



Baker University
Graduate School of Education
Continuing Education
Syllabus

Course Name: Project-Based Astronomy

New Course Request: ____ or **Repeat:** X

Dates: 3/11-15/19 (in class) and 3/18/19 - 3/22/19 (out-of-class, project-based learning unit development)

Time: 8:30AM - 5:00PM (in class)

Location: Museum at Prairiefire, 5801 W 135th Street, Overland Park, KS 66223

Credit Hours: 3 graduate credit hours

Instructor: Dr. P. Allen Macfarlane

Phone: (785) 865-6887

Title: Museum Educator

Email: allen@visitthemap.org

Course Description:

This week-long teacher professional development course will introduce teachers to the problem-based learning (PBL) instructional model and provide them with the science content needed to create a unit that is designed to help elementary and middle school students achieve the Next Generation Science Standards in astronomy. The basics of PBL will be taught by having the teachers collaboratively work through a PBL scenario (develop a plan for an Astronomy Day celebration) during the course. Astronomy content will be addressed as the teachers progress through the PBL. One evening session will be arranged for night-time star gazing. To successfully complete the course for grade, teachers will be given two weeks following the end of classroom instruction to develop outside of class and submit a short, PBL unit in astronomy or space exploration appropriate for upper elementary or middle school students.

Course Objectives:

At the end of the course, teachers will be able to:

- * Contrast the physical characteristics, chemical composition, layering and other characteristics of objects in the solar system.
- * Develop physical and conceptual models that emphasize the scale of the solar system and the objects within it.
- * Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.
- * Analyze spatial relationships between the positions of the Sun, Moon, and Earth to explain lunar and solar eclipses, and the changing night sky and the cycles of the seasons and lunar phases as experienced from Earth.

- * Infer seasonality using the angle formed between the axis of rotation of the planet and its orbital plane.
- * Predict the apparent path of the Sun across the sky at various times of the year given the latitude of the observer on Earth.
- * Model how impact craters form on planetary objects and discriminate them from volcanic craters using NASA imagery.
- * Use maps of the night sky (star charts) to locate constellations and stars.
- * State the advantages and disadvantages of project-based learning for K-12 science instruction.
- * Outline the steps needed to complete development of a project-based unit of instruction.
- * Develop a short, project-based unit in astronomy that includes a driving question, a project anchor, artifacts from the project, scaffolding activities, project schedule, plan for collaborative teamwork, assessments and rubrics.

Textbook/Materials: Online resources from NASA, the Astronomical Society of the Pacific, and Phet Online Simulations and the University of Nebraska; Materials from the National Institute for Stem Education and materials and staff at the Museum at Prairiefire; Bender, W.N., 2012, Project-based learning - differentiating instruction for the 21st Century: Corwin Press, 198 p.

Content Outline:

Day 1

Time	Topic
AM	Syllabus, logistics, and expectations; introduction to problem-based learning (PBL), NGSS standards (Earth's Place in the Universe and Engineering Design)
PM	Guiding question and anchor; team formation and meetings to brainstorm ideas and formulate questions to research for the PBL scenario

Day 2

Time	Topic
AM	Initial research and mini-lessons on the solar system, cycles of seasonality, appearance of the night sky, and moon phases as needed.
PM	Continue initial research and mini-lessons on the solar system, cycles of seasonality, appearance of the night sky, and moon phases as needed.

Day 3

Time	Topic
AM	Finish initial research; mini-lesson on crater classification and its use in planetary geology
PM	Creation of prototype displays/activities and celebration plan drafts

Day 4

Time	Topic
AM	Finish prototype of displays/activities and celebration plan creation; evaluate draft plan and prototypes of displays/activities
PM	Make revisions to the draft plan and prototypes of displays/activities; begin creating presentations of the celebration plan

Day 5

Time	Topic
AM	Finish creating presentations of the prototypes of displays/activities and celebration plan; rehearse presentations
PM	Make presentations of displays/activities and celebration plan to museum staff; receive feedback from museum staff and discuss revisions to the plan; course evaluation

Session 6

Time	Topic

Session 7

Time	Topic

Next Generation Science Standards (NGSS) Addressed in the Workshop

5-ESS1-1. Support an argument that the apparent brightness of the sun and stars is due to their relative distances from Earth.

5-ESS1-2. Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.

MS-ESS1-1. Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.

MS-ESS1-2. Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.

MS-ESS1-3. Analyze and interpret data to determine scale properties of objects in the solar system. Other engineering design NGSS may be addressed, but are not listed here.

Assessment: (Please attach rubrics)

Class Attendance	10%
Class Participation	50%
Teamwork during the PBL (15%)	
Astronomy Day Celebration PBL (15%)	
Other Classroom Activities (20%)	
Outside of Class PBL project	40%

Grading Scale:

90%-100% = A
80% - 90% = B
70% - 80% = C
60%-70% = D
59% and below = F

Attendance Expectations: (All instructors are to specifically state attendance expectations in the syllabus regarding attendance and make-up possibilities and grade implications. For instance, one absence may be made up with a makeup assignment and a second absence results in the lowering of a final letter grade as students receive points for participation during class time. Attendance is taken through the faculty portal after each class time and is submitted as minutes missed.)

NOTE: Baker University policy prohibits a candidate from earning credit if more than 30% of a course is missed. If a candidate misses two consecutive classes with or without contacting the instructor, the instructor contacts the Academic Advisor of the student.

Collins Library: Instructors and students are encouraged to use Baker University Library resources. Instructors and students log on to Collins Library with a 9-digit Baker University ID number (students will find this number in their student portal) and a self-designated password. To set their password, users must go to <https://bakeru.worldcat.org>, choose the "My Library Account Sign In" link, then choose the "Set/reset password link," enter their ID and follow instructions. If users encounter any problems setting their password or accessing the databases or other library resources, they can e-mail reference@bakeru.edu for assistance.

Technology: **Use the following statement but with a specific description about the expected technology use:** "Students use technology for a variety of reasons: to present information, to share knowledge, and to investigate best-practice research."

Academic Integrity: Academic Integrity is defined in the Baker University SPGS and SOE Catalog: "Baker University is committed to academic integrity in the performance of scholarly responsibilities. Academic integrity is defined as the honest acknowledgement of ideas, words, data, written work, and solutions. All work submitted by a Baker University student must represent the student's original work. All forms of student dishonesty constitute academic misconduct."

"Academic Misconduct" includes but is not confined to the following: plagiarizing, cheating on an assignment and/or assessments; turning in counterfeit reports, tests, and papers; stealing tests and other academic material, forgery or knowingly falsifying academic records or documents, and turning in the same work to more than one class. The definition of plagiarism and counterfeit work follows. The definitions of the other terms are found in the SPGS/GSOE catalog.

Counterfeit work includes work submitted as one's own that was created, researched, or produced by someone else. Submission of the work of another person, joint work as if that work was solely one's own, or production of work to be submitted in the name of another person.

Plagiarism is the intentional or unintentional failure to accurately attribute ideas, words, works, data, or solutions to the source of that information. It is the candidate's responsibility to seek guidance from approved writing standards. For more information about plagiarism, see the Baker University SPGS and SOE Catalog.

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"Consequences of academic dishonesty may include, but are not limited to, a zero or failing grade for an assignment, a failing grade for the course, or dismissal/expulsion from the University. Any form of academic misconduct which results in administrative or academic withdrawal or dismissal/expulsion is noted on the student's transcript.

ADA Policy: Baker University is committed to providing "reasonable accommodations" in keeping with Section 504 of the Rehabilitation Act and the Americans with Disability Act of 1992. Access Services coordinates accommodations and services for all eligible students with disabilities. If you have a disability and wish to request accommodations and have not contacted Access Services, please do so as soon as possible. Information about Access Services is found on the Baker web site:

www.bakeru.edu/sas<<http://www.bakeru.edu/sas>>.

Access Services is on the Baldwin City campus in the Office of Student Academic Success located in the lower level of Collins Library (785-594-8352 sas@bakerU.edu<<mailto:sas@bakerU.edu>>).

If accommodations have been approved by Access Services, please communicate with your instructor(s) regarding your accommodations to coordinate services.

Hostile-Free Learning Environment: Baker University's Anti-Harassment Policy is defined in the SPGS/SOE catalog under "Student Conduct, Responsibilities, and Rights": "It is the policy of Baker University to afford equal opportunity for all persons. As such, the University does not discriminate based on an individual's race, color, national origin, religion, sex, disability, age, veteran status, sexual orientation, marital status, or other status protected by law, in admission to or employment in its education programs or activities.

Harassment in any form is prohibited and incidents of harassment are met with appropriate disciplinary action, up to and including termination of employment or expulsion from the University. If any harassing conduct takes place, the offended individual is asked to immediately notify an academic advising representative. For additional information see Baker University website "Ethics Policies and Compliance."

Children and Visitor Policy: Only enrolled students, faculty, staff and approved guests are allowed in Baker University facilities during instructional periods. For safety reasons, children are not permitted in classrooms or teaching areas.

