Science Curriculum Development for Teachers
Course Syllabus

Science Teacher Education Program (STEP)

Course Information:
Title: Science Curriculum Development for Teachers
Course Number: ED 595/GEOS 595
Credits: 3
Prerequisites: Participating educators must be from schools involved in the Science Teacher Education Program administered by the Geophysical Institute. Approved districts include: Alaska Gateway, Delta Greely, Fairbanks North Star Borough, Lower Kuskokwim, Northwest Arctic Borough, Tanana City, Yukon Flats, and Yukon-Koyukuk. Concurrent enrollment in STEP's Space Physics for Science Teachers is required.
Location: Session 1: IARC 401 OR Session 2: Irving 201
Dates: Monday-Friday, Session 1: July 24 – August 4 OR Session 2: July 31 – August 11
Meeting Time: 1 PM – 5 PM

Instructors: Two Alaska Science Consortium Fellows Each Session TBD

Course materials/textbooks: Inquire Within by Doug Llewellyn; and
Learning and Assessing Science Process Skills by Richard J Rezba, Constance Sprague, Ronald L. Fiel

Course Description:

Science Curriculum Development for Educators is a special topics course designed to guide K-12 science teachers in developing Learning Cycle Model lessons and assessment based on the Alaska Grade Level Expectations (GLE) for science and best practice skills. The backward design of the Learning Cycle Model requires participants to identify the GLE and write assessment prior to writing the lesson plan. This ensures that assessment and scoring tools are solid and focused on lesson content. All Learning Cycle Model lessons also must incorporate science process skills. After being introduced to the Learning Cycle Model course participants work with instructors and peers in two "Translation Groups" (one per instructor) to translate science content learning from STEP's Space Physics for Science Teachers course. Translation groups are organized by grade level. Participants who teach K-6 grade work with an instructor in one translation group, while participants who teach 7-12 grade work with the other instructor in a second translation group. This allows participants to focus on the science content most applicable in their classroom.

Course Goals and Student Learning Outcomes:
The goal of this course is to guide participants in developing space physics lessons and assessment for K-12 students that demonstrate and include: scientific process skills; Alaska Grade Level Expectations; best practice teaching skills; and the Learning Cycle Model for science education. Each participant will write two Learning Cycle Model lessons to use in the classroom and share with peers.

Instructional Methods:
This course utilizes a variety of instructional methods including:

- Lecture-delivered by instructor and/or guest lecturers
- Large group discussion led by both instructors
- Small "Translation group" discussion led by a single instructor
- Instructor-modeled Learning Cycle Model activities
- On-site lecture and discussion at research facilities

Tentative Course Calendar:

Week 1:

Day 1: Process skills review, Alaska Grade Level Expectations review and introduction to best practice teaching skills and the Learning Cycle Model (informal and formal loop practice activities)

Day 2: Process skills review, Alaska Grade Level Expectations review and introduction to best practice teaching skills and the Learning Cycle Model (informal and formal loop practice activities)

Day 3: Translation Groups: Participants break into groups by grade level to discuss ways of translating current space physics research activities, space weather and society, and the historical development of our current understanding of space physics into lessons for K-12 students. Assignment: Begin work on Learning Cycle Model Lesson Plan #1 (due Day 6).

Day 4: Class meeting at Poker Flat Research Range. Lecture: How to use professional scientific research facilities to aid K-12 student learning. Translation Groups: Participants break into groups by grade level to discuss ways of translating physics knowledge about Earth, and the Sun (atmosphere, magnetosphere, atmospheric chemistry, solar wind, and nuclear reaction as the energy source of the sun) and experimenting with electricity and magnetic fields into lessons for K-12 students.

Day 5: Translation Groups: Participants break into groups by grade level to discuss ways of translating understandings about the processes within the aurora, (particle collision, aurora colors, atoms and molecules, light emission, light spectrum) and experimenting with prisms into lessons for K-12 students.

Week 2:

Day 6: Translation Groups: Participants break into groups by grade level to discuss ways of translating understanding of modern aurora research and research facilities, and data collection processes into lessons for K-12 students. Due: Learning Cycle Model Lesson Plan #1. Assignment: Begin work on Learning Cycle Model Lesson Plan #2 (due Day 10).

Day 7: Translation Groups: Participants break into groups by grade level to discuss ways of translating understanding about solar wind interaction with the magnetosphere, electrical energy of the aurora and its impact on Earth's magnetic field, and data interpretation for aurora prediction into lessons for K-12 students.

Day 8: Translation Groups: Participants break into groups by grade level to discuss ways of translating understandings about the solar system including: dynamics

of Earth and the moon; modeling the motion of Earth and the moon; the seasonal and day/night cycles; and the tides into lessons for K-12 students.

Day 9: Translation Groups: Participants break into groups by grade level to discuss ways of translating understandings about the universe including: structure; galaxies; black holes; stars; planets; time; speed of light; Big Bang; and Hubble expansion into lessons for K-12 students.

Day 10: Wrap up: Participants share Space Physics Learning Cycle Model Lesson Plans they have developed. Due: Learning Cycle Model Lesson Plan #2.

Assignments:

Each participant must complete two Learning Cycle Model Lesson Plans targeting Space Physics concepts. A detailed rubric for Lesson Plan evaluation will we distributed at the time of assignment. Evaluation of each Lesson Plan will include the following content and format requirements:

- Adherence to the Learning Cycle Model format
- Accuracy of scientific concepts presented
- Alignment with and clear identification of Alaska Science Grade Level Expectations
- Provision of a clear rubric or assessment strategy
- Inclusion of scientific process skills
- Incorporation of best practice teaching skills

Learning Cycle Model Lesson Plan #1 will be assigned on Day 3 and due on Day 6.
Learning Cycle Model Lesson Plan #2 will be assigned on Day 6 and due on Day 10.

Course Policies:

Attendance is essential due to the condensed nature of the course. Make up assignments may be arranged as necessary. Participation in class and translation group discussions is required. Transportation for class held at Poker Flat Research Range will be provided.

Evaluation:

Grades will be based on the following activities:

1. Class attendance: 10%
2. Participation in large group and translation group discussions: 30%
3. Written Learning Cycle Model Lesson Plan #1: 30%
4. Written Learning Cycle Model Lesson Plan #2: 30%

A grade of **A** will be given for an overall score of 90% or better. A grade of **B** will be given for 80-89%, **C** for 60-79%, **D** for 40-59% and **F** for <40%.

Disabilities Services:

The Office of Disability Services implements the Americans with Disabilities Act (ADA), and ensures that UAF students have equal access to the campus and course materials. We will work with the Office of Disability Services (203 WHIT, 474-7043) to provide reasonable accommodations to students with disabilities.