. **Science Notebook (75 points)** Students will keep a science notebook that will contain recorded data related to labs, resource information, teaching tips and course discussions. (Follow the criteria on the assignment handout.)

   "Notebooks are meant to be tools for students to record both their data and thinking as they work with materials. They are utilized prior to the investigation to record the student's thinking or planning; during the investigation to record words, pictures, photos, or numbers possibly getting wet and messy in the process; and after the investigation to help students reflect on their thinking and data in order to share them with others." (Campbell & Fulton, 2003, p. 2)
9. **Science Unit (205 points)** Follow the criteria on the assignment handout.
10. **LiveText Submission (Mandatory):** Submit the following items from your science unit to LiveText for review by the instructor: Background paper, hierarchy, unit overview, best lesson plan, and unit reflection.
11. **Midterm/Final (approximately 50 - 75 points each)**

COURSE OUTLINE

Week 1	What is Science? Conceptions of Scientist & Science Attitudes
Week 2	Scientific Practices & Activities
Week 3	Scientific Practices & Activities
Week 4	Constructivism & Misconceptions
Week 5	Inquiry Based Learning
Week 6	NGSS Using Trade Books in science
Week 7	Scope & Sequence Charts Science Concepts Developing Clarity of Learning (The Essential Understanding: Understand, Know, Be Able to Do—skills)
Week 8	Demonstration Lessons (Discrepant Events) The Importance of Questioning
Week 9	Authentic Assessment
Week 10	The Learning Cycle Model
Week 11	The Learning Cycle Model
Week 12	The Learning Cycle Model
Week 13	Other Science Teaching Strategies Simulations Project Based Learning
Week 14	Resources Available for Teachers

Academic Integrity

Students are expected to maintain principles of academic integrity and conduct as defined in EIU's Code of Conduct (http://www.eiu.edu/judicial/studentconductcode.php). Violations will be reported to the Office of Student Standards.

Student Success Center
Students who are having difficulty achieving their academic goals are encouraged to first contact their instructor. If needing additional help, please contact the Student Success Center (www.eiu.edu/~success) for assistance with time management, test taking, note taking, avoiding procrastination, setting goals, and other skills to support academic achievement. The Student Success Center provides individualized consultations. To make an appointment, call 217-581-6696, or go to 9th Street Hall, Room 1302.

Students with Disabilities
If you are a student with a documented disability in need of accommodations to fully participate in this class, please contact the Office of Student Disability Services (OSDS). All accommodations must be approved through OSDS. Please stop by Ninth Street Hall, Room 2006, or call 217- 581-6583 to make an appointment.

ELE 3290 References
***Denotes Unit Conceptual Framework References**

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National Research Council. (1993). *National science education standards*. Washington, DC: National Science Teachers Association.

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