Teaching Science

in the Elementary Classroom

EDUC 390

Salish Kootenai College
Pablo, MT

Doug Ruhman, Instructor

EDUC 390

Teaching Science in the Elementary Classroom

COURSE INFORMATION

A. **Number:** EDUC 390
B. **Title:** Teaching Science in the Elementary Classroom
C. **Credits:** 4
D. **Availability:** Winter quarter
E. **Course Location:** Education Building Rm. 113 **Time:** Mon. and Wed. 12:00 – 1:50 pm

INSTRUCTOR INFORMATION

A. Instructor: Douglas Ruhman
B. Office: Education Building Room 124
C. Office Hours: Mon., Wed. 8:00 – 11:00 am
D. Office Phone: (406) 275-4763
E. Email: doug_ruhman@skc.edu

COURSE DESCRIPTION

This course supports candidates' growth as K-8 science educators by engaging them in a comprehensive set of activities which 1) allow candidates to experience, examine and reflect upon teaching and learning strategies for the K-8 science classroom; 2) provide teaching opportunities in which candidates use the skills and knowledge that support effective science instruction; 3) require candidates to apply their knowledge of teaching in the development of science units designed for use in supporting the learning of diverse students; 4) facilitate the development of candidates' understanding of science literacy and how to develop it in students; and 5) engage candidates in active inquiry of the relationships between teaching and learning and of other issues related to science education. Candidates will gain familiarity with instructional methods and materials that are aligned with state and national standards and are developmentally appropriate, with a particular emphasis on inquiry based learning and other forms of research-based pedagogy. Students will examine instructional models and curricular materials known to foster K-8 students' conceptual understanding of core science concepts, awareness of the nature of science, and proficiency in using science process skills. Infused topics include the effective use of instructional technology to support student learning, science safety, formative and summative assessment, and cultural competency.

RELATION TO CONCEPTUAL FRAMEWORK

The opportunities provided in this course, by placing candidates in the position of both student and teacher, support the teacher candidate in developing perspectives, knowledge and skills as teachers in a social constructivist learning environment, and in developing expertise in experiential and inquiry based teaching and learning, accountability to student learning, reflective practice and instructional leadership skills.

REQUIRED TEXTS

1. Martin, David J. (2012). *Elementary School Science Methods: A Constructivist Approach ,* 6th Edition. Cengage/Wadsworth ISBN-13: 978-1-111-30543-7 (Available online through SKC Bookstore)

2. Handouts, other materials provided by instructor

OTHER COURSE INFORMATION

1) Attendance:

Attendance is mandatory due to the nature of this course. As an adult learner in this class, you are a co-creator in the content of the course. To bring meaning to the course content you will be asked to participate in discussion, group work, presentations and other class activities. A variety of class activities, discussions and presentations will be conducted throughout the course. These cannot be made up, therefore your absence forfeits the opportunity to learn from the activities. Additionally, your absence represents a limitation in the ability of others to learn from you.

Students are expected to be on time for class and to stay until the designated time set for dismissal. If a student must leave early he/she must inform the instructor at the beginning of class. Communication with the instructor is very important in this class; if students know that they will have to miss a class, they must contact the instructor ahead of time. Students missing more than 3 class meetings (6 hours) will need to drop the course.

Students must sign the course attendance sheet each class session to receive credit for being in class. Late arrivals (after the instructor begins class) will result in a reduction of attendance points. No points will be given if candidates miss 30 min. or more of any class meeting.

2) Cell Phones:

Cell phone use is a distraction to the instructor and other students. By SKC Policy, students must keep cell phones **silent** during class. Students expecting an emergency call may ask the instructor ***prior to class*** if they can take a critical call during class time. Any and all emergency calls must be taken outside of the classroom.

3) **Incompletes** will not be given except in the case of serious emergencies such as a death in the family or extreme medical illness. **Incompletes will NOT be used in cases where students have not completed assignments and are requesting more time to finish the course requirements.** In the event of medical or other emergencies where incompletes are necessary, arrangements including a signed contract for completed work and its timeline will be made with instructor prior to the end of the quarter.

3) **Academic Honesty:**
The instructor will exercise his/her right to issue failing grades to students who engage in academic dishonesty, including **plagiarism**. Refer to the SKC Student Handbook for more information on policies regarding academic honesty.

5) **Accommodation:**
Any student who feels s/he may need an accommodation based on the impact of a disability should contact the instructor privately to discuss your specific needs; this should be done **in the first week of class**. Please contact Stan Fleming, SKC's ADA Compliance Officer, at 275-4968 to learn about and coordinate reasonable accommodations for students with documented disabilities.

INSTRUCTIONAL METHODOLOGIES

The instructor will utilize a variety of instructional strategies including- but not limited to- discovery learning, cooperative learning, group projects, presentations and discussions, case study analysis, web-related learning, Smartboards, guest speakers, and other resources.

COURSE OUTCOMES AND STANDARDS:

This course is aligned with the Interstate New Teacher Assessment and Support Consortium (InTASC) Principles, National and Montana Standards for Science (NSTA/MTSCS), and the Montana Office of Public Instruction's PROFESSIONAL EDUCATOR PREPARATION PROGRAM STANDARDS (PEPPS).

MT PEPP Standards	***INTASC Principles***	***Critical Assignments***
PEPPS 10.58.531 **The program candidates will…** q. (ii) [demonstrate] knowledge, understanding, and use of the fundamental concepts of physical, life, earth, and space sciences to design and implement age-appropriate inquiry lessons to teach science, to build student understanding for personal and social applications, to convey the nature of science, the concepts in science and technology, the history and nature of science, including scientific contributions of American Indians and tribes in Montana ***SKC Division of Education*** *Guiding Principles A, E*	***INTASC Principle 4. Content Knowledge*** *The teacher understands the central concepts, tools of inquiry, and structures of the discipline(s) he or she teaches and creates learning experiences that make these aspects of the discipline accessible and meaningful for learners to assure mastery of the content.* ***INTASC Principle 5. Application of Content*** *The teacher understands how to connect concepts and use differing perspectives to engage learners in critical thinking, creativity, and collaborative problem solving related to authentic local and global issues.* ***INTASC Principle 7. Planning for Instruction*** *The teacher plans instruction that supports every student in meeting rigorous learning goals by drawing upon knowledge of content areas, curriculum, cross- disciplinary skills, and pedagogy, as well as knowledge of learners and the community context.*	Integrated, culturally congruent Math/Science unit plan.

COURSE OBJECTIVES

Through the successful completion of this course, the candidate will demonstrate that they are able to…

1) describe and contrast the nature of Western science, Indigenous Science and elementary science education,
2) articulate the meaning and value of culturally competent science instruction in supporting students' science literacy, including that of American Indians students,
3) describe and apply reform based elementary science methods in developing students' science literacy,
4) develop elementary science lessons that, when appropriate,
   - effectively incorporate instructional technology,
   - incorporate culturally competent methods and content,
   - employ differentiated methods and content to support the learning of diverse learners,
   - utilize assessment for and of learning and
   - provide opportunities for development of science process skills, content knowledge and scientific attitudes and dispositions in students.

5) identify potential student science misconceptions, their effects on learning, and how to address them to support learning,
6) use science content standards in making effective instructional decisions,
7) develop meaningful conceptual sequences that will support students' understanding of core science content,
8) develop effective formative and summative assessments,
9) employ instructional inquiry and reflective practices to examine their teaching and students' learning,
10) articulate their understanding of educational theory and how learning is supported through effective science teaching,
11) utilize educational resources in supporting their growth as a professional educator, and
12) participate in and contribute to an effective learning community with their peers.

SKC 4Cs: Culture: 1,2,4 Citizenship: 4, 11,12 Critical thinking: 1, 3, 5,7, 9-12 Communication: 1-12

COURSE REQUIREMENTS:

Attendance/Participation (100 points)

Students are expected to attend ALL class sessions and field work. Points will be awarded based on attendance... 5 points per class X 20 class meetings. Students arriving late to class or leaving early without notification will receive a deduction in attendance points. Students who appropriately notify the instructor prior to absences may receive partial points, if arrangements are made to catch up with course requirements. Students missing 30 minutes or more of a class receive 0 points for that session. ALWAYS contact the instructor to notify them in the event of an absence or of late arrival. Refer to the "Attendance" section above for more.

Science Learning Center (50 points)

Candidates are required to develop an original science learning center designed to enable students to engage in the exploration of a major science concept with minimal adult supervision. This assignment constitutes 10% of the course grade. The center should be developmentally appropriate for a specific age group and should be a self contained experiential and investigative activity. The center should be designed to support students' learning of the concept, either as an introductory exploration or an elaboration of ideas already learned. Its use should result in a student generated product that allows the teacher to assess the students' understanding of the concept addressed. Candidates will provide a write up of the activity that includes full instructions for the preparation and use of the activity and the learning rationale behind it, and will distribute copies to all course participants including the instructor. Candidates may work individually or in pairs on this assignment. In the last week of the quarter, all candidates will set up their centers in our classroom and will engage as students in using multiple centers. An instrument for assessing the science center will be distributed to candidates.

In-Class Teaching (50 points)

During the last three weeks of class each candidate will be required to present their science unit plan and to teach a short section of it to the class. The class will then discuss the effectiveness of the instruction, noting its strengths and areas for improvement. The in class teaching should be limited to 15 minutes from the beginning to the end of instruction. This assignment can be done individually or in pairs. Candidates who are teaching are expected to be prepared and to supply needed materials for completion of the lesson by all class members as appropriate. A rubric for assessing the quality of the instruction will be distributed to candidates prior to their teaching. This assignment constitutes 10% of the course grade.

Quizzes (3 quizzes: 30+30+40= 100 pts. total)

Three announced quizzes will be given during the course and combined scores on them will constitute 20% of the course grade. Quizzes may vary in format and will cover assigned readings and information covered during the course.
Quiz 1: Week 4…. Quiz 2: Week 7…… Quiz 3: Week 10

In-Class Activities (100 points)

Throughout the course there will be numerous activities associated with class meetings, including hands-on demonstrations and experiments, group discussions, reading analyses, and other happenings that students will participate and take part in.

Culture/Community Integrated Math/Science Unit Plan (100 points)

The development of a science unit instructional plan is a major component of this course. It is aligned with course objectives and requires the candidate to apply much of the skills and knowledge this course aims to teach. It constitutes 20% of the course grade. A format for writing up the unit will be distributed to students along with a rubric that will be used for assessing the unit plan. Candidates are required to generate an **original** science unit plan; no form of plagiarism in submitted assignments will be accepted. This assignment can be done individually or in pairs and should follow the template provided by the instructor. The required elements of the unit are that it:

- consists of a minimum of three lessons that fully addresses a core science concept that is aligned with the Montana Science Education Standards and Benchmarks, as well as OPI's Essential Understandings.

- is culturally congruent, in terms of content and pedagogy, and is connected

in some meaningful way to the local community and to Montana's Essential Understandings and IEFA guidelines.

- incorporates the effective use of instructional technology to enhance student learning,

- utilizes regular formative and summative assessment and includes the assessment tools with the unit,

- utilizes effective strategies for developing student literacy in reading and writing and includes the integral use of at least one relevant and age appropriate book.

GRADING:

Points will be awarded as follows:

Attendance/Participation	100 points	20%
Science Learning Center	50 points	10%
In-Class teaching	50 points	10%
Quizzes (30, 30 and 40 points)	100 points	20%
In-Class Activities	100 points	20%
Math/Science Unit Plan	100 points	20%
Total points possible	**500**	

Grades will be assigned according to the following points breakdown:

450 - 500 = A
400 - 449 = B
350 - 399 = C
300 - 349 = D
Below 300 = F

EDUC 390 Course Outline

This outline is subject to modification depending on class needs.

Week 1: Rationales for Science Education

Introductions, syllabus, requirements. Practicum overview. Defining and understanding the need for science in elementary school, cultivating a Sense of Wonder. Basic differences in the Native-Euro science paradigms. NSTA / MT Stds / Themes. *For Wed: Read Martin Chapter 1*

Weeks 2-3: The Nature of Science and Elementary Schools Today

An exploration of the major characteristics of science as a discipline and as a way of thinking and living. We will also have an overview of the systems within public elementary education which support and/or hinder science education.
Martin Chapter 2, Science Learning Centers Assigned

Week 4: The Cognitive Engines that Drive Science

Understanding and applying the major processes of science learning (observation, measuring, predicting, etc.) in classroom contexts. *Martin Chapter 3 part 1*

Week 4 (cont.): Science teaching on the Flathead and in Montana

An exploration of the methods and materials used in local schools and throughout the state in elementary science education. *Martin Chapter 3 part 2* ***QUIZ 1***

Week 5: Elementary Science Curriculum, Planning, and Assessment

Learning about the architecture of science curriculum, how to sequence instruction both short and long term, designing instructional units, and assessing science learning. *Martin Chapter 8* ***Learning Centers Presented***

Week 6: Inquiry, H.O.T.S., and Minds-On Learning

Introductions, syllabus, requirements. Practicum overview. Defining and understanding the need for science in elementary school, cultivating a Sense of Wonder. Basic differences in the Native-Euro science paradigms. NSTA / MT Stds / Themes. *Martin Chapter 5*

Literacy and Children's Books in Science Instruction

Investigating reading levels and the use of trade books and literature in science instruction. *Martin Chapter 10 Science Unit Plans Assigned*

Week 7: Science and Diverse Learners: Perspectives

Investigating the nature of science teaching with respect to differing perspectives. We will explore ways of differentiating learning to accommodate the needs of diverse students.

Indigenous Science, & Teaching in Native Communities

Considerations for teaching science in Indian communities; also an exploration into ways of bringing Indian and western science together.
Martin Chapter 6 ***QUIZ 2***

Week 8: Science and Diverse Learners: Abilities

Investigating the nature of science teaching with respect to differing abilities. Included will be an exploration of gender bias and giftedness in science education.
Martin Chapter 7

Week 9: Building a Science-Friendly Classroom

Safety, materials, and room arrangement to promote high interest and high level learning in science. Also included will be information about field study, environmental education, and family involvement. *Martin Chapter 9*

Week 10: Other topics in Elementary Science Education

Investigations into technology's role in science learning, systems thinking, professional development, and other topics. Presentations of Unit Plans.
Selected readings in Martin-Part 2 ***QUIZ 3*** ***Unit Plans Presented***

EDUC 390 Integrated Math/Science Unit Plan

Elementary / P3 TEP Stage II InTASC Principle / Portfolio Section 7

Candidate_____ Instructor_____

Date:_____

Level of Performance:	0 Unacceptable	1 Developing	2 Proficient	3 Exemplary
PEPPS 10.58.531 The program candidates will… q. (ii) [demonstrate] knowledge, understanding, and use of the fundamental concepts of physical, life, earth, and space sciences to design and implement age-appropriate inquiry lessons to teach science, to build student understanding for personal and social applications, to convey the nature of science, the concepts in science and technology, the history and nature of science, including scientific contributions of American Indians and tribes in Montana **InTASC Pr. 7** ***SKC DoE Guiding Principles:*** *A, E*	Unit Plan is weak and/or inconsistent; may be inappropriate in terms of developmental levels or topic focus. No evidence of inquiry-based learning evident. Consistently makes content errors, does not correct errors, or does not research the content as needed. No inclusion of cultural content or pedagogy is evident.	Unit Plan is adequately written, but it may require revision in terms of content and/or form. Some evidence of inquiry-based learning, but this may require further development. Demonstrates content knowledge but does not connect content with other subjects or disciplines. Limited or weak connection to cultural content or culturally congruent teaching.	Unit Plan is well designed and written. The plan includes elements that promotes individual and group inquiry and encourages students to engage in higher-level thinking. Demonstrates sound content knowledge and connects content across subjects and disciplines. Strong evidence of culturally congruent teaching, and culturally relevant content.	Candidate demonstrates proficient skills at an advanced degree or at a master teaching level. This score is reserved for those who demonstrate skills of an experienced teacher who is able to mentor others.

Score:_____

Comments:

This Learning Plan received a score of _____ out of a possible 100 points for EDUC 390.