EDSCI 454 Modern Elementary Science Education (3 credits)

PENN STATE HARRISBURG

**Course Description:** This course exposes candidates to content knowledge and teaching pedagogy as they relate to science and science education. The science content knowledge is primarily focused on Biological Sciences, Physical Sciences and Earth and Space Sciences at the K-8 level. Current research is used to ensure that the best practices in teaching and learning K-8 Sciences are explored.

**Course Goal:** At the conclusion of this course, all candidates should have a strong understanding of the best practices in teaching and learning K-8 science. Candidates should have an awareness of the Physical Sciences, Biological Sciences and Earth Space Sciences taught at the K-8 level. They should be able to utilize best practices in the teaching of these sciences.

**Course Philosophy**: As part of the Elementary Education program at Penn State Harrisburg, this course embodies the four tenets of our conceptual framework: constructivism, authenticity, reflectivity, and standards-based curriculum as described in Penn State Harrisburg’s Elementary Education Handbook.

**Required Course Materials:**

1. **Textbook**:

Hershberger, K., McNeill, K.L., & Zembal-Saul, C. (2013). What’s Your Evidence?: Engaging K-5 Students in Constructing Explanations in Science. New York: Pearson.

1. **Hard Copy of the Following Standards:**

Choose Grade Appropriate for Program:

Academic Standards for Science & Technology & Engineering Education (Elementary 3-8)

Academic Standards for Science (PreK-3)

http://www.pdesas.org 🡪 standards 🡪download pdf

1. **Learning Standards for Early Childhood** (Not Required, but helpful for EC)

Purchase bound complete copies through the PA’s Office of Child Development & Early Learning’s link. [fulfill@wavelinedirect.com](mailto:fulfill@wavelinedirect.com)

or

Print only Science related pages of these learning standards.

http://www.pdesas.org 🡪 standards 🡪download pdf

**Required Website Login:**

Pennsylvania Standards Aligned Systems <http://www.pdesas.org>

**Course Management:**

**ANGEL Course Management System**: ANGEL is an integrated set of tools for developing and delivering course components over the Web. This course will utilize ANGEL to transmit information and assignments. Students should check ANGEL for updates on a weekly basis. Student’s name and date should be on submitted assignments, and all ANGEL assignments must be submitted using the following file name:

last name, first name, item description, date

**TaskStream**: Students have three key assessments in the form of science lessons for this course. These lessons must be uploaded on TaskStream. This requires candidates to have a current TaskStream account at [www.taskstream.com](http://www.taskstream.com).

**Assignments**:

100 points Professionalism: Attendance, Preparedness, Participation and Self/Peer Evaluation

30 points Standards Review and Science Summary (10 points each)

-Biological, Physical and Earth & Space Sciences

60 points Chapter Notes and Questions (10 points each chapter)

20 points Research Topic: Notes and Questions (10 points each)

40 points Lesson Observation

30 points Self Observation

\*30 points First Draft of 3 Group 5E Lessons (\*10 points each)

-1 hard and electronic ANGEL copy per group

-Biological, Physical and Earth & Space Science

\* 180 points Second Draft of 3 Group 5E Lessons (\*60 points each)

-1 hard and electronic ANGEL copy per group

-Biological, Physical and Earth & Space Science

Key Assessments 3 Individual 5E Lessons uploaded to TaskStream -Biological, Physical and Earth & Space Science

25 points Lesson Presentation and Discussion Facilitation

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500 points Total

\*NO POINTS assigned for 5E lesson drafts to individual members until lessons are uploaded to their individual TaskStream accounts. Do NOT upload until you receive feedback/graded 2nd draft, so corrections can be made. You cannot make corrections once lessons are uploaded on TaskStream.

Your Total Points/500 = Final Average

**Letter Grades**: Letter grades will be determined using the following scale

90-100 A 75-79 C+

87-89 B+ 70-74 C

83-86 B 60-69 D

80-82 B- 0-59 F

**Professionalism**: class attendance, active and respectful engagement in hands-on experiences and group/class discussions, proper preparedness for class (well versed in assigned readings and writings) and peer/self evaluation of group work. If you are absent, you cannot earn the attendance portion of the grade without documentation of hardship. The rubric for this is found on ANGEL.

**Peer Evaluation of Group Work:** Each member of the group completes a peer evaluation rubric found on ANGEL. This evaluation is confidential, so only the professor sees the completed rubrics. This peer evaluation form must be completed and emailed by the last day of class.

**Standards Review and Science Summary:** Students review the standards and write a summary or bullet points for each of the sciences: Biological Sciences, Physical Sciences and Earth & Space Sciences.

**Research Topic Notes and Questions**: ½ to 1 page summaries of collateral reading on 2 class topics, identified on schedule. Provide clear citations for each article, a 2-3 paragraph summary and at least one thoughtful discussion question. Self-selected readings must be at least 3-4 pages in length and include references. Blogs and teacher activity sites are not acceptable. An excellent source is the website of the National Science Teachers Association (nsta.org) which has free downloads of articles from Science and Children journal through its teacher development tab.

**Chapter Notes and Questions**: While reading assigned chapters, engage in the concept, take notes and record your thoughts, new understandings and questions.

**Lesson Observation**: (4 documents) While observing a science lesson in your field placement, complete the Science Classroom Visitation Worksheet. Use the information from this visitation worksheet to complete the Science Classroom Observation Rubric form and Science Classroom Observation Worksheet. All documents are found on ANGEL in the LASER document. Note: You most likely will not see all the traits in one lesson. The lesson plan must be submitted with the LASER forms.

**Self Observation**: (3 documents) Teach a science lesson in your field placement and complete the Science Classroom Observation Rubric and Science Classroom Observation Worksheet. All documents are found on ANGEL in the LASER document. Note: You might be teaching the teacher’s lesson and not your own. Also, you are learning to become a teacher. Hence, your score will not be what the rubric reflects. Your score will be on how well you reflect on your teaching and the students’ learning. Describe the student’s learning by commenting on the students’ specific behaviors and engagements in exploration and discussion. The lesson plan must be submitted with the LASER forms.

**First Draft of 3 Group 5E Lessons**: There are 11 parts of the 5E lesson that need to be completed for the first drafts. The first draft requirements are found on ANGEL, but follow the 5E lesson rubric for further explanation of those requirements. One hard copy and one electronic ANGEL copy must be submitted on the due date, and it must include all the names of the group members. Do NOT use the TaskStream lesson format.

**Second Draft of 3 Group 5E Lessons**: One hard copy and one electronic ANGEL copy must be submitted by the due date, and it should include all the names of the group members. Follow the 5E Lesson Rubric found on ANGEL. Do NOT use the TaskStream lesson format.

**3 Individual 5E Lessons Uploaded to TaskStream**: The 3 group 5E lessons must be uploaded to individual TaskStream accounts for individual member to get credit for the drafts (70 points each). Do not use the lesson format in TaskStream.

**Lesson Presentation and Discussion Facilitation**: Each group presents one of their 5E lessons. After the lesson, the group leads a discussion about their 5E lesson and the teaching pedagogy that was exhibited. Individual members will be graded using the Individual 5E Lesson Presentation Rubric found on ANGEL.

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| Day | Date | Lesson | Assignments Due |
| 1 | 1/8 | Questionnaire  Main Branches of Science  Course Overview/Syllabus  Lesson Group Work  Importance of Science & Science Education  Sample 5E Lesson: Which is Water? | Text  3 Ring Binder  Standards |
| 2 | 1/15 | Natural Learning Processes  Sample 5E Lesson: Physical Science Content  Standards: Science as Inquiry, p.8  Physical Sciences Review  Time Permits: Lesson Possibilities/Sign-ups | Research Topic: Process Skills  Chapter 1 Notes & Questions  Standards Review and Summary: Physical Sciences |
| 3 | 1/22 | Teacher as Facilitator  5E Lesson Plan Organization  Sample 5E Lesson:  Biological Science Content | Research Topic (split class)  Teacher as Facilitator:   1. Types of Questions 2. Questioning Techniques   (Wait time & more)  Chapter 2 Notes & Questions |
| 4 | 1/29 | Biological Sciences Review  Learning Science Through Personal Inquiry  Sample 5E Lesson: Which is the Best Roller? | Standards Review and Summary:  Biological Sciences  Note: 3 chapters due next week |
| 5 | 2/5 | Scientific Explanations  Physical Science Lesson Planning | Chapter 3-5 Notes & Questions  Lesson Plan 1st Draft : Physical Science  (1 hard and electronic copy) |
| 6 | 2/12 | Earth and Space Sciences Review  Scientific Explanations Continued  Field Observation Requirements  Time Permits: Group Work | Standards Review and Summary:  Earth & Space Sciences |
| 7 | 2/19 | 3 Physical Science Lesson Presentations, Observations and Discussion  If Time: Common Misconceptions | Lesson Plan 2nd Draft: Physical Science  (1 hard and electronic copy)  Physical Science Lesson Presentations: 1/3 Class (Group A) |
|  | 2/26 | Tentatively in field |  |
|  | 3/5 | Spring Break – No Classes |  |
| 8 | 3/12 | Scientific Explanations Continued  Biological Science Lesson Planning | Lesson Plan 1st Draft: Biological Science  (1 hard and electronic copy) |
| 9 | 3/19 | Assessment  Time Permits: Group Work | Chapter 6 Notes |
| 10 | 3/26 | 3 Biological Science Lesson Presentations, Observations and Discussion  If Time: Common Misconceptions | Lesson Plan 2nd Draft: Biological  (1 hard and electronic copy)  L.S. Presentations: 1/3 Class (Group B) |
| 11 | 4/2 | Curriculum Integration  Earth and Space Science Lesson Planning | Lesson Plan 1st Draft : Earth & Space  (1 hard copy & 1 electronic copy) |
|  | 4/9 | Tentatively in field |  |
| 12 | 4/16 | 3 Earth & Space Science Lesson Presentation, Observations and Discussion  If Time: Common Misconceptions | Lesson Plan 2nd Draft: Earth & Space  (1 hard and electronic copy)  E & S Presentations: 1/3 Class (GroupC) |
| 13 | 4/23 | If needed: 1 E & S Lesson Presentation  Questionnaire Revisited  Big Ideas in Science | All Assignments:  3 Taskstream Lessons  1 Lesson Observation (hard copy)  1 Self Observation (hard copy)  1 Peer Evaluation of Group Work (electronic copy) |
| 14 | 4/30 | Final | Chapter 7 Notes and Questions |

**Academic Integrity Policy**

You are expected to follow Penn State Harrisburg’s academic integrity policy. The complete policy can be found at <http://harrisburg.psu.edu/academic-policies>. Please read this policy and abide by it. All your course assignments that you submit and present must be your own work. You must respect the rights of others by citing all work that is not your own.

Academic integrity includes commitment not to engage in or tolerate acts of falsification, misrepresentation or deception. Such acts of dishonesty violate the fundamental ethical principles of the University community and compromise the worth of work completed by others. By virtue of being registered for the course and reading this course syllabus, the instructor assumes students are aware of this policy, are knowledgeable of its standards of conduct, and will abide by its prescriptions.

**Late Policy**

Assignments must be completed on time. The policy regarding late assignments is 20% penalty for late assignments turned in within 1 day of due date and 50% penalty for assignments turned in thereafter until the end of the course (defined as the last regular class session). If you are ill or have a serious problem that prevents you from submitting an assignment on the day it is due, please contact me prior to the due date. We will arrange an alternative date. Additionally, students with incomplete assignments at the end of the course will be given the earned final grade. Incompletes (I’s) will not be given except under extenuating circumstances that are discussed with your instructor prior to assignment of final grades.

**Accommodating Disabilities**

Note to students with disabilities: It is Penn State’s policy not to discriminate against qualified students with documented disabilities in its educational programs. If you have a disability-related need for modification in this course, contact the Disability Service Coordinator in the Student Assistance Center (Swatara Building; 717-948-6025)

**Weather Policy**

In the event of inclement weather, an announcement about delays or closings is made on the university web page <http://www.hbg.psu.edu>. You may also find this information by listening to the local radio stations listed on the following link:

<http://www.hbg.opsu.edu/hbg/weather.html>.

**The Learning Center**

The Learning Center provides tutoring to support your writing in this class in either a face to face or virtual meeting. The writing tutors can help you develop your thesis and ideas, offer objective feedback during the drafting process or on completed drafts, and explain APA documentation formats. For more information on our services, visit the LC website at [www.hbg.psu.edu/LearningCenter/](http://www.hbg.psu.edu/LearningCenter/).

**Classroom Policies**

* Food is not permitted during class.
* Beverages are permitted.
* Cell phones should be turned off and stored.
* Expect to be involved in hands-on activities, so dress appropriately.
* Individual grades are not discussed during class. If you have any questions about grades or points assigned, make an appointment.