CS 8113R
ISyE 8100B
LCC 6003B
Educational Technology
Winter 1994

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Time: TTh 4:30-6pm	**Location**: Physics 204
Units: 3	**Prerequisites**: Graduate Standing

Course Information

Description

Many have claimed that technology can serve as the catalyst for changing education and training in revolutionary ways. In this course we will survey existing theoretical approaches to learning (e.g., apprenticeship learning, constructionism), technologies (e.g., intelligent tutoring systems, microworlds), and styles (e.g., collaborative learning).

Course Requirements

Readings. All students are expected to read assigned articles before the day they are to be discussed.

Moderated debate structure. Two groups of students will be assigned responsibility for presenting the readings for each topic. The first group will be expected to present the system(s) discussed, identify the target student, review the underlying learning and pedagogical theories, and describe the basic modes of interaction. The second group will be expected to address shortcoming and limitations of the discussed approach(es).

Group presentation should last about 30 minutes and will include a written synopses of major points for other participants in the class. These synopses are to be made available via Gopher/WWW and News. This partly distributes detailed readings, though all students are expected to be familiar with the content of these papers.

Term Paper or Project. Group projects or papers are encouraged, and considerable latitude will exist in determining the project's focus. Deliverables for the project will include a class presentation using visual aids and a written report.

The last meeting(s) will be devoted to student presentations of projects. Presentation of the project should last about fifteen minutes, including a couple of minutes for questions and discussion.

A detailed project or paper proposal is due on the date indicated. The proposal should describe the problem, and the method of approach.

Homework Assignments. Two homework assignments will be distributed during the quarter, and are due on the date indicated. Again, groups of students may work on these (though we will have higher expectations of group homework assignments and will evaluate them more critically).

Classroom participation. Volume and quality are sometimes confused, but not here. Students who do not speak at length in class should have an opportunity to demonstrate their grasp of the readings and assignments.

Due Dates:

- Jan 27. Homework 1
- Feb 3. Project Proposal
- Feb 22. Homework 2
- Mar 8 and 10. Presentations of projects
- March 16. Final projects due

Topics and Readings

Additional or replacement papers and topics may be unearthed during the course of the quarter, depending on students' interests.

Topic 1 : Introduction and Overview. Jan 6

Topic 2 : Why? Jan 11

Collins, A. (1991). The Role of Computer Technologies in Restructuring Schools. *Phi Delta Kappan*, September, 73(1), 28-36.

Papert, S. (1993). Obsolete Skill Set: The 3 Rs. *Wired.* May/June, pp 50-51.

Soloway, E., Guzdial, M. and Hay, K. (1992). Reading and Writing in the 21st Century. *EDUCOM*, January/Febuary.

Topic 3 : Microworlds. Jan 13

Papert, S. (1980). Mindstorms: Children Computers and powerful ideas. Chapter 5. New York: Basic Books.

diSessa, A and Abelson, J. (1986, September). Boxer: A reconstructible computational medium. *Communications of the ACM.*

Topic 4 : Constructionism. Jan 18

Papert, S. (1991). Situating Constructionism. In Harel, I. & Papert, S. (Eds.), *Constructionism.* Norwood, NJ: Ablex.

Resnick, M. (1991). Overcoming the Centralized Mindset: Towards an Understanding of Emergent Phenomena. In Harel, I. and Papert, S. (Eds.) *Constructionism.* Norwood, NJ: Ablex.

Harel, I. & Papert, S. (1991). Software Design as a Learning Environment. In Harel, I. & Papert, S. (Eds.), *Constructionism.* Norwood, NJ: Ablex.

Topic 5 : Intelligent Tutoring Systems. Jan 20

Wenger, E. (1987). *Artificial Intelligence and Tutoring Systems*, Chapter 2. Los Altos, CA: Morgan Kaufman.

Clancey, W and Soloway, E. (1990). Artificial Intelligence and Learning Environments: Preface. *Artificial Intelligence* **42**, pp. 1-6.

Anderson, J.R., Boyle, C.F., Corbett, A.T. and Lewis, M.W. (1990). Cognitive modeling and intelligent tutoring. *Artificial Intelligence* 42, 7-49.

Topic 6 : Intelligent Tutoring Systems. Jan 25

Reiser, B., Kimberg, D., Lovett, M., and Ranney, M. (1992). Knowledge representation and Explanation in GIL, an intelligent tutor for programming. In Larkin, J. and Chabay, R. (Eds), *Computer-Assisted Instruction and Intelligent Tutoring Systems: Shared Goals and Complementary Approaches.* Hillsdale, NJ: Erlbaum.

Vasandani, V., & Govindaraj, T. (1993). Knowledge organization in intelligent tutoring systems for diagnostic problem solving in complex dynamic domain. Manuscript submitted for publication.

Brown, J.S. (1989). Toward a New Epistemology for Learning. In C. Frasson and J. Gauthier (Eds.), *Intelligent Tutoring Systems at the Crossroad of AI and Education.* Norwood, NJ: Ablex.

Topic 7 : ITS Demonstrations. Jan 27

Topic 8 : Student Modelling. Feb 1

Van Lehn, K. (1988) Student modeling. (pp. 55-78) In M.C. Polson, J. J. Richardson (Eds.) *Foundations of intelligent tutoring systems.* Hillsdale, NJ: Lawrence Erlbaum Associates, Inc., Publishers.

Pirolli, P. (1986). A cognitive model and computer tutor, *Human-Computer Interaction*, **12**, 319-355.

Katz, S., Lesgold, A., Eggan, G., Gordin, M. (1992). Modelling the Student in Sherlock II. *Journal of Artificial Intelligence in Education*, 3(4), 495-518.

Topic 9 : Interactive Learning Environments (ILS). Feb 3

Kass, A., Burke, R., Blevis, E., and Williamson, M. (in press). Constructing Learning Environments for Complex Social Skills, *Journal of the Learning Sciences.*

Schank, R. et al. (1991). Case-Based Teaching: Four Experiences in Educational Software Design.

Topic 10 : Interactive Learning Environments. Feb 8

Soloway et al., (1992). Technological Support for the Learning and doing of Design. In Jones, M. and Winne, P. (Eds.), *Adaptive Learning environments*, NATO ASI Series, Vol F85, Berlin: Springer-Verlag.

White, B. and Frederiksen, J. (1990). Causal model Progressions as a Foundation for Intelligent Learning Environments, *Artificial Intelligence*, **42**, 99-157.

Topic 11 : Coaching/Apprenticeship Learning. Feb 10

Collins, A., Brown, J.S., and Newman, S. (1989). The new apprenticeship: Teaching students the craft of reading, writing, and mathematics. In L. B. Resnick (Ed.), *Cognition and Instruction: Issues and Agendas.* Hillsdale, NJ: Lawrence Erlbaum Associates.

Collins, A. (1991). Cognitive Apprenticeship and Instructional Technology. In Idol, L. and Jones, B.F. (Eds.), *Educational values and cognitive instruction: Implications for reform.* Hillsdale, NJ: Lawrence Erlbaum Associates.

Topic 12 : Coaching/Apprenticeship Learning. Feb 15

Burton, R.R. and Brown, J.S. (1982). An investigation of computer coaching for informal learning activities. In D. Sleeman and J.S. Brown (Eds.), *Intelligent Tutoring Systems* (pp. 79-98). New York: Academic Press.

Lajoie, S. and Lesgold, A. (1989). Apprenticeship Training in the Workplace: Computer-Coached Practice Environment as a New Form of Apprenticeship. *Machine-Mediated Learning*, **3**, pp 7-28.

Topic 13 : Collaborative Learning. Feb 17

Scardamalia, M., Bereiter, C., McLean, R., Swallow, J., and Woodruff, E. (1989). Computer-supported intentional learning environments. *Journal of Educational Computing Research*, Vol 5(1), pp. 51-68

Scardamalia, M., and Bereiter, C. (in press). Computer-Support for Knowledge-Building Communities. *Journal of the Learning Sciences.*

[optional] Fischer, G., Grudin, J., Lemke, A., McCall, R., Ostwald, J., Reeves, B., Shipman, F. (1992). Supporting indirect collaborative design with integrated knowledge-based design environments. *Human-Computer Interactions*, vol.7, no.3, p.281-314.

Topic 14 : Collaborative Learning. Feb 22

Lesgold, A., Katz, S., Greenberg, L., Hughes, E., Eggan, G. Extensions of Intelligent Tutoring Paradigms to Support collaborative Learning.

Roschelle, J. (1992). Learning by collaborating: Convergent conceptual change. *The Journal of the Learning Sciences*, **2**, pp. 235-276.

Topic 15 : Multimedia/Hypermedia. Feb 24

Spiro, R. and Jehng, J. (1990). Cognitive Flexibility and Hypertext: Theory and Technology for the Nonlinear and Multidimensional Traversal of Complex Subject Matter. In Nix, D. and Spiro, R. (Eds.), *Cognition, Education, and MultiMedia: Exploring Ideas in High Technology.* Hilldale, NJ: Erlbaum.

[optional] Florin, F. "Section 1: Applications Researchers". In Ambron, S. and Hooper, K. (Eds.), *Learning with Interactive Multimedia.* Microsoft Press.

Topic 16 : Multimedia/Hypermedia Demonstrations. Mar 1

Topic 17 : Computer Networks. Mar 3

Pea, R. and Gomez, L. (1992). Distributed Multimedia Learning Environments: Why and How? *Interactive Learning Environments*, **2**, pp 73-109.