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## Course Description

This course provides a studio-based, hands-on, and participatory approach to the development and research of technology tools and curriculum materials.

The course will introduce participatory design models for the development and research of educational materials through a studio-based, materials development project. The course integrates three emerging ideas into a studio experience where education students and technology students will pool their disparate, yet necessary and complementary knowledge and skill sets to work with a teacher to design, program, develop learning activities, field test and revise a curriculum sequence.

The course builds on three major ideas emerging from recent research on technology and learning. The first idea is that the use of domain-specific tools can make the difference in learning conceptual material. For example, in mathematics, tools can transform normally obscure ideas and concepts with multiple, vivid and linked representations and ways to engage in inquiry. The second idea is that even the best software is unlikely to engage learning or be used widely and/or effectively unless it is compatible with and linked to curriculum materials (such as teacher guides, student problems and activities, and assessments). The third idea emerging from recent research is that achieving an effective level of technology integration is virtually impossible without the direct involvement of developers *and* teachers with the design, development and research processes.

Completed projects will have the chance to be chosen as exemplars for similar courses in universities nationwide, or if they are in mathematics, for widespread publication through the Math Forum (the largest on-line community for math teachers).

The course arranges resources for the work including:

- Workshops/tutorials to help brush up on skills or use new development tools.
- Weekly drop-in sessions for groups with faculty and TA
- Access to a project coach/mentor and an education-related content area expert

Each project team will engage in the following activities:

- Work with a multi-skilled team including education students, computer science students or others.
- Design and develop a technology tool and accompanying curriculum activities in conjunction with a teacher who will act as a client and field test the materials
- Field test the curriculum materials under real classroom conditions, using research and field test methods and processes
- Create and prioritize a revision list and possibly implement one or two items from the list
- Read and review literature concerning theories and practices of curriculum and software design as well as technology use in mathematics and science classrooms
- Review current educational technologies and curriculum materials to delineate best features and best development processes and best teaching practices.

## Texts & Resources:

Bransford, J. et. al. (2000). How people learn. Washington, DC: National Academy Press. (also available at [<http://www.nap.edu/html/howpeople1/>]. NOTE: Don't buy the summary book. The text we use is 374 pages)

Dewey, J. (1997 [1938]). Experience and Education. New York: Simon & Schuster.

Wiggins, G. & McTighe, J. (1998). Understanding by design. Alexandria, VA: Association for Supervision and Curriculum Development.

Hom, J. (1998). The Usability Methods Toolbox. <http://jthom.best.vwh.net/usability/>

## Class Composition:

<b>Student Background:</b>	<b>We hope you'll bring:</b>	<b>What you can get out of the course:</b>
Computer Science/ Symbolic Systems	Basic programming skills (Java, Flash?)/knowledge of software development	<ul style="list-style-type: none"> <li>• Understanding of relationship between content and design</li> <li>• Experience collaborative development process with designers and teachers (non-technical stakeholders)</li> <li>• Product-related field research process and techniques</li> <li>• Gain understanding of special needs of education environment</li> <li>• Possibility submit materials for publication on the Math Forum</li> <li>• Advances technology, rapid development of component -based solutions</li> </ul>
LDT/Industrial Engineering	Knowledge of design practices (HCI)/Interest in product development process	<ul style="list-style-type: none"> <li>• Hands-on experience managing the R&amp;D process</li> <li>• Collaborative design process with programmers &amp; teachers</li> <li>• Product-related field research process and techniques; project management</li> <li>• Gain understanding of special needs of education environment</li> <li>• Possibility to submit materials for publication on the Math Forum</li> </ul>
SUSE/LSTD/CTE	Content and teaching knowledge/foundations of education/interest or knowledge of R&D process	<ul style="list-style-type: none"> <li>• Curriculum development in conjunction with technology tools</li> <li>• Collaborative design process with designers, programmers &amp; teachers (learn how to communicate with technical developers)</li> <li>• Product-related field research process and techniques</li> <li>• Gain understanding of special needs of education environment</li> <li>• Possibility to submit materials for publication on the Math Forum</li> </ul>

## **Week 1: January 11**

**Course introduction, participatory design, get to know you, and demos**

### Assignments in Progress:

Reflective Assignment explained

## **Week 2: January 18**

**Addressing collaboration and the need to attend to it regardless of prior experience. Discuss learning needs and how applet technology can support learning. Pre-project survey.**

### Readings DUE:

How People Learn: Ch 1-Introduction and Ch 9-Technology to Support Learning

Muller, M.J. (2002) Participatory design: the third space in HCI. In the human-computer interaction handbook: fundamentals, evolving technologies and emerging applications, Lawrence Erlbaum Associates, Inc., Mahwah, NJ.

### Assignments DUE:

- Reflective assignment (post to Blackboard by 11:59pm January 16<sup>th</sup>)
- Take a look at postings of 3 classmates

### Assignments In Progress:

-Work on technology review project (with at least one other person)

## **Week 3: January 25**

**Technology in schools, organizing for observations and forming teams with teachers.**

### Readings DUE:

How People Learn: Ch 3-Learning and Transfer

Goldman, S.V. (2001). Technology in the Mathematics Classroom: Guidelines from the Field. ERIC Update, 22(2), pp. 1-6.

Scaife, M., Rogers, Y., Aldrich, F. & Davies, M (1997) Designing For or Designing With? Informant Design For Interactive Learning Environments. CHI 1997: 343-350

Soloway, E., Guzdial, M., & Hay, K.E. (1994) Learner-centered design: the challenge for HCI in the 21st century, interactions, v.1 n.2, p.36-48, April 1994

### Assignments DUE:

- Technology review project—groups present in class

### Assignments in progress:

- Meet with partner-teacher and arrange observations during week 4
- Begin brainstorming ideas for an appropriate development tool
- Dewey pre-read

## **Week 4: February 1**

### **Identifying pedagogical styles, technology and content alignment and preparing for observation.**

#### Readings DUE:

Dewey, J (1938). Chapters 1 and 9. *Experience and Education*. New York: Simon and Schuster.

Collins, A. (1996). Design issues for learning environments. In S. Vosniadou, E. D. Corte, R. Glaser, & H. Mandl (Eds.), *International perspectives on the design of technology-supported learning environments* (pp. 347-361). Mahwah, NJ: Erlbaum.

Norman, D. (2002) Chapter 7. *The Design of Everyday Things*. Basic Books.

#### Assignments DUE:

Dewey pre-read. Bring to class.

#### Assignments in Progress:

Classroom observations and write-ups

Journal #1: early group impressions and process

## **Week 5: February 8**

### **Development work. Alignment between tools and other curriculum materials.**

#### Readings DUE:

*How People Learn*. Chapter 6. Design of Learning Environments.

Wiggins, G. and McTighe, J.(1998) *Understanding by Design*. Chapters 1, 4 and 5

Gruen, D., (2000). Storyboarding for Design: An Overview of the Process. CUE Technical Report #00-03. IBM Watson Research Center.

#### Assignments DUE:

Classroom observations/teacher meeting write-up

Journal #1: Early group impressions and process

Email to [booker@stanford.edu](mailto:booker@stanford.edu) and [emercier@stanford.edu](mailto:emercier@stanford.edu) before class.

#### Assignment in Progress

- At least 2 prototypes (i.e. paper/user tests with at least 2 people before week 6)
- Meet with content expert by week 6 (we'll arrange someone for you to meet with)
- Teacher meetings about prototypes

## **Week 6: February 15**

### **Reviewing prototypes and discussing final project direction**

#### Readings DUE:

Gould, J.D. & Lewis, C. (1985). Designing for Usability: Key Principles and What Designers Think. Communications of the ACM, 28(3), pp. 300-311.

#### Assignments DUE:

Present 2 prototypes and reflections on testing outcomes

#### Assignments in progress:

- Product outlined in GORP
- 2<sup>nd</sup> round of prototype user testing with one refined idea—emphasis on curriculum integration
- Journal #2 : review of collaboration and what you're learning from group members

## **Week 7: February 16**

### **Revisiting collaboration and preparing for field testing**

#### Readings DUE:

Gruen, D., (2000). Beyond Scenarios: The Role of Storytelling in CSCW Design. CUE Technical Report #00-02. IBM Watson Research Center.

Becker, H. Problems of inference and proof in participant observation. (1969) In G.J. McCall & J.L. Simmons (Eds) Issues in Participant Observation: A text and reader. Addison-Wesley Publishing Company: Reading, MA.

Coffey, J.E. (2003) "Involving Students in Assessment." In J.M. Atkin & J.E. Coffey (Eds.) Everyday Assessment in the Science Classroom. National Science Teachers Association, NSTA Press: Arlington, VA.

#### Assignments DUE:

- Product outlined in GORP
- Update on project – tool & curriculum integration
- Journal #2 : review of collaboration and what you're learning from group members

#### Assignments in Progress:

Prepare for in-class practice field test

## **Week 8: March 1**

### **Draft of Project due, practice field test in class with class members**

#### Assignments DUE:

- Field test during class time with class members to prepare for school field test.

#### Assignments in progress:

- Field test in classroom
- Reflection on field test
- Preparing for final presentations and final deliverables

## **Week 9: March 8**

### **Part 1 of Presentation Fair**

#### Assignments DUE:

- Field/user test report:
  - What you learned
  - Ideas for improvement (if you were doing a next round)

#### Assignments in progress:

Journal #3: reflection on learning and collaborative process

## **Week 10: March 9**

### **Part 2 of Presentation Fair and Final Write-ups**

#### Assignments DUE:

##### -Curriculum Fair

- Have your software up with an activity for others to complete or for you to demonstrate
- Have curriculum guide/materials ready for use
- A poster for your curriculum project
- Analysis/critique of the group process
- Analysis/critique of the user tests

-Final Journals submitted including a write up of analysis/reflection on collaborative process