STONE CHILD COLLEGE
TEACHING AND ASSESSING K-8 SCIENCE - EDU 430
COURSE SYLLABUS

COURSE INFORMATION
A. Teaching and Assessing K-8 Science EDU 430, 3 credits
B. Co-requisite: EDU 480 Clinical Experience Level 2
C. Prerequisite: Admissions to the TEP program
D. Fall Semester

INSTRUCTOR INFORMATION
TBD

COURSE DESCRIPTION
Teaching and Assessing K-8 Science focuses on topics related to the effective teaching of science in K-8 classroom settings. Candidates will explore teaching methods that are aligned with state and national standards, and are oriented around inquiry-based and collaborative learning. A special focus of this class will be the infusion of culturally responsive science teaching methods and issues, as well as the integration of science learning across various disciplines. Candidate will explore implementation of methods and materials in all areas of science instruction appropriate to the development of the K-8 educator within co-requisite clinical experience.

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

Cajete, G. (2016). *Native Science; Laws of Interdependence*. Clear Light Publishers. **ISBN-10:** 1574160419 **ISBN-13:** 978-1574160413

Peat, D. (2005). *Blackfoot Physics*. Weiser Books. **ISBN-10:** 1578633710 **ISBN-13:** 978-1578633715

COURSE INFORMATION
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. 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.

PEPP STANDARDS AND InTASC PRINCIPLES

10.58.532 (d) Candidates will be able to 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 Principle 5 Application of Content: The candidate 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.

Assessment Indicator 2.3: Integrate cross-disciplinary skills, such as critical thinking, problem solving, creativity, and communication to help learners learn the content

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, a) effectively incorporate instructional technology, b) incorporate culturally competent methods and content, c) employ differentiated methods and content to support the learning of diverse learners, d) utilize assessment for and of learning, and e) 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.

COURSE REQUIREMENTS

Attendance/Participation: (100 points) Students are expected to attend all class sessions and field work. Points will be awarded based on attendance. 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 zero points for that session. Always contact the instructor to notify them in the event of an absence or of late arrival.

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. 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. In class teaching should be limited to 20 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.

Quizzes: 3 quizzes: (30 + 30 + 40 = 100 points total) Three announced quizzes will be given during the course. Quizzes may vary in format and will cover assigned readings and information covered during the course.

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 candidates will participate and take part in.

Culture/Community 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. 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. 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: 1) 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. 2) is culturally competent, in terms of content and pedagogy, and is connected in some meaningful way to the local community. 3) incorporates the effective use of instructional technology to enhance student learning. 4) utilizes regular formative and summative assessment and includes the assessment tools. 5) 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 SCALE

Grading Points will be awarded as follows: Attendance/Participation 100 points 20% In-Class Activities 100 points 20% Science Learning Center 50 points 10% In-Class Teaching 50 points 10% Quizzes: (30, 30 and 40 points) 100 points 20% Science Unit Plan 100 points 20% Total Points Possible 500 points 100%

Grades will be assigned according to the following points breakdown: 450 - 500 = A 350 - 399 = C 400 - 449 = B 300 - 349 = D Below 300 = F

EVIDENCE DOCUMENTATION RUBRIC AND GUIDELINES

Evidence Documentation Form: The essential elements for this assessment are: The artifact must demonstrate the candidate's ability to **integrate cross-disciplinary skills, such as critical thinking, problem solving, creativity, and communication to help learners learn the content** (Assessment Indicator 2.3) by demonstrating 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.

Essential Elements	**0 Unacceptable**	**1 Developing**	**2 Proficient**	**3 Exemplary**
The artifact must demonstrate the candidate's ability to integrate cross-disciplinary skills, such as critical thinking, problem solving, creativity, and communication to help learners learn the content by	Unacceptable (0) is defined to be a level of work lacking clear demonstration of more than one of the essential elements being assessed.	Developing (1) is defined to be a level of work that indicates all essential elements have been demonstrated, but one of those critical elements are	Proficient (2) is defined to be a level of performance that indicates all assessed elements have been developed to the degree that it is reasonable to conclude the	Exemplary (3) is defined to be a proficient candidate who has developed beyond expectations in 50% or more of the essential elements being assessed.

demonstrating 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. The Evidence Documentation Form must reflect the 6 traits of writing.		underdeveloped to the degree it would be prudent for the candidate to receive additional preparation in the underdeveloped area.	candidate has succeeded in meeting the stated expectations of the assessment.	

COURSE RESPONSIBILITIES

Knowledge of the course content, class lectures, assignments, and syllabus content are the responsibility of the student regardless of absenteeism. If the syllabus is changed in any way you will be notified.

CREDIT HOURS

Following the SCC credit hour policy, to meet the identified objectives of this course, this 3 credit course, delivered over a 15 week term will approximate about 4 hours a week classroom time for about total of 45 hours of instructional time. In addition out-of -class student work will approximate a minimum of 6 hours each week.

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, Smart-boards, guest speakers, and other resources.

COURSE OUTLINE
This outline is subject to modification depending on class needs.

- 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
- 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
- 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
- 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
- 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
- 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
- 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
- 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
- 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

- 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.