Loyola University Chicago
School of Education
CIEP M83-003/004: Teaching Science in Elementary/Middle School
Fall 2011
Tuesdays OR Wednesdays, 8:15 am - 11:15 am, Cudahy Hall 314 (Lake Shore Campus)

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COURSE OVERVIEW, OBJECTIVES, AND STANDARDS

COURSE OVERVIEW AND OBJECTIVES

This course is designed to increase your confidence in and commitment to teaching science in grades K-9. Current understandings of best practices in the teaching and learning of science at the elementary and middle school levels will be introduced and discussed. You will have the opportunity to engage in learning activities both as a learner and as a teacher, reflecting on each experience and how one influences your thinking on the other. In doing so, you are encouraged to see yourself as a life-long learner and professional in your field.

At the end of this course, through large and small group instruction and discussion, hands-on learning experiences, clinical field work, and reflective writing, you will:

1. Increase your science content knowledge;
2. Reflect on what it means to teach culturally responsive science and create, locate and modify a wide variety of resources for effective instruction of diverse classrooms;
3. Design, teach and refine integrated science lessons that meet national and state standards and frameworks;
4. Demonstrate an understanding of and effectively employ a variety of assessment strategies to monitor students' learning throughout instruction;
5. Provide a rationale to support instructional decisions and critically reflect on instructional decisions and actions;
6. Demonstrate competency in the use of emerging educational technologies to support instruction.

COURSE STANDARDS

This course is aligned to the following standards:

1. Loyola University of Chicago – School of Education – Conceptual Framework (CF) standards
    a. CF 1: Candidates demonstrate an understanding of a current body of literature and are able to critically evaluate new practices and research in their field.
    b. CF 5: Candidates demonstrate technological knowledge and skills that enhance education.

2. The Association for Childhood Education International (ACEI) and The National Council for the Accreditation of Teacher Education (NCATE) standards:

a. 2.2: *Science*: Candidates know, understand, and use fundamental concepts in the subject matter of science—including physical, life, and earth and space sciences—as well as concepts in science and technology, science in personal and social perspectives, the history and nature of science, the unifying concepts of science, and the inquiry processes scientists use in discovery of new knowledge to build a base for scientific and technological literacy.
b. 3.1: *Integrating and applying knowledge for instruction*: Candidates plan and implement instruction based on knowledge of students, learning theory, subject matter, curricular goals, and community.
c. 3.2: *Adaptation to diverse students*: Candidates understand how elementary students differ in their development and approaches to learning, and create instructional opportunities that are adapted to diverse students.
d. 3.3: *Development of critical thinking, problem solving and performance skills*: Candidates understand and use a variety of teaching strategies that encourage elementary students' development of critical thinking, problem solving, and performance skills.
e. 3.4: *Active engagement in learning*: Candidates use their knowledge and understanding of individual and group motivation and behavior among students at the K-6 level to foster active engagement in learning, self motivation, and positive social interaction and to create supportive learning environments.
f. 3.5: *Communication to foster learning*: Candidates use their knowledge and understanding of effective verbal, nonverbal, and media communication techniques to foster active inquiry, collaboration, and supportive interaction in the elementary classroom.

CORE ASSESSMENT REQUIREMENTS

This course includes two ACEI/NCATE Core Assessment requirements:

#2: Assessment of content knowledge in elementary education (This will be met by the course grade.)
#3 Assessment of candidate ability to plan instruction (This will be met in the Lesson Plan requirement, which must be submitted in LiveText.)

CONCEPTUAL FRAMEWORK

This course embodies the conceptual framework – *Professionalism in Service of Social Justice* – of the School of Education (SOE) at Loyola University Chicago. The four components of the SOE's conceptual framework are *service*, *skills*, *knowledge*, and *ethics*. As teachers, we recognize our connection to students as individuals and as members of a larger community. We serve others (students as well as families and communities) by creating experiences that encourage creative, moral and intellectual development. Leaders in our classrooms and larger school communities, we must consider how education can be transformational and how we might be agents of change. In this course, we will explore what it means to hold high expectations for all learners that include academically challenging, personally and socially relevant knowledge and complex learning skills. In order to successfully provide opportunities for youth to meet these expectations, we must also be committed to reflecting on our own practice and to continually developing our own knowledge, attitudes and skills.

COURSE TEXTS AND MATERIALS

1. Michaels, S., Shouse, A.W., & Schweingruber, H.A., (2008). *Ready, set, science! Putting research to work in K-8 science classrooms*. Washington, DC: National Academies Press.
2. Keeley, P., Eberle, F. & Dorsey, C. (2008). *Uncovering student ideas in science: Volume III*. Arlington, VA: NSTA Press.

3. Additional handouts and readings will be posted to Blackboard throughout the course.
4. One composition notebooks for use during the Moon Study Project.

TECHNOLOGY

Throughout this course, we will consider how technology can support and enhance science teaching and learning. Class readings, assignments and discussions are intended to help you develop your own technological pedagogical content knowledge (TPACK) and informed opinions about technology integration specific to the elementary/middle school science classroom.

COURSE POLICIES

ACADEMIC HONESTY

Academic honesty is an expression of interpersonal justice, responsibility and care, applicable to Loyola University faculty, students, and staff, which demands that the pursuit of knowledge in the university community be carried out with sincerity and integrity. The School of Education's Policy on Academic Integrity can be found at: http://www.luc.edu/education/academics_policies_integrity.shtml. For additional academic policies and procedures refer to: http://www.luc.edu/education/academics_policies_main.shtml

ACCESSIBILITY

Students who have disabilities which they believe entitle them to accommodations under the Americans with Disabilities Act should register with the Services for Students with Disabilities (SSWD) office. To request accommodations, students must schedule an appointment with an SSWD coordinator. Students should contact SSWD at least four weeks before their first semester or term at Loyola. Returning students should schedule an appointment within the first two weeks of the semester or term. The University policy on accommodations and participation in courses is available at: http://www.luc.edu/sswd/

HARASSMENT (BIAS REPORTING)

It is unacceptable and a violation of university policy to harass, discriminate against or abuse any person because of his or her race, color, national origin, gender, sexual orientation, disability, religion, age or any other characteristic protected by applicable law. Such behavior threatens to destroy the environment of tolerance and mutual respect that must prevail for this university to fulfill its educational and health care mission. For this reason, every incident of harassment, discrimination or abuse undermines the aspirations and attacks the ideals of our community. The university qualifies these incidents as incidents of bias.

In order to uphold our mission of being Chicago's Jesuit Catholic University-- a diverse community seeking God in all things and working to expand knowledge in the service of humanity through learning, justice and faith, any incident(s) of bias must be reported and appropriately addressed. Therefore, the Bias Response (BR) Team was created to assist members of the Loyola University Chicago community in bringing incidents of bias to the attention of the university. If you believe you are subject to such bias, you should notify the Bias Response Team at this link: http://webapps.luc.edu/biasreporting/

DIVERSITY

I strive to facilitate an inclusive environment respectful of all cultures and people regardless of race, sex, gender identity, religion, ethnic background, socio-economic class, sexual orientation, and abilities. If you are a student who requires any special considerations, please inform the instructor during the first week of class.

ATTENDANCE AND PARTICIPATION

Attendance is required. If you are unable to attend class, it is your responsibility to:

1. Notify the instructor in advance. Please note that informing the instructor does **not** excuse your absence.
2. Send assignments that are due.
3. Get handouts, assignments, class notes, and information about activities from a classmate prior to the meeting of the next class.
4. Be prepared for the next class.

Participation in class activities and discussions is expected. You should come to class prepared and be ready to contribute and take part in class activities. Your constructive contributions to our discussions are always welcome.

Hand held electronic/communication devices and laptop computers must be used discriminately and professionally per our discussion in class. Thank you.

LATE WORK AND EXTENSION REQUESTS

All assignments are due on the dates listed in the syllabus. Late work will only be accepted under special circumstances (e.g., family emergency, illness). Please *contact me* in person or by phone or email *prior to any given due date* to discuss assignment extensions requests. Failure to do so in a timely manner will result in significant grade deductions.

REQUIREMENTS FOR ALL WRITTEN ASSIGNMENTS

Unless otherwise instructed, all written assignments completed outside of class must be double spaced, with one inch margins, word-processed in Times New Roman, 12 point font, and saved electronically. You must have the capability to produce the assignment again. Computer problems are not an excuse for late work.

Unless otherwise noted, all assignments should be submitted via Blackboard's Assignment tool. (For assistance navigating this tool, please review Blackboard's Help Resources at: http://luc.edu/blackboard/Student_Resources.shtml). Uploaded files must be named using the following format: **LastName_AssignmentName**. For example, when submitting the Learning Center Project, I would name the file: Smetana_LearningCenterProject. Also, as a reminder, the lesson plan is a Core assessment, and will be submitted via LiveText. *Please make certain you have activated your LiveText account if you have not already done so.*

References should be cited where applicable, following American Psychological Association style guidelines (APA – 6th edition). Please access the APA style manual through Loyola University Chicago's libraries or online at http://www.apastyle.org.

Written assignments will be graded for accurate mechanics and English grammar usage as well as thoughtful, pertinent, and clear content.

COURSE EVALUATION

GRADING

All assignments will be graded using the rubrics provided during class and posted on Blackboard. Each assignment will be calculated into the total number of points for the course. The number of points earned will then be divided by the number of points possible, and a letter grade will be assigned using the scale below.

Grading Scale:

A+: 98% and above; A: 97 - 94%; A-: 93 - 90%
B+: 89 - 88%; B: 87 - 84%; B-: 83 - 80%
C+: 79 - 78; C: 77 - 74%; C-: 73 - 70%
D+: 69 - 68%; D: 67 - 64%; D-: 63 - 60%
F: Below 60%

ASSIGNMENTS AND PROJECTS

Course Participation and Blackboard Discussion Forum – *50 points – earned throughout the course*

Full participation in the course is expected. *At the start of each class session, a "quick write" assignment will be administered to assess your attention to and ability to synthesize the readings assigned*. You will be successful on these informal assessments as long as you keep up with the assigned reading.

For the period of time that you are in the field completing your clinical hours, you will receive participation points for contributing to an *online discussion*, through Blackboard. All students will be assigned one week to lead, as a team, the asynchronous online discussion. Each group is encouraged to meet and discuss the assigned readings together. Then, the group will post at least three discussion-provoking questions for the class and monitor the online discussion that ensues. The discussion questions should be posted by 11:59 pm Monday of the assigned week. On those weeks that you are not assigned to lead a discussion, you will make at least two postings in response to the questions your classmates have posed and/or to others' responses. All postings (questions and responses) should make an explicit connection between some aspect of the course (draw on ideas from the readings we have already done) and your collective experiences in the field. These postings should be completed by 11:59 pm Sunday. Responses should be insightful and specific, using at least one quotation from the assigned readings (properly referenced/cited using APA).

For each class session, you can earn up to four participation points. The following guidelines will determine the points you earn:

"Quick Write" (on campus class meetings only)

2 points = insightful and complete response demonstrates careful reading and synthesis of ideas; 1 point = partial or vague response; 0 points = inaccurate or incomplete response.

General Class Participation:

2 points = On-time to class with full-participation (given the guidelines described above); 1 point = Late to class and/or limited participation (given the guidelines described above); 0 points = Did not attend class or did not participate at all (given the guidelines described above).

Moon Study & Inquiry Investigation - *60 points - due on or before October 12*
To help you think about teaching science, it is important that you think about learning science. In this assignment you will be engaged as a science learner. You'll be making observations and developing explanations to fit your observations. You are going to become a moon-watcher! First, you will watch the moon each day for 2 weeks, making an entry in your notebook each time you make an observation. You will use your eyes and your mind to make sense of any patterns you notice and observations you make. After you've completed your observations in nature, you will use the free computer program, *Stellarium*, to make additional simulated observations and test some of the predictions that you made during the first two weeks of the project. Finally, you will write a reflection summarizing what you observed and learned, your most current thinking about the moon, as well as what the project taught you about both teaching and learning science.

Make natural observations from September 13/14 – September 27/28
Notebook Check on September 20/21
Completed Project due on or before October 12

Field-Based Formative Assessments - *30 points – due date to be determined by clinical field work dates*
During the clinical component of the course, you will have an opportunity to converse with students and elicit their ideas and reasoning about specific science topics and phenomena. As part of this assignment, you will administer a formative assessment probe either to your class or to a small group of students. Then, you will reflect upon what you learned about students' understandings and thought processes as well as about your own teaching.

NSTA Learning Center Project - *60 points - due on or before November 3 (Part 1) and December 12 (Part 2)*
As a result of this course, it is my hope that you will think of yourself as a professional in your field, reflecting on your current skills and abilities and how you would like to grow in meeting personal professional goals. The *NSTA Learning Center* is a wealth of resources for science formal and informal educators of all levels. This site will be valuable not only in this course but as you continue on in your career as an elementary science educator. The NSTA PD Indexer and PD Plan & Portfolio tools will allow you to identify personally meaningful professional development goals, outline and track your progress over time.

NSTA PD Indexer and PD Plan due on or before November 3
NSTA Portfolio & Reflection due on or before December 12

Lesson Plan- *50 points - due on or before November 23 (by 11pm)* ***via LiveText***
The lesson plan portion of this assignment is a Core Assessment for standards CF1 and CF5, which are both written out in their entirety at the beginning of this syllabus. Please see the last pages of this syllabus for the requirements that need to be included in your lesson plan, as well as the rubric I will use to evaluate your plan. You can also access the rubric through your LiveText account.

Information about Clinical Field Work
This course includes a **mandatory clinical experience** component. More information regarding this requirement, including dates, location and specific responsibilities and expectations, will be provided from Dr. Riggs and in the Fieldwork Handbook. Although this class will not be meeting in person during the Clinical weeks, there are several assignments that you are expected to complete outside of class and online, as described in the syllabus. I will continue to be available for office hours and private consultations during this time to assist you in completing all course requirements.

TENTATIVE COURSE SCHEDULE

(Any changes will be announced in class and posted on Blackboard. Specific weekly readings and assignments will be listed for Weeks 6-15 on Blackboard after Clinical dates are finalized.)

Week 1: 8/30 & 8/31

Introduction to the Course & to the Culture of Science

ASSIGNED READINGS TO BE COMPLETED BEFORE THIS CLASS

A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas, Executive Summary and Introduction (freely available at: http://books.nap.edu/catalog.php?record_id=13165)

ASSIGNMENTS DUE ON THIS DAY

none

ASSIGNMENTS TO WORK ON BEFORE NEXT CLASS

1) Visit the Understanding Science website: http://undsci.berkeley.edu/ and complete the Understanding Science 101 tour. Write a one page statement (~200 words) explaining how your understanding of science has changed as a result of reviewing this material.
2) Complete the TPACK self-assessment

Week 2: 9/6 & 9/7

Science Process Skills & Explicit Nature of Science Instruction

ASSIGNED READINGS TO BE COMPLETED BEFORE THIS CLASS

1) Read Ready, Set, Science! Chapters 1 & 2
2) Teaching the Nature of Science: Three Critical Questions

ASSIGNMENTS DUE ON THIS DAY

1) Understanding Science website assignment
2) TPACK self-assessment

ASSIGNMENTS TO WORK ON BEFORE NEXT CLASS

Digital Media assignment

Week 3: 9/13 & 9/14

The Learning Cycle Model of Instruction: Exploring its history, purpose and application in the elementary and middle school science classroom

ASSIGNED READINGS TO BE COMPLETED BEFORE THIS CLASS

1) Brown, P. L., & Abell, S. K. (2007). Examining the learning cycle. *Science and Children, 44* (5), 58-59.
2) Why Inquiry? A historical and Philosophical Commentary
3) What Children Gain by Learning Through Inquiry
4) Shifting from Activity Mania

ASSIGNMENTS DUE ON THIS DAY

Digital Media assignment

ASSIGNMENTS TO WORK ON BEFORE NEXT CLASS

Moon Study natural observations

"I Wonder" assignment

Week 4: 9/20 & 9/21

Understanding & Incorporating Students' Background Knowledge, Skills and Experiences

ASSIGNED READINGS TO BE COMPLETED BEFORE THIS CLASS

1) Ready, Set, Science Chapter 3
2) The Power of Children's Thinking
3) Teaching Science to Every Child, Chapter 1 Point/CounterPoint

4) Kang & Howren. (2004). Teaching for conceptual understanding. *Science and Children, 42(1), 28-32.*

ASSIGNMENTS DUE ON THIS DAY

"I Wonder" assignment

Moon Study Notebook Check

ASSIGNMENTS TO WORK ON BEFORE NEXT CLASS

Asking Good Scientific Questions Assignment

Continue Moon Study natural observations

Week 5: 9/27 & 9/28

Science Teaching as a Profession & Exploring Curriculum Library Resources

**Professor Away for Research Conference; Guest Speaker **

ASSIGNMENTS DUE ON THIS DAY

End Moon Study natural observations

ASSIGNMENTS TO WORK ON BEFORE NEXT CLASS

Asking Good Scientific Questions Assignment

Begin Moon Study *Stellarium* observations

Week 6: 10/4 & 10/5

Developing Experimental Scientific Research Questions & Conducting Investigations

ASSIGNED READINGS TO BE COMPLETED BEFORE THIS CLASS

1) An Introduction to the National Science Standards
2) Inquiry and the National Science Education Standards: A guide for teaching and learning.
3) What Makes a 'Good' Experiment?
4) Asking a Good Science Fair Question
5) Thinking about Students' Questions

ASSIGNMENTS DUE ON THIS DAY

Asking Good Scientific Questions Assignment

ASSIGNMENTS TO WORK ON BEFORE NEXT CLASS

Begin Moon Study *Stellarium* observations

Week 7: 10/11 & 10/12

Tuesday Class: Mid-semester Break

Wednesday Class: Informal Science Experiences – Learning Outside the Classroom

Week 8: 10/18 & 19/19

Evidence, Claims & Scientific Argumentation

Week 9: 10/25 & 10/26

Field Work

Culturally Responsive & Equitable Science Teaching

Week 10: 11/1 & 11/2

Field Work

Integrating Science with Other Subjects

Week 11: 11/8 & 11/9

Field Work

The Power of Questioning, for Teachers and Students

Week 12: 11/15 & 11/16
Field Work
Organizing and Managing a Safe & Successful Science Classroom

Week 13: 11/22 & 11/23
Tuesday Class: Informal Science Experiences – Learning Outside the Classroom
Wednesday Class: Thanksgiving Break

Week 14: 11/29 & 11/30
Science in Everyday Life & Nature of Science Review

Week 15: 12/6 & 12/7
Reflections on the Course; Loyola Science Education Professional Share Fair