EDCI 770: Foundations of Science Education: Research and Theory

Instructor: Dr. Diane Jass Ketelhut
Course Location: Benjamin 2212b
Course Time: M 4:15-7, most Mondays.
Office: 2226L Benjamin
Office Hours: By appointment (email request)
Contact Info: djk@umd.edu 301-405-3324 (email is by far preferable and more assured of reaching me)

COURSE DESCRIPTION:
This course is part of a 2 course sequence in science education. This course focuses on the history of science education; the influences on current and future practices; and the identification and critical analysis of current status of science education.

This course will be guided by questions such as:

- What are the major periods in science education?
- What factors led to the evolution of science education practices?
- What do we know and how does that influence current practices?
- What don’t we know?
- How do scholars build on previous work in the field?
- How do scholars critique previous work in the field?

Where at all possible, assignments will contain options that will allow for personalization to fit your interests and degree progression. If you have a suggestion of a way to meet the overall goals of an assignment with an option not listed, please do not hesitate to propose that change to me. Graduate level courses work best when you can make connections to your own interests and needs.

COURSE GOALS:
Through course readings, active participation in class discussions, and independent work, students will develop knowledge, skills and attitudes relating to:

- An appreciation for the breadth of research in science education and for the intellectual history of ideas in the field;
- A familiarity with key issues and compelling & competing ideas in science education research;
- Critical discussion and analysis of science education research literature;
- Thoughtful comparison of diverse perspectives and approaches to research in science education;
- Reading academic papers and extracting the main points;
- Becoming more expert at expressing your own scholarly ideas, and other people’s ideas, in writing.
- Situating your own emerging research interests within the field of science education;
- Participation in current science education projects

COURSE MATERIALS:
1. Reading will be assigned throughout the course that will be available as handouts, on the web, or through the library.
2. It is recommended that you have access to the book:
   This book is on 24 hour reserve in the library and information on that is available on canvas through the ‘modules’ link.
3. In addition, you must:
   a. Have access and use of email and the World Wide Web
   b. Please know your official email address as I will from time to time send important announcements through elms between classes. If you use another email address regularly, have your UMd email forwarded to that account so you do not miss any important messages.
COURSE EXPECTATIONS:

1. Attendance Policy:
   The interactive nature of this course requires regular attendance to ensure your learning and that of your classmates. Absences might cause your attendance/participation grade to be reduced. In the event of illness or an emergency occurs preventing you from attending class, please contact me privately through email or phone in advance if at all possible.

   The University System of Maryland policy provides that students shall be given an opportunity, whenever feasible, to make up within a reasonable time any academic assignment that is missed due to individual participation in religious observances. We are a diverse community and enroll students of many religions; therefore, students' requests for excused absences and make-up test requests due to reasons of religious observances will be honored where at all possible. It is the student's responsibility to inform the instructor of any intended absences for religious observances in advance.

2. Classroom Expectations and Code of Conduct:
   a. General Responsibilities:
      For me to help you gain content knowledge and practices, and foster a productive and safe science learning community, you will be expected to assume many roles and interact in a variety of situations. I realize that some of these situations may be outside your cultural and social comfort zones. For instance, it is often difficult for some people to continue to question scientifically when they have not received “the right answer.” However, to help foster your learning and those around you, it will be your responsibility during each of these moments and interactions to:
      - communicate your understandings, feelings, and perspectives
      - work to understand other's perspectives
      - take risks
      - make your own discoveries, gather new information, and develop your own explanations.

   b. Collaboration and feedback:
      Collaboration and communication are keys to working within a science community. Therefore, for all of our intellectual development, I expect that you will be honest and thoughtful with your reflections of others and be willing to accept feedback. Please remember that we can disagree and challenge one another’s ideas without getting personal.

   c. Cell phone policy:
      Please turn your cell phone and other personal communication devices off before entering the classroom. Please notify me ahead of time if there are extenuating situations, which will require you to be reachable to others.

3. Policy on Turning in Work:
   a. Assignments:
      Students will be expected to adhere to the due dates listed on the calendar or negotiated in class. An assignment is considered late if it is not handed by the due date/time listed. Points will be deducted for work that is not proof read.

   b. Academic integrity:
      The University has a nationally recognized Honor Code, administered by the Student Honor Council. The Student Honor Council proposed and the University Senate approved an Honor Pledge. The University of Maryland Honor Pledge reads:
      
      I pledge on my honor that I have not given or received any unauthorized assistance on this assignment/examination.

      Since most of our assignments will be electronic, putting your name on any assignment will stand in lieu of a handwritten pledge/signature.

      Please give credit where credit is due. It is plagiarism if you have used science concepts, someone else’s ideas, works and words without citation. Websites must be cited if they are used as a source of
information and quoted if directly copied. Please note that academic dishonesty can result in a failing grade for the assignment and/or referral to the Honor Council.

4. **Disability Policy:**
Students with documented disabilities and/or who think they may have a disability that entitles them to time extensions for in-class assignments, require testing modifications and/or alternative assignments, etc must make an appointment to speak with me privately and consult the Office of Disability Support Services to get written documentation.

5. **Bad weather policy:**
The course will adhere to the University emergency closing schedule. However, in some cases with an afternoon class, we might fall in the crack between a cancelled evening classes and open day classes. In those cases I will sometimes cancel class ahead of the official ruling for safety’s sake. On bad weather days, please check your email and the announcement page on elms for information on whether class is being held or not.

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<td>B+</td>
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**INFORMATION ABOUT ASSIGNMENTS:**
Note: Additional information for each assignment will be provided in class and posted on elms.

1. **Class participation (30%)**
   Class participation grade will be assessed on various factors: daily class discussion participation (this means sharing as well as listening to other’s) and peer feedback, in particular.

2. **Readings**
   Class discussions will presume that students have read the readings, and therefore will use the readings as a basis for class discussion. I will not be lecturing on the content of the readings! In addition to thinking about the content, please come to class having thought about the following questions as well for each article:
   - What is the author's purpose?
   - What is the author’s argument?
   - What issue is the author responding to?
   - What is the evidence?
   - What are the conclusions? Are they warranted?
   - What are your suggestions to the author(s) for next steps?
   - How do your own values and experiences shape your response to the text?

3. **Discussion Leader (20%).** In addition to weekly participation, once during the semester, you and a partner will be responsible for facilitating a conversation and/or activity related to a specific topic assigned for that week. All students will read one article in each topic, but discussion leaders will also read additional articles on their topic and will synthesize/summarize for the class. This ‘leadership’ can take any form. This assignment will take place during March 3, 10 or 24.

4. **Research notebook to keep a list of questions that you want to know more about** (ungraded)
5. ‘Science Education in Action’ internship Project:

This course has two parallel purposes. First, it is about understanding the foundations of science education and the influences on current practices. Second, it is to continue your growth towards the professional skills you will need to be successful. This assignment focuses on integrating these two purposes. In essence, you are to find an active science project in which to become involved. Learn/participate in how science education is being ‘improved’/researched/designed/debated. The choice of project is up to you—find a research project on campus, work with a science museum on a new exhibit, attend a science ed conference (like NARST), participate in a research discussion group, etc. For those currently involved in a research project, I ask that you find a new one to participate in for this assignment to give you a new perspective or at least to participate in an arm of it in which you have had no role. If you need assistance in finding a project, all three of the science ed faculty (Andy Elby, Randy McGinnis and myself) have disparate active research projects and would welcome an intern.

This assignment has several parts:

i. The proposal (10%): in approximately 1 page, please outline the project that you are proposing interning with and your proposed role on it. Create a rationale for how your participation in this project will allow you to a) experience ‘science education in action’, bearing in mind the focus of this course is on foundations/influences on current practices; and b) how this internship will help you gain knowledge/skills/experiences that will further your professional growth. In this assignment, I am looking for a clear and succinct rationale for this internship.

ii. The participation (20%): Your participation will take various different forms that must be approved in the proposal. However, in addition to your participation in the project itself, please also find and read 5 articles in peer-reviewed journals on the topic or some aspect of the topic that intrigues you. Feel free to ask the project personnel for advice about seminal articles. For this assignment, summarize your participation and create a short annotated bibliography of the 5 articles.

iii. The poster (20%): Our last class will be a poster symposium. Please create a poster (see below for general guidelines) that shares what you have learned from this assignment. I will expect to see at minimum—information on the project, connections to the course, your reflections/learning, a synthesized paragraph (or two) review of your 5 articles.

General information on creating a successful poster presentation:

1. The title should grab readers.
   a. Prominently displayed at the top
   b. Do not use all capitals

2. The subject and purpose should be clear in a 30 second perusal!
   a. Use images to help
   b. Limit the amount of text used in any one place
   c. Large type
   d. Use of color in font and background helps make it readable.
   e. Emphasize photos, graphs, drawings if possible.

3. Subtitle the sections clearly so that a reader can locate sections they are most interested in.

4. Typically, use powerpoint. Go into properties and set the size for one slide to equal the final size of the poster

5. Below are links to a good model and a bad model of a poster:
   http://tos.org/resources/publications/sci_speaking/good_poster.pdf
   http://tos.org/resources/publications/sci_speaking/bad_poster.pdf

6. The following are links to examples of posters:
   http://www.writing.engr.psu.edu/samples/poster7.pdf
   http://www.writing.engr.psu.edu/courses/presentations/poster1.pdf
   http://www.writing.engr.psu.edu/courses/presentations/poster3.pdf
   http://www.writing.engr.psu.edu/samples/poster6.pdf

7. You can google “poster templates” and find links to download a powerpoint template with the text boxes already set up. There are many templates (not all are free so be careful)
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<thead>
<tr>
<th>Date</th>
<th>Class</th>
<th>Homework due by this date</th>
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<tbody>
<tr>
<td>January</td>
<td>27 What is science education? What does it look like and where is it found?</td>
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<tr>
<td>February</td>
<td>3 Science through 1800s-1910</td>
<td>DeBoer (1991), Chapters 1-4</td>
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<td>10 <strong>No class—work on research project</strong></td>
<td>Investigate where to commit to doing your science ed in action project</td>
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<td>17 Science Education 1900-present day</td>
<td><strong>Submit proposal for sci ed in act project</strong></td>
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<td>24 Current practices: goals/standards</td>
<td>Next gen science standards (online)</td>
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<td>March</td>
<td>3 Current practices: scientific practices, argumentation, modeling</td>
<td>Student discussion leaders: argumentation, modeling</td>
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<td>10 Current practices: educational contexts</td>
<td>Student discussion leaders: informal, urban</td>
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<td>Spring break</td>
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<td>24 Current practices: equity issues Gender, race, ESL</td>
<td>Student discussion leaders: gender, race, ESL</td>
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<td>31 <strong>No class—work on research project</strong></td>
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<td>April</td>
<td>7 Current practices: Motivation</td>
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<td>14 Current practices: technology</td>
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<td>21 Current practices: Teacher knowledge</td>
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<td>28 Current practices: assessment</td>
<td><strong>Participation paper due</strong></td>
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<td>May</td>
<td>5 Peer feedback on poster</td>
<td><strong>Bring 3 copies of a small version of your poster for peer review</strong></td>
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<tr>
<td>May</td>
<td>12 Poster session</td>
<td><strong>Poster due</strong></td>
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