

OAKLAND UNIVERSITY
SCHOOL OF EDUCATION AND HUMAN SERVICES
TEACHER DEVELOPMENT AND EDUCATIONAL STUDIES
Fall, 2018, Wednesday Afternoons

COURSE SYLLABUS

- 1. COURSE:** SCS 2060; Science for the Elementary Teacher; 4 credit hours; Elementary Education Program, Department of Teacher Development and Educational Studies (Wednesday, 1:20 pm – 4:40 pm, Section 44048, Building 3 110 MUC)

- 2. CATALOGUE DESCRIPTION:**

Develops science concepts and processes based on recent elementary school curricula in the fields of earth, physical and chemical science. For elementary education majors only; includes laboratory experiences. Prerequisite: Grade of 2.0 in one of (BIO 104 or BIO 1002), (BIO 110 or BIO 1004), (BIO 111 or BIO 1200), (BIO 113 or BIO 1300), (BIO 300 or BIO 3000), (CHM 104 or CHM 1040), CHM 157 (no longer offered), CHM 167 (no longer offered), (CHM 300 or CHM 3000), (ENV 308 or ENV 3080), (GEO 106 or GEO 1060), (PHY 101 or PHY 1010), (PHY 104 or PHY 1040), (PHY 105 or PHY 1050), (PHY 106 or PHY 1060), (PHY 115 or PHY 1150), (PHY 120 or PHY 1200), (PHY 151 or PHY 1510), or (SCI 100 or SCI 1000). [NOTE: It is the student's responsibility to ensure that prerequisites are met prior to registering for this course.]

- 3. DROP DATE INFORMATION:**

The last day to drop this class with 100% tuition refund, as well as other important academic dates, can be found on the Office of the Registrar web page that lists important dates: <http://oakland.edu/registrar/important-dates/> For this term, the final drop date is September 11, 2018 (by 4 PM).

- 4. COURSE/INSTRUCTOR EVALUATIONS:**

Course evaluations are available approximately 2 weeks prior to the final day of classes at <http://www.oakland.edu/evals>. You can access all your course evaluations by entering your Grizzly ID number and password. You will be asked to rate the course and the instructor on 20 items. Written comments are also encouraged. The last day of class is the last day to complete the evaluation. A summary of the results is not available to the professor until after final grades have been submitted. Your feedback is taken seriously, and you are encouraged to be honest in your evaluations. Your participation is greatly appreciated.

- 5. AUTHORIZED INSTRUCTOR:**

Mary Stein, Ph.D.

OFFICE: 485 E Pawley Hall
OFFICE HOURS: Monday 1 pm – 3 pm, Thursday 2 pm – 4 pm; **By appointment**
PHONE: (248) 370-3086
e-mail: stein@oakland.edu, note that the Moodle Quick Mail feature also sends directly to this email address

- 6. REQUIRED TEXTBOOKS OR READINGS:**

ScienceSaurus: A student handbook. (New Ed.). (2014). United States: Houghton Mifflin

Harcourt. [Note that this is the Grades 6-8 version and has a green cover. There is a similar book for elementary grades with a blue cover.]

[**Recommended**] Rillero, P. & Eddis, S. (2018). Mastering science content for middle school teaching and the NES general science exam. Retrieved from https://www.amazon.com/Mastering-Science-Content-Teaching-General-ebook/dp/B06XXPQLWG/ref=sr_1_1?ie=UTF8&qid=1499981452&sr=8-1&keywords=mastering+science+content+for+middle for purchase (1.99) and accessible through kindle reading application on smart phones, tablets, or computer operating systems.

Michigan Department of Education. (November, 2015). Michigan K-12 standards: Science. Retrieved from http://www.michigan.gov/documents/mde/K-12_Science_Performance_Expectations_v5_496901_7.pdf, August 11, 2018.

Achieve, Inc. (2013). *Next generation science standards*. Retrieved from <http://www.nextgenscience.org/overview-dci>

Michigan Department of Education. (January, 2008). Certification standards for elementary teachers. Retrieved from http://www.michigan.gov/documents/mde/Elementary_Program_Standards_557145_7.pdf August 11, 2018.

Council of Chief State School Officers (CCSSO). (April, 2013). InTASC model core teaching standards and learning progressions for teachers. Retrieved from https://ccsso.org/sites/default/files/2017-12/2013_INTASC_Learning_Progressions_for_Teachers.pdf August 11, 2018.

University of Michigan (2016). TeachingWorks: High-leverage practices. Retrieved from <http://www.teachingworks.org/work-of-teaching/high-leverage-practices> August 11, 2018.

Reading and video assignments as posted on Moodle.

7. LEARNING GOALS FOR CANDIDATE PERFORMANCE:

1. Candidates know, understand, and use fundamental concepts in the subject matter of science – including physical, life, and earth/space sciences – as well as concepts in science and technology, science in personal and social perspectives, the history and nature of science, the unifying concepts of science, and the inquiry processes scientists use in discovery of new knowledge to build a base for scientific and technological literacy. (MI Elementary Science Certification, 1.1)
2. Candidates use scientific knowledge in Earth and Space science in terms of systems and subsystems (such as atmospheric systems, crustal systems, solar systems, or galaxies), which are useful in explaining phenomena, including volcanic eruptions, earthquakes, thunderstorms, and eclipses. (MI Elementary Science Certification, 1.2.4)
3. Candidates use scientific knowledge in Physical science that focuses on phenomena such as motion, electromagnetic interactions, or physical, chemical, and nuclear changes in matter.(MI Elementary Science Certification, 1.2.5)
4. 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 4)

5. The teacher how to connect concepts and use differing perspectives to engage learners in critical thinking, creativity, and collaborative problem solving related to authentic and global issues. (InTASC 5)

8. **COURSE TOPICS:** See attached course outline.

9. **FIELD EXPERIENCE AND CLINICAL PRACTICE:**

Students may be provided with an opportunity to attend a science field trip, professional science teaching conference or professional development workshop as an integral component of the course when such events are scheduled within the semester.

10. **METHODS OF INSTRUCTION:** This course requires the active participation of students in class sessions and online. Methods of instruction include: lecture / demonstration; laboratory / field experiences; media presentations; review and analysis of teaching strategies / materials; library research; collaborative / cooperative learning.

11. **PERFORMANCE ASSESSMENT:**

The topics for this course target physical, earth and space sciences. The topics are organized around the Next Generation Science Standards (NGSS) which align Michigan K-12 Science Standards. The only major difference is that Michigan has a selected number of Michigan-specific standards in addition to the national standards. The course is designed to foster inquiry and exploration through activities and experiments conducted during class sessions (Face-to-Face/FTF) and online simulations and experiences to reinforce scientific concepts, vocabulary, and processes. **Students are expected to check Moodle postings at least once a week and between sessions.** Students will also be required to read selections in the required text book as noted on the syllabus and in class.

PLEASE CHECK MOODLE FOR MORE INFORMATION ON EACH ASSIGNMENT

Online Sessions (46 points)

This course is comprised of 4.5 online sessions, four of which engage students in learning and/or reinforcing new science content involving the physical or earth sciences. The online sessions involve quizzes to demonstrate participation and development of understanding. The due dates for the online assignments are firm and cannot be made up at a later date. The fifth session involves face-to-face review of all content in the course in preparation for the final exam with follow-up online review materials.

At the conclusion of these sessions students complete an accompanying online assignment related to the content of the session. Each content session assignment is assigned a value of 10 points. At the conclusion of the review session, there are verification assessments and a short survey that provide for an additional 6 points (total).

Explaining and Modeling High-leverage Teaching Practices (2 Components, 15 points each)

Specific directions, the evaluation rubric, and associated assignment materials for this assignment will be posted on Moodle after the assignment is modeled and discussed in class. Below you will find a general description of each component.

Explaining and Modeling #1 - Preparation (15 points)

Review the components of effective “Explaining and Modeling” on the feedback form and through the materials and interactions that were shared during our course sessions. Select one of the inquiry

questions on Moodle as discussed in class. The focus of this assignment will be on preparation components for your Explaining and Modeling episode.

Explaining and Modeling #2 - Implementation (15 points)

Review feedback provided to you on the first “Explaining and Modeling” assignment. Also review the components of effective “Explaining and Modeling” on the feedback form and through the materials and interactions that were shared during our course sessions. Although preparation, correctness/accuracy of your scientific modeling and explanation are important, emphasis will be placed on the extent to which you can effectively explain and model your thinking as you engage in science inquiry. You are required to video record your Explaining and Modeling example.

NGSS Research Questions (24 points)*

This assignment is comprised of answering 3 NGSS research questions* that target specific standards. This assignment has multiple purposes: (1) it will help you develop understanding of various science topics, (2) it will help you practice formulating clear and thorough explanations for others (such as a student who asked you a question), (3) it will help you become more familiar with the nature of standards that require students to understand specific information.

To develop a more complete understanding of the questions you will need to utilize other science content resources. The specific questions have multiple sub-questions and these are posted on Moodle. **To answer each question, it typically will take a number of different resources. At a minimum you must use, cite and reference two peer-reviewed or professionally respected resources. One of these two resources may be the ScienceSaurus course textbook for each answer.**

Each question will be evaluated using this 8-point rubric:

Question interpreted correctly. Answer reflects a correct understanding of what was being asked. If the question involved multiple parts, all parts are answered. **(2 pts)**

Answers are correct and demonstrate student understanding of the science content, beyond copying relevant information. The response should thoroughly, yet concisely, address the important aspects of the questions posed. Explanations that include too many details that are not relevant to the question posed will be viewed as lacking an understanding of the key concept(s) involved in the question. **(3 pts)**

Overall: Well-written and scholarly; answers are referenced appropriately (two references at a minimum as described above) using correct APA format. **(3 pts)**

***All students must complete the first NGSS research question. However, in place of the remaining two research questions there are two optional replacement assignments: choose either the STARBASE Field Trip and Report OR MDSTA Conference Attendance and Report. The explanations and criteria for these assignments can be found on Moodle. By the due date of the second research question, students must demonstrate that they have signed up for (or attended) STARBASE or the MDSTA Conference in order to participate in the optional assignments.**

In-class Quizzes and Final Test (80 points)

Six face-to-face sessions will be followed by a 2 point online quiz that targets information within the session. Two comprehensive quizzes (14 pts. each) will be administered at mid-semester and towards the end of the semester. The final exam (40 points) will take place as noted in the syllabus and designated by the university final exam schedule. The quizzes and final exam will target questions related to understanding concepts, important science terminology, and applying what is learned through hands-on activities to new situations. These quizzes are administered on the dates found within the tentative timeline for the course. In order to prepare for these quizzes and tests, students must be actively involved in class experiences, integrate understandings from assigned readings, and ask questions when concepts are not adequately understood. Students will be required to complete assigned readings posted on Moodle, handouts provided in class, and readings in *Science Saurus: A Student Handbook*. Students will also be responsible for content and vocabulary taught as part of the peer presentations. Planned online sessions will involve students in learning about physical and earth sciences through interactive activities. Information from these sessions will be assessed on each quiz and the final exam.

Attendance and Participation (20 points*)

Maximum benefit for students involves, not only engaging in the hands-on activities provided, but also sharing with others your personal ideas, plans, and experiences. Regular attendance and class participation is extremely important in this course. Participating in class activities and experiments is an integral component to success in this class. Each student is expected to prepare for, and take an active part in, class discussions, activities, and collaborative group work. This requires students to complete assigned reading and homework prior to their due dates.

Credit is earned for full, positive, participation at each Face-to-Face (FTF) class period. Additionally, each student is responsible for maintaining a clean classroom environment during the semester as part of positive participation. Tardiness and partial attendance is often disruptive to class and full participation points will not be earned when this occurs. There are 8 FTF sessions as noted on the syllabus and a maximum of three points may be earned for each session. Note that the total (3 pts. x 8 possible) exceeds the 20 pt. allocation for attendance. Thus, it is possible to earn extra points in this category. Because of the nature of class activities, it will be impossible to make up missed class time. However, check with your classmates and/or instructor to ensure that you did not miss critical information. Points will not be earned for missed sessions, irrespective of the nature of the absence, and students need not provide a reason.

To encourage full participation, students may earn attendance points as follows:

- 3 points: Full, positive participation (i.e., not texting, e-mailing, surfing) and arrive/depart as scheduled.
- 2 points: Positive participation but late arrival or early departure.
- 1 point: Participation limited and/or significant late arrival early departure.
- 0 point: Session not attended

FOR ALL ASSIGNMENTS:

1. All formal assignments should be formatted in MS Word or a program that can easily be opened in Moodle and by most computers. Any required attachments may be scanned/photographed and submitted electronically. Complete web addresses should be included in APA formatted citations and references.
2. All assignments should relate to the teaching of *science* as opposed to general teaching methods.

3. Students are **encouraged to arrange to meet with the instructor for help and feedback on assignments.** As future teachers, it is essential that you demonstrate care with respect to the submission of written assignments. For each assignment, spelling, grammar, organization, and clarity of written work are evaluated. Errors such as these often result in lower assignment grades.
4. Assignments are to be uploaded to Moodle by the due date and time. Assignments turned in late, except assignments or quizzes associated with the online sessions, will be accepted for reduced credit (a reduction of 20% for first week the assignment is late and greater reductions as submission time increases).
5. All assignments are expected to be the individual student's original work and writing. Any quoted material should appear in quotations and be properly referenced with page numbers (APA style). This means that work from other students should also be referenced (e.g., lessons from Conceptual Change Units found in the ERL). Paraphrased material should be referenced using APA style. Students are strongly encouraged to complete the online [Plagiarism Tutorial](#) found on the [KresgeLibrary](#) website. All allegations of academic misconduct will be reported to the Dean of Students and, thereafter, to the Academic Conduct Committee for adjudication. Anyone found guilty of cheating in this course may receive a course grade of 0.0, in addition to any penalty assigned by the Academic Conduct Committee. Please refer to the 2018-2019 Oakland University Undergraduate Catalog to read the full *Academic Conduct Policy* listed under *Other Academic Policies* online at <http://catalog.oakland.edu/content.php?catoid=37&navoid=4612>

12. COURSE REQUIREMENTS AND GRADING:

Participation and Attendance (for 8 FTF sessions x 3 pts. max)	20 pts.*
Assignments (100 points total)	
Explaining and Modeling Assignment #1 (Preparation)	15 pts.
Explaining and Modeling Assignment #2 (Implementation)	15 pts.
NGSS Research Questions (3@8 pts. Each)**	24 pts.
Online Sessions (4 x 10 pts. each and 6 pts. for review session)	46 pts.
Quizzes and Tests (80 points total)	
Short online quizzes on information from sessions 1, 2, 3, 5, 6, 8	12 pts.
Quiz 1 - all standards and on-line information first half of semester	14 pts.
Quiz 2 - all standards and on-line information first half of semester	14 pts.
Final Exam - Inclusive and on-line information	40 pts.
TOTAL	200*

***Note that 4 extra points are possible through maximum attendance and participation.**

**** An optional replacement assignment for the Research Questions is available on Moodle and will be explained in class (STARBASE OR MDSTA Conference Attendance and Report)**

GRADING SCALE

LETTER GRADE	SCALED GRADE	PERCENTAGE	POINT EQUIVALENCY (OF 200)
A	4.0	93-100	185-200
A-	3.7	90-92	179-184
B+	3.3	87-89	173-178
B	3.0	83-86	165-172
----- 3.0 is program requirement -----			
B-	2.7	80-82	159-164
C+	2.3	77-79	153-158
C	2.0	73-76	145-152
C-	1.7	70-72	139-144
D+	1.3	67-69	133-138
D	1.0	65-66	131-132
F	0.0	Below 65	<131

13. BIBLIOGRAPHY:

See complete list on Moodle.

LIST OF MEETING TYPE, TOPICS AND DUE DATES (Wednesday, MUC)

Session	Date	Topic	Due
1	Sept 5 FTF	1. Course Overview 2. Introduction to the Next Generation Science Standards (NGSS) 3. Science Investigations <u>Homework</u> (1) Read ScienceSaurus: 001-019 (2) Review potential investigation questions; (3) Session 1 Online Quiz	
2	Sept 12 FTF	1. Matter and its Interactions 2. High-leverage Teaching Practices: Modeling and Explaining <u>Homework</u> (1) Review research questions and determine whether you will want to attend STARBASE in lieu of research questions 2 & 3 (all students complete #1); (2) determine investigation question and enter question on Explaining and Modeling Google Doc (on Moodle) (3) Session 2 Online Quiz	Session 1 Online Quiz
3	Sept 19 FTF	1. Matter and its Interactions <u>Homework</u> (1) Read ScienceSaurus: 249-273 (2) Session 3 Online Quiz	Session 2 Online Quiz
4	Sept 26 Online	Online Session #1 1. Phase Changes 2. Density 3. Felt Pen Secrets <u>Homework</u> (1) Read ScienceSaurus: 274-298 (2) Research Question #1	Session 3 Online Quiz
5	Oct 3	1. Forces and Interactions <u>Homework</u> (1) Read ScienceSaurus: 299-304; 315-321; 323-328 (2) Session 5 Online Quiz (3) Prepare for Quiz 1	Research Question #1

6	Oct 10	1. Quiz 1 2. Energy 3. Waves <u>Homework</u> (1) Read ScienceSaurus: 306-314 (2) Session 6 Online Quiz (3) Explaining & Modeling #1 (Preparation)	Session 5 Online Quiz
7	Oct 17	Online Session #2 1. Sled Wars 2. Circuit Builder 3. Waves <u>Homework</u> (1) Research Question #2	Session 6 Online Quiz Explaining & Modeling #1 (Preparation)
8	Oct 24	1. Earth's Place in the Universe: Geology <u>Homework</u> (1) Read ScienceSaurus: 166-169; 175-200 (2) Session 8 Online Quiz	Research Question #2 (unless completing optional assignment as communicated to instructor)
9	Oct 31	Online Session #3 1. Rock Cycle 2. Rock Classification 3. Earth's Structure Homework: Prepare for Explaining and Modeling #2 (Implementation) Due Dec. 5th	Session 8 Online Quiz
10	Nov 7	1. Earth Systems: Hydrology 2. Earth Systems: Meteorology <u>Homework</u> (1) Read ScienceSaurus: 212-230 (2) Research Question #3 or Optional Assignment (STARBASE or MDSTA report)	
11	Nov 14	Online Session #4 1. Comparing Climates 2. Weather Maps 3. Seasons Around the World <u>Homework</u> (1) Prepare for Quiz 2	Research Question #3 OR Optional Assignment (STARBASE or MDSTA Reports) Note: No Online Session Quiz

12	Nov 21	WORK SESSION (No Class) Complete Explaining and Modeling #2 <u>Homework</u> (1) Prepare for Quiz 2	
13	Nov 28	1. Quiz 2 2. Earth's Place in the Universe: Astronomy <u>Homework</u> (1) Read ScienceSaurus: 231-248 (2) Explaining and Modeling #2	
14	Dec 5	1. Wrap-up on unfinished topics 2. Explaining and Modeling 3. Review for Final Exam <u>Homework</u> (1) Online Review Session	Explaining and Modeling #2 (Implementation)
15	Dec 12	Final Exam	Online Review Session by 1 pm