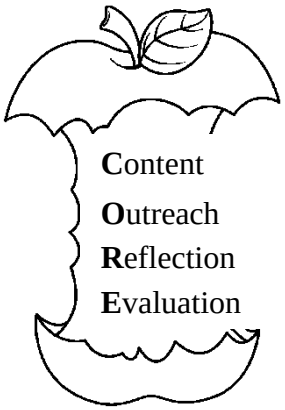
Eastern Illinois University
Early Childhood, Elementary, and Middle Level Education Department
ELE 3290.001: Science in the Elementary and Middle School



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Class Meetings: Buzzard Hall 2430 – M,W 8:00-9:40
Semester: Fall 2016

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/MLE 4100. (3-0-3)

Prerequisites: ELE 3100 or MLE 3110. 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:
Martin, R., Sexton, S., Wagner, K., & Gerlovich, J. (2009). *Teaching science for all children* (5th 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.

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 (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)

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.

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

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 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 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, 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	Points
Participation	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, 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 voice mail, text or e-mail. Five points will be deducted for each unexcused class absence.	40 pts

Science notebook & investigation sheets	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)	20 pts for each investigation sheet 50 pts for collection of daily notes and final notebook
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.	20 pts each
Midterm and Final	A midterm and a final will be given over the course content.	Approximately 50 pts each
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.	150 pts
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. 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.	30 pts for the lesson plan 30 pts for presentation 30 pts for review of peer presentations
Field Trip	Performance includes interaction with outside agencies to enhance educational experiences for all students. Activities at the	50 pts

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

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

All assignments must be submitted by the agreed upon due date established during class. Points will be deducted for late assignments. Assignments must be completed in an exemplary fashion to receive an "A".

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

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
"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."

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**

Adams, D, & Hamm, M. (1998). *Collaborative inquiry in science, math, and technology*. Portsmouth, NH: Heinemann.

Baker, D., & Piburn, M. (1997). *Constructing science in middle and secondary classrooms*. Boston: Allyn & Bacon

Beisenherz, P., & Dantonio, M. (1996). *Using the learning cycle to teach physical science: A hands-on approach for the middle grades*. Portsmouth, NH: Heinemann.

*Bloom, B. S. (1956). *Taxonomy of educational objectives: The classification of educational goals, Handbook I: Cognitive domain.* New York: Longmans Green.

Blosser, P. (1991*). How to ask the right questions*. Washington, DC: National Science Teachers Association.

Brooks, J. G., & Brooks, M. (2001). *In search of understanding: The case for constructivist classrooms* (2nd ed.). Alexandria, VA: Association for Supervision and Curriculum Development.

*Bruner, J. S. (1961). The act of discovery. *Harvard Educational Review*, 31, 21-32.

Campbell, B., & Fulton, L. (2003). *Science notebooks: Writing about inquiry*. Portsmouth, NH: Heinemann.

Carin, S., & Sund, R. (1989). *Teaching modern science* (5th ed.). Columbus, OH: Merrill Publishing Company.

Carin, A. (1993). *Teaching science through discovery* (7th ed.). New York: Merrill Publishing Company.

Cerullo, M. M. (1997). *Reading the environment, children's literature in the science classroom.* Portsmouth, NH: Heinemann.

Cordeiro, P. (1992). Whole *learning, whole language and content in the upper elementary grades*. Katonah, NY: Richard C. Owen Publishers, Inc.

Doris, E. (1991). *Doing what scientists do: Children learn to investigate their world*. Portsmouth, NH: Heinemann.

*Dunn R., & Dunn K. (1975). Finding the best fit- learning styles, teaching styles. *NAASP Bulletin, 59*, 37-49

Esler, W., & Esler, M. (1989). *Teaching elementary science* (5th ed.). Belmont, CA: Wadsworth Publishing Company.

Finson, K. D., Beaver, J. B., & Cramond, B. L. (1995). Development and field test of a checklist for the draw-a-scientist test. *School Science and Mathematics, 95*, (4), .

Fleer, M., Hardy, T., Baron, K., & Malcolm, C. (1996). *They don't tell the truth about the wind*. Portsmouth, NH: Heinemann.

Hein, G., & Price, S. (1994). *Active assessment for active science: A guide for elementary school teachers*. Portsmouth, NH: Heinemann.

Hixson, B. K. (1999). *Women in science rule*. Sandy, UT: Loose in the Lab, Inc.

Howe, A., & Jones, L. (1998). *Engaging children in science*. Upper Saddle Hall, NJ: Prentice-Hall, Inc.

*Johnson, R.T. & Johnson, D.W. (1991). So what's new about cooperative learning in science? *Cooperative Learning, 11* (3), 2-3

Manning, M., Manning, G., & Long, R.. (1994). *Theme immersion: Inquiry-based curriculum in elementary and middle schools*. Portsmouth, NH: Heinemann.

Marek, E. A. & Cavallo, A. M. L. (1997). *The learning cycle: Elementary school science and beyond.* Portsmouth, NH: Heinemann.

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.

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

Norton-Meier, L., Hand, B., Hockenberry, L. & Wise, K. (2008). *Questions, claims, and evidence: The important place of argument in children's science writing.* Portsmouth, NH: Heinemann.

Ostlund, K. L. (1992). *Science process skills: Assessing hands-on student performance*. Menlo Park, CA: Addison Wesley.

*Piaget, J. (1954). *The construction of reality in the children.* New York: Basic Books.

Pearce, C. R. (1999). *Nurturing inquiry, real science for the elementary classroom*. Portsmouth, NH: Heinemann.

Russell, H. R. (1990). *Ten-minute field trips: A teacher's guide to using the school grounds for environmental st*udies (2nd ed.). Washington, DC: National Science Teachers Association.

Saul, W., & Jagusch, S. A. (1991). *Vital connections, children, science, and books*. Portsmouth, NH: Heinemann.

Saul, W., & Reardon, J. (1996). *Beyond the science kit: Inquiry in action*. Portsmouth, NH: Heinemann.

*Slavin, R. L. (1995). *Cooperative learning*. Boston: Allyn and Bacon.

Strassenburg, A. (1996). *A perspective on reform in mathematics and science education.* Eisenhower National Clearinghouse for mathematics and Science Education. Columbus, OH: National Science Teachers Association.

Tierney, B. & Dorrah, J. (2004). *How to write to learn science* (2nd ed.). Arlington, VA: NSTA Press.

Vasquez, J. (2008). *Tools & traits for highly effective science teaching, k-8.* Portsmouth, NH: Heinemann.

Zemelman, S., Daniels, H., & Hyde, A. (2005). *Best practice: Today's standards for teaching and learning in America's schools* (3rd ed.). Portsmouth, NH: Heinemann.

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