Eastern Illinois University Early Childhood, Elementary, and Middle Level Education Department ELE3290.002: Science in the Elementary & Middle School



http://www.nextgenscience.org/

Instructor: Denise E. Reid

Location & Time: BB2430/Monday & Wednesday/10:00 a.m. – 11:40 p.m.

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Office Hours: Monday & Wednesday 12:45 p.m. – 1:45p.m. /Tuesday 2:00 – 4:00 p.m. OR by appointment

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

Catalog Description: Science in the Elementary 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 4000.

Prerequisites: Concurrent enrollment in ELE 3340 and ELE 4880, or permission of department chair. University Teacher Education requirements apply and department requirements for enrollment must be met.

Purpose of the Course: To involve students 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 students develop their skills at teaching science processes through discovery, guided discovery, and inquiry lessons. Students will also understand the importance of assessment and evaluation, and will develop various means of assessment. **Students will integrate technology in their lessons, projects, and science units.**

Course Text:

Martin, R., Sexton, S., Wagner, K., & Gerlovich, J. (2005). *Teaching science for all children* (4th ed.). Boston: Allyn & Bacon.

Carin, A. A., Bass, J. E., Contant, T. L. (2005). *Activities for teaching science as inquiry* (6th ed.). Upper Saddle River, NJ: Pearson, Merrill Prentice Hall.

Supplemental Materials

LiveText account, course packet, and science notebook

Learning Model:

The Information-Processing Models

- 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.
- Scientific Inquiry & Inquiry Training: The Scientific Inquiry Model used The Biological Sciences Curriculum (BSCS) model as one example of a curriculum that uses inquiry teaching in developing science curriculum. "The essence of the model is to involve students in a genuine problem of inquiry by confronting them with an area of

investigation, helping them identify a conceptual or methodological problem within that area of investigation, and inviting them to design ways of overcoming the problem." (p. 169) In addition, the Scientific Inquiry Model uses the work of Richard Suchman to support the Inquiry Training Model. Suchman believed that students can be conscious of their process of inquiry and can be taught the scientific procedures directly. "The model promotes strategies of inquiry and the values and attitudes that are essential to an inquiring mind, including: process skills; active, autonomous learning; verbal expressiveness; tolerance of ambiguity; persistence; logical thinking; and an attitude that all knowledge is tentative." (p. 185)

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/bscs-5e-instructional-model

Joyce, B., Weil, M., & Calhoun, E. (2009). *Models of teaching*. (8th ed.). Boston: Pearson.

Dispositions: Teacher candidates in the Department of EC/ELE/MLE will exhibit professional ethical practices, effective communication, and sensitivity to diversity, the ability to provide varied teaching practices evidenced in a supportive and encouraging environment.

Live Text Assessment Requirement: For those classes with Live Text or Practicum- If the portfolio 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:

- Association for Childhood Education International Standards (ACEI) http://www.acei.org/Synopsis.htm
- National Association for the Education of Young Children (NAEYC)
 http://www.naeyc.org/ncate/files/
- Illinois Professional Teaching Standards (IPTS) http://education.illinois.edu/ci/oce/Documents-new/Professional_Teaching_Standards.pdf
- Illinois Social Emotional Learning Standards (SEL) http://www.isbe.net/ils/social-emotional/standards.htm
- Eastern Illinois University Professional Dispositions http://www.eiu.edu/clinical/forms/DispositionsforEIUcandidates.pdf

Course Outcomes

- 1. The teacher candidate will exhibit a positive attitude toward providing meaningful experiences in science for young 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 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 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 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 IPTS 1C, 1I, 2B, 2G, 2I - 2K, 2N, 3B, 3I, 5A, 5L, 6E, 6H, 6Q, 7B, 7E, 9A, 9S 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 SEL 2B – 2C, 3A.1b Dispositions: PEP, EC, IWS
*LiveText Submission	All or a portion of the Science Unit will be submitted the Program Assessment.	hrough LiveText for Unit and

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 (Textbook & 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 a 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, IPTS, 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 Sciences, Earth & Space Sciences and Engineering, Technology, and Application of Science). Teacher candidates will create lessons to meet NGSS and CCSS.	ACEI 2.1, 2.2, 3.3 NAEYC 5a - 5b IPTS 2B, 2D, 5D, 9A 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 the course D2L page.

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

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

- 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 beneficial. 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 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 voice mail or e-mail. Five points will be deducted for each class absence.
- 2. **Field Trip Assignment (40 points)** We will take a field trip to the Douglas Hart Nature Center on Friday, August 23, 3-4:30 p.m.
- 3. Content Area Readings (60 points-20 points each) Select an article from a *professional journal* that corresponds with the relevant topic. Topics will be constructivism, inquiry (teaching science), and authentic assessment. Copy the article. Read, highlight, and write reflective comments in the margins. Be prepared to discuss the topic in class. Type a one-page reflection that answers this question: What was the key idea presented in this article? *See grading guidelines listed below and scoring rubric.
- 4. Professional Teaching Journal/Science & Children Critique (50 points) Follow the criteria on the assignment handout.
- 5. Science Beliefs Ouiz & Article (10 points)
- 6. **Science Lab Notebook and Homework (100 points)** Keep a science notebook that will contain recorded data related to labs, resource information, teaching tips and course discussions. **There will be homework completed for each lab.** (Follow the criteria on the assignment handout.)

"Notebooks are meant to be tools for students to record both their data and thinking as they 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)

- 7. **Double Entry Journal (30 points)** You will be reading *Stop Faking It! Finally Understanding Science so You Can Teach It, Force and Motio* by William C. Robertson. As you are reading the book you will keep a journal recording notes, ideas and data.
- 8. **Science Demonstration Lesson (28 points) & Group Presentation (30 points)** 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 through WebCT. Work with group members to put together a presentation (science show).
- 9. **S.O.S—Sensational Opportunities in Science (100 points)** EIU students will plan and teach developmentally appropriate science lessons following the Learning Cycle Model for third graders at Carl Sandburg Elementary School. Students will assess the third graders' understanding of the concepts taught. EIU students will reflect on this learning experience.
- 10. Science Unit (195 points) Follow the criteria on the assignment handout.
- 11. **LiveText Submission (Mandatory):** Submit the following to LiveText items from science unit for review by the instructor: Background paper, hierarchy, unit overview, best lesson plan, and unit reflection.
- 12. Midterm (approximately 50 points)
- 13. Final (approximately 50 points)

*Grading system for Content Area Readings:

10 points: Essential ideas for understanding the topic are highlighted throughout the whole article-including the sample lesson or any appendices, the comments in the margins show that the reader was *thinking* about the ideas that were presented and not just repeating the ideas. Reflective paper is well written, and clearly explains the key idea learned from reading this article. The written response is one page in length. Written response is typed and includes reference using APA guidelines.

8 points: Important ideas are highlighted throughout entire article, but comments are not truly reflective-comments just restate the ideas presented. Reflective paper highlights key idea presented in the article, and is the appropriate length. Written response is typed and includes reference using APA guidelines.

6 points: Few ideas are highlighted throughout the article, and there are few comments written in the margins. Comments are not reflective. Written response is a summary of the article, and is the appropriate length. Paper is typed and includes the reference, which may or may not follow APA guidelines.

4 points: Few ideas are highlighted in the article and there are no comments written in the margins. Written response is too general. Written response is typed and lists reference.

2 points: Article has no highlighted information or comments written in the margins. Written response may or may not be typed. Written response does not reflect key idea from article.

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
Week 15	Fianl

Student Success CenterStudents 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.

Academic Integrity

"The Department of EC/ELE/MLE is committed to the learning process and academic integrity as defined within the Student Conduct Code Standard I. "Eastern students observe the highest principles of academic integrity and support a campus environment conducive to scholarship." Students are expected to develop original and authentic work for assignments submitted in this course. "Conduct in subversion of academic standards, such as cheating on examinations, plagiarism, collusion, misrepresentation or falsification of data" or "submitting work previously presented in another course unless specifically permitted by the instructor" are considered violations of this standard."

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Students with Disabilities: If you have a documented disability and wish to discuss academic accommodations, please contact the Office of Disability Services at 581-6583.