ED 834 – DESIGNS OF SCIENCE LEARNING ENVIRONMENTS  
Wednesdays, 9:00 a.m. - 12:00 p.m.  
Room 2334 SEB

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734-647-2975 (office phone)  
Office Hours: by appointment

CTools: Log onto the CTools site (www.ctools.umich.edu) with your uniqname and password. You will see a tab titled EDUC 834 001 W13. I will use this site to communicate with you, as well as post all course materials (e.g., weekly reading, handouts, assignments). You will use this site to post to forums, submit assignments, etc. It is your responsibility to check CTools regularly. Please let me know if you do not have regular Internet access.

COURSE DESCRIPTION
“Rather, the master question from which the mission of education research is derived: What should be taught to whom, and with what pedagogical object in mind? That master question is threefold: what, to whom, and how? Education research, under such a dispensation, becomes an adjunct of educational planning and design. It becomes design research in the sense that it explores possible ways in which educational objectives can be formulated and carried out in the light of cultural objectives and values in the broad” (p. 408, italics in original).


Course Overview
This course will focus on issues of, and related to, design, specifically in the context of science learning environments. Throughout the semester, we will interrogate text, talk with designers, visit designed spaces to investigate their learning affordances, and engage in design work ourselves. We will examine concepts of design in a wide variety of science learning environments from K-12 education, teacher education (pre- and in-service), informal education (e.g., science centers and museums), and science labs. We will also explore research methods that enable researchers to study designed environments. Lastly, because we will focus on the designs of science-related learning environments, we will delve into perspectives on human learning and deconstruct designed learning environments in order to investigate the perspectives on learning that have informed the designs.

The following questions will guide our work:
1. In any given design context, what is meant by “design”?
2. In any given design context, what are the apparent design principles in play?
3. In any given design context, what perspective(s) on learning is/are in play?
4. How do we create equitable designs for science learning and what do we mean by equitable in any given context?
Course Objectives
In order to interrogate the course’s guiding questions…

1. Participants will engage a broad conception of “design” and “science learning environments” (e.g., K-12 school science instruction, curriculum, & assessment; informal science spaces such as museums; teacher education, science labs).
2. Participants will dialogue with designers.
3. Participants will explore issues of equity with respect to design.
4. Participants will learn more about design-based research methods (e.g., DBR, DBIR, studio pedagogy).
5. Participants will design a draft of a science learning environment or artifact, and accompanying design documentation, including how they might go about researching elements of their design.
6. Participants will continue to hone their competencies related to academic literacies (especially identifying, interpreting, and producing academic arguments).

COURSE POLICIES
Course Evaluation
Grades are based on total points earned. No curve is used. The course grading scale is as follows:

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<thead>
<tr>
<th>Percent Range</th>
<th>Corresponding Grade</th>
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<tbody>
<tr>
<td>94% - 100%</td>
<td>A</td>
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<tr>
<td>90% - 93%</td>
<td>A-</td>
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<tr>
<td>88% - 89%</td>
<td>B+</td>
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<td>84% - 87%</td>
<td>B</td>
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<tr>
<td>80% - 83%</td>
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<td>78% - 79%</td>
<td>C+</td>
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<td>74% - 77%</td>
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<td>70% - 73%</td>
<td>C-</td>
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<td>68% - 69%</td>
<td>D+</td>
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<td>64% - 67%</td>
<td>D</td>
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<tr>
<td>60% - 63%</td>
<td>D-</td>
</tr>
<tr>
<td>Below 60%</td>
<td>F</td>
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</tbody>
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NOTE: See “Course Assignments and Projects” for a list of course assignments and their accompanying points.

Additional Policies and Expectations
1. Academic and Professional Integrity
It is expected that all members of this learning community will conduct themselves with integrity related to all aspects of our academic and professional lives. This includes making certain that plagiarism never occurs. If you are unsure about how to correctly attribute ideas, words, work, etc. to others, please ask. Please refer to the following website for specific policies and procedures related to academic and professional integrity:
http://www.soe.umich.edu/file/academic_integrity/
2. Accessibility
Every member of this learning community has the right to full participation. If you need an accommodation(s) for a disability, please let me know at your earliest convenience. We can work with Services for Students with Disabilities (http://ssd.umich.edu/) to ensure that your learning is fully supported. I will, of course, keep our discussions private and confidential.

3. Discrimination/Harassment
No member of this learning community should be subject to discrimination of any kind and/or harassment, as these practices have no place in a just society. Please refer to the following websites for University policies related to discrimination and harassment:
http://urespect.umich.edu/report/what/#Report3
http://www.rackham.umich.edu/policies/discrimination_harassment/

4. Diversity/Social Justice
It is my intention to facilitate this course in ways that acknowledge and respect all aspects of diversity. This includes respect for ideas and practices related to gender, sexuality, disability, religion, age, socio-economic status, race, ethnicity, and culture. Not only must we have respect for each other relative to diversity but we must also examine how issues of diversity interact with the designs of learning environments and artifacts.

5. Classroom Community
Our work together relies on honest, open, and respectful dialogue so that all participants feel free to express their views. Disruptive behavior (e.g., inappropriate language, talking over others, harassing others) has no place in our course and will result in the loss of participation points at the very least. Here are a few guidelines to help facilitate our conversations and activities each week:
   a. **There is no such thing as a stupid question.** Please ask any and all questions that you have and remember that by asking your questions, you are allowing us to learn as a community because you are helping to make ideas visible.
   b. **Be respectful of others’ ideas and experiences** even if they are different from your own. We do not have to agree but we do owe it to each other to listen to and consider each other’s points of view. On a related note, please respect confidentiality both in the class and outside of it.
   c. **Listen to others** by trying not to interrupt until whoever is talking is finished and until you have heard and considered what others have said. **Do not assume that silences are unproductive.** Give others time to think, consider, and formulate ideas.
   d. **Monitor your participation.** If you are outgoing and tend to dominate conversation, use this course as a chance to practice allowing others a space to participate. If you are less outgoing and tend to let others do the talking, use this course as an opportunity to practice speaking up and adding to the conversation.
   e. **Please turn cell phones off or to vibrate** before each class session out of respect for our community. On a related note, **use laptops appropriately** (e.g., note taking, presentations). Unless directly related to this course, please refrain from texting, visiting Facebook, etc. Please **turn off all MP3 players.**
6. Attendance, Participation, and Communication
Regular, on-time attendance and thoughtful participation during class discussions and other activities are essential not only to your individual performance but also to the success of the course and our community. We all share responsibility for the learning and teaching in this course and beyond. Because you will not be able to participate in the class community if you are not present, absences will result in the loss of participation points, except in cases of extreme circumstances (e.g., family emergency, illness). If you know that you have to miss a class session, please notify me PRIOR to your absence. You are responsible for obtaining all materials (including summaries of class activities and discussions) and making up any missed work. I expect excellent communication (e.g., notifying me prior to any absence, notifying me about any issues regarding assignments).

7. Late Work, Extension Requests, and Revisions
LATE WORK: Unless I state otherwise, all assignments are due on the dates listed in the syllabus. Again, unless I state otherwise, you will be expected to post assignments on CTools (in your DropBox folder) using an agreed upon file name and format.

EXTENSIONS: I will only accept late work in the event of special circumstances (e.g., family emergency, illness). If you need an extension, please talk with me in person or contact me via email or phone. Make sure you contact me prior to any given due date.

REVISIONS: You may revise and resubmit assignments that you submitted on time (this policy does not apply to late work unless I have granted you an extension). You have one week from the time you received feedback to revise and resubmit. In addition to the revised assignment, you must also provide a summary of the revisions you made based on the feedback you received.

8. Format for Assignments & Assignment Submission Guidelines
Unless I note otherwise, all assignments must be typed. Please double-space your work, use 1” margins all around, and use 12 point Times New Roman font. As with all assignments, I expect you to attend closely and carefully to spelling, grammar, and other conventions. When referencing course and other materials, please follow the American Psychological Association style guidelines (APA – 6th edition). You can access the APA style manual through University of Michigan’s libraries or online at http://www.apastyle.org. Purdue University also has a very helpful online APA guide: http://owl.english.purdue.edu/owl/resource/560/01/

COURSE ASSIGNMENTS
NOTE: More information (i.e., detailed assignment guidelines with rubrics, when applicable) will be posted to CTools in a timely fashion and discussed in class.

1. Participation – 5 points per class session; 60 points total – 10% of final course grade
Due Date: Rolling throughout the semester
As noted above, you are expected to participate in all aspects of this course. Participation will take many different forms throughout the semester. For example, I might ask you to bring questions to class, post to a CTools discussion forum, design an activity that relates to the readings, find various web sites, etc. You are expected to come to class having already done the readings and ready to participate in discussions and other activities.
2. Lead a Class Discussion – 60 points – 10% of final course grade
*Due Date: Rolling throughout the semester*
In order to gain practice in facilitating dialogue, you will lead a class discussion over the readings during a week of your choosing.

3. Interview a Designer – 120 points – 20% of final course grade
*Due Date: January 30*
Several people who are involved in design work in a variety of settings and contexts will be speaking with our class this semester. However, in order to gather even greater perspective, you will interview someone who designs environments and/or artifacts for science learning. In the course of reflecting on this interview, you will compare and contrast your interviewee’s perspectives with those found in the readings and discussed in class.

4. Analysis of a Science-Related Designed Learning Environment or Artifact – 120 points – 20% of final course grade
*Due Date: February 27*
You will analyze, using course readings, course focal questions, discussions, etc., a science-related designed learning environment or artifact. This might be a piece of curriculum, a syllabus from a course, a museum exhibit, a segment of instruction, a science-related “serious” video/computer game, a professional development experience, etc.

5. Design Some Aspect of a Science-Related Learning Environment or Artifact & Draft Accompanying Research Proposal – 240 points – 40% of final course grade
You will gain some practice designing a science-related learning environment or artifact and then draft a research proposal that you would use to study your design in context.
   -- Design Ideas Document (due Jan. 16; 20 points)
   -- Elaborated Design Idea & Target Scenarios of Use (due Feb. 13; 20 points)
   -- Annotated Bibliography (due March 27; 50 points)
   -- Final Design Documentation (including proposed research plan) (due on or before April 22; 150 points)
**NOTE: We will have two different design studio days (Feb. 20, and then April 10/17). You will be able to workshop your designs during these studios and receive feedback from your peers.**

**COURSE SCHEDULE***
*I reserve the right to revise this schedule whenever necessary.*

**WEEK 1 – JANUARY 9, 2013 – FRAMING SCIENCE EDUCATION**

**READINGS:**
→ Chapters 2, 3, & 4
ASSIGNMENTS:
1. Draft the Design Ideas document. Upload to your DropBox on CTools before the start of class next week. Be ready to share and workshop your ideas.
2. Begin thinking about an interviewee. We will discuss specific assignment guidelines for this interview next week in class.

WEEK 2 – JANUARY 16, 2013 – INTRODUCTION TO DESIGN IN EDUCATION

**NOTE: CLASS WILL END AT 11:15/11:30 TODAY.**

READINGS:

OPTIONAL READINGS:
*Available online at: http://www.edc.org/CCT/ccthome/reports/trl.html

ASSIGNMENTS:
*Solidify your interviewee. Interviews are due on Jan. 30.

WEEK 3 – JANUARY 23, 2013 – INFLUENCES ON EDUCATIONAL DESIGN

READINGS:

ASSIGNMENTS:
1. Remember that interviews are due next week. Upload your work to your DropBox on CTools before class begins.
2. Begin to draft your elaborated design project idea, including your target scenarios of use. This document is due on Feb. 13.

**WEEK 4 – JANUARY 30, 2013 – DESIGN & ENGINEERING EDUCATION**

**GUEST SPEAKERS: PROFESSOR CHARLES DERSHIMER AND MRS. DEBI PARIZEK (CLASS HELD IN DESIGN LAB 3 - DUDERSTADT DIGITAL MEDIA COMMONS/MLIBRARY/NORTH CAMPUS)**

**READINGS:**


**ASSIGNMENTS:**

1. Begin to think about what science-related designed learning environment or artifact you would like to analyze. Analyses are due on Feb. 27.

2. Continue drafting your elaborated design project idea, including your target scenarios of use. This document is due on Feb. 13.

**WEEK 5 – FEBRUARY 6, 2013 – DESIGN & ENGINEERING EDUCATION**

**CONTINUED…**

**GUEST SPEAKERS: MRS. MARY BETH DANN AND DR. SHANNA DALY**

**READINGS:**


**ASSIGNMENTS:**

1. Your elaborated design project idea, including your target scenarios of use, is due before class next week. Upload this document to your Dropbox on CTools.

2. By Sunday event (2/17), post (using the CTools Forum) a short description of your design work (what you are designing and why), as well as one or two questions that you have at the moment about how to move forward with your design work. We will have our first studio day on Feb. 20. You will be paired with several classmates during the first studio in a “speed dating” type of format called a “speed critique” or a “speed crit” for
short. Your CTools forum post will ensure that your speed crit partners are read to give you feedback.

3. Solidify what science-related designed learning environment or artifact you would like to analyze. Analyses are due on Feb. 27.

**WEEK 6 – FEBRUARY 13, 2013 – SCIENCE EDUCATION CURRICULUM DESIGN**

**GUEST SPEAKER: PROFESSOR BETSY DAVIS**

**READINGS:**

**ASSIGNMENTS:**
1. Remember that by Sunday event (2/17) you should post (using the CTools Forum) a short description of your design work (what you are designing and why), as well as one or two questions that you have at the moment about how to move forward with your design work. This will ensure that your speed crit partners are read to give you feedback.
2. Analyses of science-related designed environments or artifacts are due on Feb. 27.
3. Begin to compile categories of literature (and sample pieces within each category) that will help undergird your design work. Annotated bibliographies are due on or before March 27.

**WEEK 7 – FEBRUARY 20, 2013 – DESIGN OF LABORATORY/RESEARCH SPACES & FIRST STUDIO DAY (SPEED CRITIQUES)**

**READINGS:**
⇒ Chapters 1 & 6
⇒ NOTE: You can download this publication for free at: [http://www.nap.edu/catalog.php?record_id=11311](http://www.nap.edu/catalog.php?record_id=11311)
ASSIGNMENTS:
1. Remember that your analysis of a science-related designed learning environment or artifact is due next week. Please upload your analysis to your Dropbox in CTools.
2. Continue to compile categories of literature (and sample pieces within each category) that will help undergird your design work. Start to read the sample literature you are compiling. Annotated bibliographies are due on or before March 27.

WEEK 8 – FEB. 27, 2013 – SCIENCE EDUCATION CURRICULUM DESIGN CONT…
GUEST SPEAKER: PROFESSOR GINA CERVETTI

READINGS:
*A compilation of text from Professor Cervetti’s curriculum design work.

ASSIGNMENTS:
*Continue to compile categories of literature (and sample pieces within each category) that will help undergird your design work. Continue to read the sample literature you are compiling. Annotated bibliographies are due on or before March 27.

WEEK 9 – MARCH 6, 2013 – NO CLASS/SPRING BREAK
ASSIGNMENTS:
1. Continue to compile categories of literature (and sample pieces within each category) that will help undergird your design work. Continue to read the sample literature you are compiling. Annotated bibliographies are due on or before March 27.
2. First design studio will take place on March 20. This studio will take the form of a speed critique or “speed crit.” You will be paired with several classmates throughout the session and will have time to share your design work and ask for feedback.

WEEK 10 – MARCH 13, 2013 – TECHNOLOGY-FACILITATED LEARNING ENVIRONMENTS
GUEST SPEAKER: PROFESSOR CHRIS QUINTANA

READINGS:


ASSIGNMENTS:
1. Continue to work on your annotated bibliographies. They are due on or before March 27.
2. Our 2nd (and last) studio day will take place on April 10 and April 17 (you must sign up for one of these dates). Each designer will bring a prototype (draft) (e.g., storyboards, handout, some other type of visual that is representative of the work). Each designer will also detail a “problem of design” (i.e., the design problem, issue, etc. on which the presenter wants feedback. First we will have a panel format (each designer briefly his/her “problem of design”), and then we will split into groups and rotate among designers.
3. Final Design Documentation is due on or before April 22.

WEEK 11 – MARCH 20, 2013 – TEACHING AND PROFESSIONAL DEVELOPMENT

READINGS:

ASSIGNMENTS:
1. Annotated bibliographies are due next week. Please upload to your DropBox on CTools.
2. As a reminder, our 2nd (and last) studio day will take place on April 10 and April 17 (if you haven’t already done so, you must sign up for one of these dates). See March 13th’s “assignment” section of the syllabus for details.
3. Final Design Documentation is due on or before April 22.

WEEK 12 – MARCH 27, 2013 – DESIGN OF SCIENCE-RELATED ASSESSMENTS
GUEST SPEAKER: PROFESSOR NANCY SONGER

READINGS:

ASSIGNMENTS:
1. As a reminder, our 2nd (and last) studio day will take place on April 10 and April 17 (if you haven’t already done so, you must sign up for one of these dates). See March 13th’s “assignment” section of the syllabus for details.
2. Final Design Documentation is due on or before April 22.

**WEEK 13 – APRIL 3, 2013 – DESIGNS IN “INFORMAL” SCIENCE SPACES**

**GUEST SPEAKERS: MS. ANN HERNANDEZ & MS. NICHOLE SCHMIDT**

**NOTE:** We will meet at the Starbucks on Main & Liberty from 9:00-9:45 for our readings discussion and we will then travel to the Ann Arbor Hands-On Museum to meet with Ann and Nichole.

**READINGS:**


→ Chapters 1 & 5

→ **NOTE:** You can download this publication for free at: [http://www.nap.edu/catalog.php?record_id=12190](http://www.nap.edu/catalog.php?record_id=12190)


**ASSIGNMENTS:**

1. As a reminder, our 2nd (and last) studio day will take place next week and on April 17. See March 13th’s “assignment” section of the syllabus for details.

2. Final Design Documentation is due on or before April 22.

**WEEK 14 – APRIL 10, 2013 – 2ND DESIGN STUDIO & RESEARCHING DESIGNS**

**READINGS:**


**OPTIONAL READINGS:**


ASSIGNMENTS:
1. The second half of our 2\textsuperscript{nd} design studio will take place next week. See March 13\textsuperscript{th}’s “assignment” section of the syllabus for details.
2. Final Design Documentation is due on or before April 22.

\textbf{WEEK 15 – APRIL 17, 2013 – 2\textsuperscript{ND DESIGN STUDIO (CONTINUED…)} & EQUITY & DESIGN, SYNTHESIS}

\textbf{READINGS:}

ASSIGNMENTS:
*Final Design Documentation is due on or before April 22.