**SMT 504, Integrated Methods in Earth Science Instruction:**

***Teaching Earth science using climate and global change data***

*(Fall 2015)*

## Outcomes & Assignments

1. **Mini data-stories** [Purpose: Develop data analysis skills and data literacy pedagogical content knowledge (PCK) by exploring and analyzing many kinds of archived Earth and environmental data]

--> Create three one-page mini “data stories” using (or modifying) the template provided. Purpose: familiarize you with sources of data that support learning of an Earth science content idea with real evidence. (At least three at 5 pts each for 15 - 20 pts)

1. **Content Data activity** [Purpose: Develop data analysis skills and data literacy pedagogical content knowledge (PCK)

**-->** Develop a short (one period or less) lesson that involves analysis of environmental data and supports learning of an Earth science concept, practice, or crosscutting standard. Identify one target Earth science content learning standard that the data activity supports. (20 pts)

1. **Student & peer feedback** [Improve ability to critically and productively respond to students “data stories” in a way that helps students deepen their stories.]

**-->** Review, score, and provide feedback on at least 4 samples of student work. Each of your reviews must be accompanied with at least 2 peer reviews of your comments. You should each provide at least 4 peer reviews for your colleagues. (5 pts each for 20 – 30 pts)

1. **Written Literature Review** [Purpose: Review education research literature to become familiar with pedagogical content knowledge related to Earth sciences education]

 --> Read and review at least three papers that relate to one of the following topics:

(1) Research and/or classroom examples related to teaching and learning Earth science concepts using Earth science data (archived data or student-collected data)

(2) Recent (last 3 years?) research into applications of “Claim, Evidence, Reasoning” teaching framework in science teaching (\*e.g. McNeill, Krajick et al), or other aspect of data literacy.

(3) Three related research articles from the Journal of Geoscience Education, topic of your choice.

Word limit: 650 words (not counting citations), 1.5x line spacing, professionally formatted. Include a title that unifies the 3 papers. Briefly summarize each paper and describe a key “take-away” idea from each. Connect the key ideas from all the papers to a central idea or problem of your choosing (which your title should relate to), and briefly compare or critique one or more of the papers if fitting. Grades will be based on the clarity of the ideas presented, writing style, formatting, and synthesis of thought. Consider this a formal academic paper. You will receive feedback, with an option to revise and re-submit for an improved score. (25 pts)

1. **Research project:** Conduct an open-ended research investigation that could be conducted by middle or high school students and describe the study and finding(s) in a briefly written “extended abstract” (ie. a more mature data story) (25 – 50 pts, with Lesson plan & rubric must total 75 pts)

--> Design and undertake an open-ended environmental research project that addresses a question you pose at the beginning of the semester. The research project should be feasible to carry out within a 4-6 week window between mid-September and the end of October. It should include data from **two** kinds of sources: data gathered in the field and at least one related data set from an online archived source. You may work in pairs or small teams and share sites and data collection, but each student must have her or his own unique research question, (and/or classroom implementation strategy), and do her own data analysis and reporting. Four due dates pertain to the research projects:

**Research plan*,*** *by* ***Class 3 (Sept. 15)****:* includes your research question, sampling plan and time line, materials/equipment needed, list of mentors and/or collaborators, hypothetical graph, most closely related content standard. (Submit a written digital copy)

**Progress *report,*** *by* ***Class 7 (Oct 20):*** due. Describe status of data collection and analysis include a preliminary digital graph or figure to share at Class 7 progress report)

**Extended abstract**, *by* ***Class 14 (Dec. 8)*:** (2 pages, written digital and hardcopy)

1. **Classroom lesson plan & rubric (presentation)**: Prepare a short (1 period or less) or longer (up to 3 days) teaching activity, and a rubric for scoring student proficiency in some aspect of the lesson (Scope depends on your point target, 25 – 50 pts; with Research project, must total 75 pts))

**--> Rubric:** **Due Class 12** **(Nov 24, electronically).** Adopt/prepare a rubric for scoring a learning activity that scaffolds a concept or skill needed to do an open-ended environmental/Earth science-related research project.

**--> Classroom teaching activity (Due Class 13, Dec 1).** 4 slides, 8 minutes. How would you implement your research project (or a part of it) in a classroom?

1. **Class prep & participation** Expectation: Engage as an active contributing participant in the class, building on what you read, discover, and learn. Deepen your own understanding of science content related to how Earth systems change and how environmental, climate, and global changes are measured at different spatial and temporal scales, and how to teach about that effectively.] (25 pts)
* Read and ponder all reading assignments and data literacy resources;
* Hand in completed (professionally-formatted) work on time
* Participate in and contribute productively to class activities and discussions.

--> Keep up with the readings – they inform assignments and activities.

1. **Class leadership, service, and reflections**: Assume shared leadership in determining the quality and direction of learning in the course

**Expectation:** Contribute to the betterment of the class as a whole; collaborate with peers and instructors to ensure that learning goals are met for everyone, provide feedback and gather and share class resources when needed, reflect upon individual and group learning through the semester. (15-25 pts)

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**Examples of Class Community Contributions:**

1. Set up / help manage class website for access to readings, file-sharing, resources, calendar
2. Provide extra peer review of work for peers
3. Contribute additional relevant readings to the readings list (annotated, ideally)
4. Present an Earth science “Graph of the Week” for short class discussion
5. Help prepare and/or lead a class activity or lesson
6. Find and share relevant teaching resources with the class
7. Propose & negotiate mid-course modifications that improve learning
8. Support/collaborate with peers on research projects
9. Reflect on your learning and share with instructors and peers as appropriate.
10. Work to tailor your course work to support your interests, teaching goals, and/or research
11. Support, observe, or assist with relevant Earth science activity in a real classroom
12. Add new or verify existing data links to the Data Portaportal