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Cognition, Collaboration, and Technology
Instructor: Dr. Cindy Hmelo-Silver

Thursday 4:50- 7:30
GSE 314
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How computers can serve as cognitive, metacognitive and social tools?
What effects do multimedia, simulations, and modeling tools have on learning?
In what ways can technology be used to support student collaboration and reflection?
How can we understand the effects *with* and effects *of* computer-based learning environments

This seminar will tackle these questions as we consider cognitive, constructivist, and sociocultural approaches to learning and teaching with technology. A myriad of educational technology has been developed over the last decade, much of it based on psychological research on how people think and learn. We will explore a number of technologies ranging from those that provide information such as hypermedia to technologies that support collaborative learning to those that provide expressive media for learners. We will discuss factors that are important to the success and failures of these approaches as well as exploring the research issues inherent in these learning environments. We will examine the nature of knowledge construction, collaboration, and distributed cognition by discussing the relevant literature, demonstrations of different examples of these technologies. In addition, we will consider some of the Web 2.0 technologies and look to the future to see how these might be important in education.

Course requirements:

1) Class attendance is mandatory. This will be a discussion-based seminar and being here is half the fun. Class participation will account for 10% of the class grade. Any absences above 2 will lead to a grade reduction.
2) Lead a discussion: All students will lead discussions on 1-2 readings (10% of grade). The discussion should open with the 5 key points of the readings—this should take no more than 5 minutes with another 10 minutes allotted to a software demo (see 3). Discussion questions should be posted by the 11:00 the night before class in the discussion board.
3) Demonstrate software: All students will demonstrate an exemplary piece of software and explain the learning sciences principles underlying the software design as part of leading the discussion (10%).
4) Reflect and participate in online blogs and discussion (15%)—All students will post reflections and discussion questions on their blog by 8:00 pm the night before class. You should respond to at least 2 other students' blogs each week. You can access the blogs through Sakai.
5) Learn a tool: All students will learn to use a new tool such as NetLogo, HubNet, FLE3, Boxer, Squeak, Second Life, etc. (15%). Demonstration of minimal proficiency is negotiable. You may develop a portfolio that demonstrates your proficiency (this can include intermediate products enroute to your final project such as code examples, CDs, etc. with an explanation of how these show proficiency and reflections on how you went about learning).

6) Project proposal (5%). This will allow you to get early feedback. Due March 24. This should be 2-3 pages with appropriate figures that lays out clearly what your project team will be doing. It should be clear which option you are choosing for your project (see below).
7) Final project. (35% of grade). You are encouraged to work on these projects in teams.

There are two options for this:

a. Design a learning environment . Make sure that you do human-centered design: begin with a group of people with a need, and show how you can use technology to meet that need. Begin by doing interviews with 3-6 members of your target user group. Each team member must do at least 2 interviews.

    i. For each design decision, explain why you made the decision you made.

    ii. Write a 'scenario' of your learning environment in use--tell a fictional story of one or two people coming to use the site, and what they do on the site.

    iii. Cite the readings in your analysis. Where appropriate, note possible alternate design approaches and explain why you chose the approach you did. Compare and contrast your proposed site to existing sites, especially those we've viewed in class.

    iv. In a paint program, powerpoint or other prototyping tool or by hand, prepare designs for all the main screens of your system. Include these in your paper. It is not necessary to write any code or do any actual implementation work.

    v. In your paper, make sure to cite the course readings and include a detailed bibliography.

    vi. This is not an exercise in science fiction-- please make your design technically realizable. Do not include features that require major technological advances to achieve.

Include a page in your paper noting who on your team did what.

Grading criteria:

- Insight into design, usability, and usefulness issues
- Writing
- Background research
- Attention to detail
- Use of readings

b. Evaluate a learning environment. This might involve a usability study in trying to use a learning environment to achieve a task or possibly the use of a tool to design a learning environment. It might also involve trying to understand how learners work with a learning environment or piece of educational software. It might also involve studying an online community. This would most likely involve use of existing data. If you collect new data, you may need to check with IRB and get their approval (there are some exceptions for course-related projects).

    i. Consider ways in which the learning environment is successful of not with respect to learning or other goals. For example, if you are evaluating videomosaic.org, you might study how easy it is to locate videos for a

particular professional development goal. If you are looking at video of students using a software, you might examine inquiry practices, motivation, collaboration, etc.

ii. If you plan to do such research, please discuss this with me early in the semester as I have several datasets that could be used and usability projects that I can suggest. In any event, your project must be approved by the instructor before you begin work.

iii. In your paper, make sure to cite the course readings and include a detailed bibliography.

iv. Include in your paper a "methods" section in which you describe how you did your research and analysis.

v. At the end of your paper, include a short description of which team member did what.

Grading criteria

- Quality of writing.
- Attention to detail.
- Quality of field work.
- Thoughtful citation of course readings. Show me that you have done the readings and they have aided in your understanding of what you observed.
- Insight into research issues about the design of online communities.

Tentative Class Schedule

	Date	Topic	Readings	Assignments and activities
1	January 20	**Introduction**	Bush (1945) Review K&S Chapter 3	Blog: Introductions
	January 27	**Overview and the Design of Learning environments**	Goldman-Segall and Maxwell (2003) Kirschner et al., (2004) Recommended: Quintana et al. (2006) Explore short usability tutorial: http://www.utexas.edu/learn/usability/index.html	Blog: Reflections, questions In class: Be prepared to select discussion leaders
2	February 3	**Computers as cognitive tools**	K&S chapter 14, 15, 16 Explore: http://reptools.rutgers.edu/ http://ia.usu.edu/	Blog: Reflections, questions
3	February 10	**Computers as Metacognitive Tools**	K&S chapter 6, 11	Blog: Reflections, questions Initial project ideas, team formation
4	February 17	**Computers as Tools for Inquiry**	Wilensky & Reismann (2006) de Jong (2006) Linn et al (2006) Explore: http://www.ccl.sesp.northwestern.edu/netlogo	Blog: Reflections, questions
5	February 24	**Computers as Scaffolds**	Reiser (2004) K&S, Chapter 26 http://wise.berkeley.edu/pages/intro/wiseIntro01.html	Blog: Reflections, questions Determine jigsaw assignments for 3/3 class
6	March 3	**Computers as Social Tools**	K&S, All read Chapters 2, Jigsaw: Chapters 16, 20, 21	Blog: Reflections, questions
7	March	**Computers**	K&S Chapters 25, 27	Blog:

	10	**for Knowledge Building**	http://www.knowledgeforum.com/K-12/products.htm	Reflections, questions
8	March 24	**Research methods, and assessment**	K&S chapter 12 Van Aalst & Chan (2007) Clark-Midura & Dede (2010)	Blog: Reflections, questions Project proposals due
9	March 31	**Mobile computing**	Guest facilitator: Tim Zimmerman Additional reading TBA	Blog: Reflections, questions
10	April 7	**Multimodal literacies and new media** **Class via Adobe connect**	Jewitt (2008) Barron et al. (2010) K&S chapter 1	Blog: Reflections, questions
11	April 14	**Online communities, virtual worlds, games**	K&S Chapter 18 Fields & Kafai (2009) Explore: Second life or whyville,	Blog: Reflections, questions
12	April 21	**Video as a tool for learning**	Derry et al.(2006) Hmelo-Silver et al. (2010) K&S Chapter 16 Explore: videomosaic.org http://stellar.wcer.wisc.edu/Dev/kw/SignIn/pbl/step01 (id: demo2; password: testing2)	Blog: Reflections, questions
13	April 28	**Technology in the schools**	K&S Chapter 13, 19, 22	Blog: Reflections, questions
14	May 5	**Project presentations**		

Required Readings:

Khine, M. S. & Saleh (2010). *The new science of learning: Cognition, computers, and collaboration in education.* New York: Springer.

To access Khine & Saleh (2010):

- Log in to the Rutgers Libraries
- Go to "Find Articles"
- Select springerlink
- Search for "New Science of Learning" and you should be able to access the chapters individually.

Additional Readings (subject to modification)

Bush, V. (1945). As we may think. *Atlantic Monthly.* Available at http://www.ps.uni-sb.de/~duchier/pub/vbush/vbush-all.shtml

Davis, E. A. (2003). Prompting middle school science students for productive reflection: Generic and directive prompts. *Journal of the Learning Sciences, 12*, 91-142. Available online from RU library.

de Jong, T. (2006). Technological advances in inquiry learning. *Science, 312*, 532-533.

Derry, S. J., Hmelo-Silver, C. E., Nagarajan, A., Chernobilsky, E., & Beitzel, B. (2006). Cognitive transfer revisited: Can we exploit new media to solve old problems on a large scale? *Journal of Educational Computing Research, 35*, 145-162.

Fields, D., & Kafai, Y. B. (2009). A connective ethnography of peer knowledge sharing and diffusion in a tween virtual world. *ijCSCL, 4*, 47-68.

Goldman-Segall, R. & Maxwell, J.W. (2003). Perspectivity technologies: Computers, the Internet, and new media for learning. In W. Reynolds & G Miller's *The comprehensive handbook of psychology, Volume 7.* American Psychological Association Handbook. Wiley.

Hmelo-Silver, C. E., Maher, C. A., Agnew, G., Palius, M. (2010). The video mosaic: Design and preliminary research. In *Proceeding of ICLS 2010*. Gomez, K., Lyons, L., & Radinsky, J. (Eds.) Learning in the Disciplines: *Proceedings of the 9th International Conference of the Learning Sciences (ICLS 2010) - Volume 2* (pp. 425-426). International Society of the Learning Sciences: Chicago IL.

Kirschner, P., Strijbos, J.-W., Kreijns, K., & Beers, P. J. (2004). Designing electronic collaborative learning environments. *Educational Technology Research and Development, 52*, 47-66.

Linn, M. C., Lee, H.-S., Tinker, R., Husic, F., & Chiu, J. L. (2006). Teaching and assessing knowledge integration in science. *Science, 313*, 1049-1050.

Pea, R. D. (2004). The social and technological dimensions of scaffolding and related theoretical concepts for learning, education, and human activity. *Journal of the Learning Sciences, 13*, 423-451.

Reiser, B. J. (2004). Scaffolding complex learning: The mechanisms of structuring and problematizing student work. *Journal of the Learning Sciences, 13*, 273-304.

Sharples, M., Arnedillo-Sáchez, I., Milrad, M., & Vavoula, G. (2009). Mobile learning: Small devices, big issues. In S. Ludvigsen, N. Balacheff, T. d. Jong, A. Lazonder & S. Barnes (Eds.), *Technology-enhanced learning: Principles and products* (pp. 233-249). Dordrecht: Springer.

van Aalst, J., & Chan, C. K. K. (2007). Student-Directed Assessment of knowledge building using electronic portfolios. *Journal of the Learning Sciences, 16*, 175-220.

Wilensky, U. & Reisman, K. (2006). Thinking Like a Wolf, a Sheep or a Firefly: Learning Biology through Constructing and Testing Computational Theories -- an Embodied Modeling Approach. *Cognition & Instruction.*