

ED 688
SCIENCE METHODS AND CURRICULUM DEVELOPMENT
OFF-CAMPUS, FALL SEMESTER

COURSE INFORMATION

Credits: 3

Prerequisites: Participating in the Internship Year or Permission of Instructor

Location:

- Audio-Conference Number 1-800-570-3591 & Pin Number: 6944438
If problems are encountered please call Customer Service at 1-800-290-5900. Have the course number and instructor information available.
- Blackboard: <http://classes.uaf.edu>
Course Site: [ED F479 F688 STACKED 201103 \(CRN 77957, 77967\) Science Methods & Curriclm Dev](#)

Meeting Time: Dates and times noted on the internship calendar and on the syllabus calendar

INSTRUCTOR INFORMATION

Instructor: Cindy Fabbri

Office: 714D Gruening Building

Office Hours: Following the audio-conference or by appointment

Telephone: (907) 474-1558

Fax: (907) 474-5451

Email: cfabbri@alaska.edu

During the elementary internship year students are required to participate in university coursework with UAF faculty and in aligned internship year responsibilities in an elementary classroom with a qualified mentor teacher. The internship year follows the school district calendars for teachers (approximately 190 days per academic year) and during each school day, interns are required to be in their elementary classroom whenever they are not participating in university required coursework with their UAF instructor or UAF supervisor. There are additional evening and weekend requirements for students during the internship year.

Following the UAF formula for credit distribution, ED 479 includes approximately 33 hours of "lecture" (.i.e., face-to-face instruction and individual e-mail interaction with a UAF instructor and with a UAF supervisor) and 59 hours of internship time in the assigned elementary classroom with a qualified mentor teacher. In the catalog, the credit distribution for this 3 credit class is shown as ED 688 (2.5+0+1x5). (2.5+0+4)

MATERIALS

Carin, Arthur A., et al. 2005. *Teaching Science as Inquiry, Eleventh Edition*. Pearson Education, Inc.: Upper Saddle River, NJ.

Campbell, Brian and Fulton, Lori. 2003. *Science Notebooks: Writing About Inquiry*. Heinemann: Portsmouth, NH

National Science Teacher Association – Student Membership

<http://www.nsta.org/membership/student.aspx>

Select *Science and Children* (grades K–6) for the journal you receive with your membership

National Research Council. 2011. *A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas*. National Academy Press: Washington, DC. [online] http://www.nap.edu/catalog.php?record_id=13165

National Research Council. 1996. *National Science Education Standards*. National Academy Press: Washington, DC. [online] <http://www.nap.edu/readingroom/books/nses/>

Alaska State Board of Education & Early Development. 2005. *Standards: Content & Performance Standards for Alaska Students, Third Edition*. Alaska Department of Education & Early Development: Juneau, AK. [online] <http://www.eed.state.ak.us/standards/>

American Association for the Advancement of Science. 1989. *Science for All Americans*. Oxford University Press: New York, NY. [online] <http://www.project2061.org/publications/sfaa/online/sfaatoc.htm>

American Association for the Advancement of Science. 1993. *Benchmarks for Science Literacy*. Oxford University Press: New York, NY. [online] <http://www.project2061.org/publications/bsl/online/bolintro.htm>

American Association for the Advancement of Science. 2001 and 2007. *Atlas for Science Literacy Volumes 1 and 2*. Oxford University Press: New York, NY. [online] <http://www.project2061.org/publications/atlas/default.htm>

American Association for the Advancement of Science. 2011. Project 2061 Science Assessment Website. [online] <http://assessment.aaas.org/>

Annenberg Media “Video-on-Demand” (VOD) Series www.learner.org

If available, science curriculum framework for your school district

If applicable, science textbook for your students/grades

Household materials may be required for lab investigations TBA

Additional Readings or Resources TBA

COURSE DESCRIPTION

Study and application in the classroom of the best practices from research-based strategies for the teaching and learning of science concepts, content and methods for students in elementary classrooms with diverse populations. Requires development and classroom implementation of science unit. Classroom internship required. Prerequisites: Admission to the post-baccalaureate elementary licensure program; graduate standing; or permission of instructor. Stacked with ED F479. (2.5+0+1.5)

COURSE GOALS

“Effective science teaching is more than knowing science content and some teaching strategies. Skilled teachers of science have special understandings and abilities that integrate their knowledge of science content, curriculum, learning, teaching, and students. Such knowledge, called ‘pedagogical content knowledge,’ distinguishes science knowledge of teachers from that of scientists. It is one element that defines a professional teacher of science.”

– National Science Education Standards, Chapter 4

The goal of this course is to prepare interns to be a professional teacher of science. Interns will study the various aspects of pedagogical content knowledge mentioned above. Students will become familiar with current research and recommendations for science education. Science standards and inquiry-based learning will be emphasized. Interns will have the opportunity to practice and reflect on their science learning experiences.

STUDENT LEARNING OUTCOMES

Outcomes that align with the National Science Teacher Association’s *Standards for Science Teacher Preparation* are shown in the course diagnostic assessment. Some general goals follow. Through study, experience and reflection, students will:

- Understand methods for teaching and learning science through inquiry;
- Be familiar with National, State and local standards for content, performance & practice;
- Become adept using research-based methods/strategies for teaching and learning;
- Understand and use knowledge of learning, pedagogy and students to create appropriate, relevant learning opportunities for diverse groups of students;
- Create and use multiple assessment strategies in the context of teaching a science unit;
- Plan and implement a holistic science unit; and
- Reflect on science topics, personal ideas, future goals and experiences as a science educator.

INSTRUCTIONAL METHODS

In the spirit of inquiry, mentioned in Standard A of the NSES, it is expected that students will:

- Assess prior knowledge and perceptions about science and education;
- Ask questions;
- Research and investigate to find answers;
- Interpret what they have found;
- Apply what they have learned;
- Reflect on the experience;
- Share the new knowledge and understandings;
- Refine the ideas; and
- Work independently and collaboratively.

To facilitate individual and group learning opportunities, coursework will include, at least:

- Hands-on investigations;
- Designing, implementing and reflecting on a science unit;
- Critical reviews of literature;
- Case Studies;
- Reflections and critiques of work done by oneself and peers; and
- Group collaboration and discussion.

ASSIGNMENTS

ED 688: 1300 points possible

Audio-conference/Blackboard Attendance, Preparedness and Participation

Total Points Possible = 140 (20 points per class x 7 classes)

Student attendance at the audio-conference and on Blackboard is expected. With only seven classes it is essential that you make each and every class. Being prepared and participating in the audio-conference and on Blackboard are also key elements of the learning experience. Being prepared and participating means you post homework assignments in the discussion forums and are prepared to discuss homework. Critical thinking and sharing of ideas that advance the group's learning are expected.

Show & Tell: Bring 3 Resources to Class

Total Points Possible = 60 (20 points each x 3 resources)

For three of the seven audio conferences will need to bring a resource to share with your colleagues. The resource (book, website, curricula, etc.) should be something not likely to be known by your colleagues. You will explain a bit about the resource, why it is of high quality and how to find it. At least one of your resources during the semester must use technology to improve science instruction/learning. Please remember to post the resource in the Blackboard "Discussion Board" as I will use this list to enter final grades.

Take Home Lesson (This assignment is done twice... once in Sept. and once in Oct.)

Total Points Possible = 200 (100 point per assignment) (see rubric)

Teach an inquiry-based lesson to an individual child or a small group of children. You will record the experience, assess it and write a thoughtful reflection about the process. You will then post your reflection in a Blackboard forum. The subsequent week students will respond to their colleagues' posts with questions and feedback. Guidelines and a rubric will be provided.

Develop and Teach a Science Unit

Total Points Possible = 400 (see checklist and rubric)

Draft Unit = 100 Points

The draft is graded for completeness (cover sheet, week-long overview, 5 lesson plans, summative assessment rubric, and student activity sheets) and that it is turned in on time.

Please Note: Your mentor teacher and the course instructor must approve the unit plans before you teach the unit. Please plan accordingly.

Final Unit = 300 Points

The final unit is graded for completeness (cover sheet, week-long overview, 5 lesson plans, assessment rubric, and student activity sheets), content/competencies (see science unit rubric) and implementation.

Please note: You are encouraged to photograph and/or video tape your unit. Also, please let your UAF supervisor/liaison know when you are teaching this week.

Science Teaching: Final Reflections, Summative Assessment, and Future Plans

Total Points Possible = 200 (Guidelines will be provided)

This assignment will include five daily reflections and one comprehensive reflection on teaching your science unit. In addition, students will reflect on their new understandings of science education and their future professional development goals.

ED 688 Students: Independent Project

Total Points Possible = 300

Write three short papers (approximately 5 pages) based on reviewing a combination of resources, including but not limited to:

- ✓ Lessons, articles, journal articles, position papers, ebooks etc. found at the National Science Teachers Association (NSTA) website
- ✓ NSTA online, seminars, classes, webinars in which you participate
- ✓ NSTA “DIY Learning” online interactive trainings
- ✓ Articles from *Science and Children* (the journal that comes with your NSTA membership)
- ✓ Readings, video professional development series, etc. from other scholarly sources (e.g. www.learner.org or regional education laboratories at www.ies.ed.gov/ncee/edlabs/).

Each paper should focus on a different area of science education (e.g. a science content area, curriculum, learning, teaching, assessment, students, technology, cultural responsiveness, etc.). Papers should describe what is considered best practice in that area and give examples that illustrate the concept. Papers should demonstrate the ability to synthesize information from a variety of professional sources. Finally, after describing best practice, describe how the information is relevant for you as a teacher and in your current/future classroom. Papers should use an accepted citation method. Please choose areas where you feel you need additional professional development and get the topics for your papers pre-approved.

EVALUATION

As outlined in the UAF catalog, the grading system is as follows:

- A An honor grade, indicates originality and independent work, a thorough mastery of the subject and the satisfactory completion of more work than is regularly required.
- B Indicates outstanding ability above the average level of performance (80% or better)
- C Indicates a satisfactory or average level of performance. (70% or better)
- D The lowest passing grade, indicates work of below-average quality and performance. (60% or better)
- F Indicates failure. (Below 60%)

Grades will be posted using the following scale:

- | | |
|---|---------|
| A | 90-100% |
| B | 80-89% |
| C | 70-79% |
| D | 60-69% |

F

59% or below

As one of the culminating courses of the internship year, students are required to earn a “C” or better in order to successfully complete the licensure program. In addition to obtaining minimum grade requirements, students must meet all required ESAAP competencies in order to pass the class and continue with the internship. Any student in jeopardy of failing should contact the instructor to discuss options.

CALENDAR

Please note, that this is a tentative schedule and it may be modified. Homework assignments listed for each class are your major assignments and you should be prepared to discuss them during our next audio-conference. Additional readings/work will be announced in class each week. Additional readings will be posted on the Blackboard site.

Wednesday, August 24th 9:00-12:00

Bring these items to class (or be on the internet to access online versions):

- AAAS Benchmarks for Science Literacy (Link on Blackboard)
- National Science Education Standards (Link on Blackboard)
- Alaska Content Standards for Science & Grade Level Expectations (Link on Blackboard)
- Science curriculum for your school district
- Documents from Blackboard

Audio-conference:

- What do we currently think about science education? (Diagnostic assessment)
- Course business... syllabus, etc.
- How do we start planning a science unit?
 - o What is the *Understanding by Design* framework?
- NSTA Standards 1-4: What do we teach? (Content, Nature of Science, Inquiry, Issues)
 - o What are goals for science education?
 - o What are unifying themes in science education?
 - o What are big ideas in science?
 - o What do national and state research/standards tell us?
- NSTA Standard 9: What do I need to know about safety?

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Homework:

- 1) Read text Chapter 5, Planning and Managing Inquiry, pages 112-115
- 2) Complete *Unit Planning Worksheet 1: Choose a Topic & Brainstorm Learning Goals*
Be prepared to present the items in red at our next class. Please **post your answers in the Blackboard discussion forum**, so the group can see your work. Please type

directly in the forum box (rather than posting an attachment) so the group can view your work without having to download it.

- 3) What is Inquiry Assignment (See directions on Blackboard)
- 4) Read text Chapter 2, *Processes and Strategies for Inquiring*, Chapter 4, *Teaching Science for Understanding* and Chapter 6 *Assessing Science Learning*.
- 5) Other readings TBA
- 6) Find a lesson in the back of your textbook and start making plans to teach it to an individual child or small group of children the week of September 12-16.
- 7) (Optional) Bring a resource to class (post resource in Blackboard Discussion Forum)

Friday, September 9th 9:00-12:00

Due today:

Unit Planning Worksheet 1: Choose a Topic & Brainstorm Learning Goals

Audio-conference:

- NSTA Standard 5: How do I teach science? (General Methods)
- What is inquiry?
- How do I ask good questions?
- What are the next steps in unit planning? (Steps 2 & 3 of Understanding By Design)
 - o Choosing assessments
 - o Choosing instructional activities
- NSTA Standards 5 & 8: What does it mean that assessment and instruction are two sides of the same coin?
 - o An introduction to assessment and instruction
 - o What is best practice in science assessment?
 - o What is performance assessment?

Homework:

- 1) Read text Chapter 5, *Planning and Managing Inquiry*, pages 116-134
- 2) Unit Planning Worksheet 2: Assessment & Instruction
- 3) Begin drafting unit
- 4) Take Home Lesson (guidelines will be provided)
 - Teach lesson and post your reflection on Blackboard **Sept 12-16**
 - Respond, critically, to at least two colleagues' reflections **Sept 17-23**
- 5) Chapters 1-3 in *Science Notebooks: Writing About Inquiry* by Brian Campbell and Lori Fulton. We will discuss science notebooks in our next class.
- 6) Chapter 9 of your textbook, *Connecting Science with Other Subjects*
- 7) Other readings TBA
- 8) (Optional) Bring a resource to class (post resource in Blackboard Discussion Forum)

Friday, September 23rd 9:00-12:00

Due today:

Posted reflection to science lesson due on Blackboard **Sept 12-16**

Respond, critically, to at least two colleagues' reflections **Sept 17-23**

Unit Planning Worksheet 2: Assessment & Instruction

Audio-conference:

- NSTA Standards 5 & 8: What does it mean that assessment and instruction are two sides of the same coin? (Continued)
- What is assessment and how do I do it?
 - o How do I use rubrics?
- How do I teach science and manage learning? What instructional methods exist? (Methods Specific)
 - o Science Notebooks, Interdisciplinary Learning, Collaborative Learning, Etc.

Homework:

- 1) Continue drafting unit
 - 2) Watch *A Private Universe*
 - 3) *Chapter 3, Learning Science with Understanding*
Chapter 10, Science for All Learners, Pages 253-267. (We will read the second part of the chapter after our next class.)
- Reading TBA
- 4) (Optional) Bring a resource to class (post resource in Blackboard Discussion Forum)

Friday, October 7th 9:00-12:00**Audio-conference:**

NSTA Standard 5:

- How do student learn?
- What does brain research tell us?
- What about student misconceptions?
- What is “appropriate and differentiated” instruction?
- What do I need to know about special needs?

Homework:

- 1) **DRAFT UNIT DUE OCTOBER 15**
- 2) *Unit Planning Worksheet 3: Relevancy & Differentiation*
- 3) Begin making plans to teach Take Home Lesson #2 during the week of **Oct 24-28**
- 4) *Chapter 10, Science for All Learners*, Pages 267-271.
- 5) Other readings TBA
- 6) (Optional) Bring a resource to class (post resource in Blackboard Discussion Forum)

Friday, October 21 9:00-12:00

Due today:

Unit Planning Worksheet 3: Relevancy & Differentiation

Draft Science Unit

Audio-conference:

NSTA Standard 7:

- What is “relevant & responsive” curriculum/instruction?
- How do you build a community of learners?
- What is culturally relevant science education?
- What is authentic learning?
- How do I facilitate community-based, place-based learning?

Homework:

- 1) Teach Take Home Lesson #2 during the week of **Oct 24-28**
Respond to two colleagues during the week of **Oct 29-Nov 4**
- 2) Refine unit and turn in a **FINAL VERSION asap**. (The final unit does not include the reflections). You should submit your final version as soon as possible after receiving feedback on the draft, so if you need to make more revisions you have time to do so. Please note, unlike math, the final version is due before you teach.
- 3) Read text Chapter 8 Technology Tools and Resources for Inquiry Science
- 4) Read posted on teaching evolution
- 5) Other readings TBA
- 6) (Optional) Bring a resource to class (post resource in Blackboard Discussion Forum)

Friday, November 4th 12:30-3:30

Due today:

Teach Take Home Lesson #2 during the week of **Oct 24-28**

Respond to two colleagues during the week of **Oct 29-Nov 4**

Final version of science unit (+/- a few days)

Audio-conference:

- What do I need to know about science and technology? (NSTA Standard 5)
- What do I need to know about teaching evolution? (NSTA Standard 1)
- What does an inquiry classroom look like? (NSTA Standards 3 & 9)

Homework:

- 1) Refine unit and turn in a **FINAL VERSION asap**. (The final unit does not include the reflections). You should submit your final version as soon as possible after receiving feedback on the draft, so if you need to make more revisions you have time to do so. Please note, unlike math, the final version is due before you teach.
(All competencies must be met before you teach)
- 2) ED 688 Student’s Independent Projects Due on December 3rd
- 3) Final reflections due on December 3rd
- 4) (Optional) Bring a resource to class (post resource in Blackboard Discussion Forum)

November 21st – December 2nd

NSTA Standard 6:

TEACH Science Unit (5 days total)

Homework:

- 1) **Final reflections** (i.e. while you are teaching you should be writing daily reflections, collecting samples of student work, taking photos, etc.) are **due December 9th**.
- 2) **ED 688 Students Independent Projects Due on December 9th**.
- 3) (Optional) Bring a resource to class (post resource in Blackboard Discussion Forum)

Friday, December 9th 9:00-12:00

Due today:

Final reflections

ED 688 Student's Independent Projects Due

Audio-conference:

- How do I feel about teaching and learning science?
 - o Share your final reflections on teaching your science unit
- What is my understanding of science and science education now?
 - o Share your course summative assessment
- NSTA Standard 10: What professional development opportunities exist?

POLICIES

As a compressed course, a great deal of information is covered each session. For this reason, attendance at all classes is expected. If you need to miss class, please contact me immediately.

Assignments are expected on the stated due date or prior to the due date. If you are unable to turn in an assignment on time, you will need to document an emergency or extenuating circumstances (beyond your control) or the assignment may not be accepted. If accepted, the instructor reserves the right to award a reduced point value for late work.

Please let me know, as soon as possible, if you are having difficulties with the coursework or workload.

Students are expected to adhere to the Student Code of Conduct (Board of Regents' Policy 09.02.01). Students are required to conduct themselves honestly and responsibly, and to respect the rights of others. Academic integrity is essential and expected from all students. Cheating or plagiarism is not acceptable.

SUPPORT SERVICES

If you have questions, concerns, comments, or individual needs please contact me immediately. In addition, please be aware that these other forms of assistance are also available:

Kelly Mendez
Coordinator – Elementary
474-7981
ksmendez@alaska.edu

Hillary Weller
Coordinator – Elementary
474-7981
hhweller@alaska.edu

Rural Student Services (RSS)
Tel: (888) 478-1452
Email: fyrss@uaf.edu

Student Support Services (SSS)
Tel: (907) 474-6844
Email: sssp@uaf.edu

Tutoring Services:
Writing Center (907) 474-5314
Math Laboratory (907) 474-7332

DISABILITIES SERVICES

If you have a special need please notify the Office of Disability Services (474-7043) and me. I will make every effort to provide reasonable accommodations for you.

LITERATURE REFERENCED

National Research Council. 1996. *National Science Education Standards*. National Academy Press: Washington, DC. [online] <http://www.nap.edu/readingroom/books/nses/>

National Science Teacher Association. 2003. *NSTA Standards for Science Teacher Preparation (Science Content Recommendations for Elementary Generalists)*. [online] <http://www.ncate.org/ProgramStandards/NSTA/NSTAstandards.doc>