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

http://www.nextgenscience.org/

Instructor:	Denise E. Reid
Location & Time:	BB2430/T-Th 8-9:40 a.m.
Office:	BB2211
Office Hours:	Monday: 9-11/Tuesday: 3 – 4/Wednesday: 1-2
Telephone:	Office (217) 581-7891/Cell (217) 549-3633
E-mail address:	dereid@eiu.edu
Web Site:	http://www.ux1.eiu.edu/~dereid

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
- Illinois Standards for Certification in Special Teaching Fields-Elementary (ELE) http://www.isbe.net/profprep/CASCDvr/pdfs/26310_elementaryed.pdf
- Illinois Professional Teaching Standards (IPTS) http://www.isbe.state.il.us/profprep/PDFs/ipts.pdf
- Illinois Core Language Arts Standards (ICLAS) http://www.isbe.net/profprep/CASCDvr/pdfs/24110_corelangarts_std.pdf
- Illinois Core Technology Standards (ICTS) http://www.isbe.net/profprep/CASCDvr/pdfs/24100_coretechnology.pdf

Course Outcomes

1. The students will exhibit a positive attitude toward providing meaningful experiences in science for young students.
2. The students will demonstrate an understanding of the nature of science, the learner, and the learning environment.
3. The students will demonstrate a working knowledge of appropriate science learning and hands-on inquiry experiences for children.
4. The students will exhibit the ability to effectively utilize various types of materials, resources, and media to engage children in meaningful science experiments.
5. The students will demonstrate knowledge of assessment and evaluation procedures for science.
6. The students will demonstrate the ability to plan, implement, and assess science instruction for elementary students.

7. The students will become familiar with the Illinois Learning Standards for Science and the National Science Education Standards.

Course Requirements	**Demonstrated Competencies**	**Aligned Standards (ACEI, ELE, IPTS, ICTS, ICLAS)**
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 5.1 ELE 16, 17 IPTS10, 11 ICTS 2E, 6C, 6D ICLAS 2D, 2E, 2H Dispositions: PEP, EC, SDE
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 2.2 ELE 4 IPTS 1, 7, 10 ICTS 2B ICLAS 2B Dispositions: PEP, EC, PTSL
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 2.2, 3.1, 3.3 ILSCSTF IPTS 1 ICTS 2E, 7K ICLAS 1E, 2B, 2D, 2F Dispositions: PEP, EC
Quizzes & Tests	Tests will be provided as one form of assessment of student's content knowledge related to planning and teaching effective science lessons. Focus is on demonstrating understanding of course content knowledge.	ACEI 2.2 ELE 4,16 IPTS 1, 8 ICLAS Dispositions: EC, PTSL
Science Unit*	Performance includes creating a one-two week science unit that is developmentally appropriate and inquiry based. The unit will address an essential question. 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 developing a developmentally appropriate inquiry-based science unit that fosters conceptual understanding.	IPTS 1, 2, 3, 4, 6, 7, 8, ICTS 2E, 6A, 6C, 7J, 8A, 8D ACEI 1, 2.2, 3.1, 3.2, 3.3, 3.4, 4, NAEYC 4b, 4c, 4d 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 demonstration and understanding of the concept through effective questioning techniques for creating conceptual understanding and overall explanation of the concept.	ACEI 1, 2.2, 3.2, 3.3, ELE 4 IPTS 1, 3, 4, 6, 7 ICTS 7A, 7D, 7J, 8D ICLAS 1F, 2D, 2F Dispositions: PEP, EC, PTSL, 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 (The assignments and points are listed below the table.)**
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, and course packet	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 an article from a professional journal that corresponds with the relevant topic. 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 1/2 to 1 page reflection that answers this question: What was the key idea presented in this article?
Quizzes & tests	A midterm and a final will be given over the course content.
Science Unit	An inquiry-based science unit will be developed. 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 demonstration 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 Assignment	**Brief Description**
Illinois Learning Standards & National Science Education Standards Assignment (NSES)	Performance requires the students to be able to identify the three state science goals (11, 12, & 13) ultimately being able to identify the standards taught in his/her science unit. The students will be comparing the content standards developed by NSES with the content standards in state goal 12, recognizing the content is divided into three categories: life sciences, physical sciences, & earth and space sciences.
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?
Take Home labs	Performance requires the students 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.
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.
Integrated Learning Project	Performance includes planning a developmentally appropriate science lesson (or lessons), teaching the lesson(s) to children, assessing student learning, and reflecting on this experience.

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 sent to students through D2L.

Grading Scale: A=100-92%; B=91-83%; C=82-74%; D=73-65%; F=below 65%

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 (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. **Three points will be deducted for each class absence.**

2. **Content Area Readings** (**30 points-10 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, 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.
3. **Field Trip Assignment (40 points)** We will take a field trip to the Douglas Hart Nature Center on Friday, February 1, 3-4:30 p.m.
4. **Professional Teaching Journal Critique (50 points)** Follow the criteria on the assignment handout.
5. **Science Beliefs Quiz & Article (10 points)**
6. **Process Skills Quiz (36 points)**
7. **Ongoing Homework Assignments (30 points each)** Moon and Forces & Motion Assignments Follow the criteria on the assignment handout
8. **Integrated Learning Project—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.
9. **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).
10. **Science Notebook (50 points)** 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)
11. **Science Unit (205 points)** Follow the criteria on the assignment handout.
12. **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.
13. **Midterm (approximately 50 points)**
14. **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 (Draw-A-Scientist Test)
Week 2	Science Process Skills & Activities
Week 3	Science Process Skills & Activities
Week 4	Constructivism & Misconceptions
Week 5	Inquiry Based Learning
Week 6	National Science Education Standards & Illinois Learning Standards Science Content: Life Science, Physical Science, & Earth & Space Science 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

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.

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."

ELE 3290 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.

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.