

P600/R680 Seminar: Interactive Tools for Learning (3 Cr)

(i.e., Interactive Tools for a Learning Community)

Spring 1995, Mondays 5:45-8:25

Distance Educ. Suites: Room 2140 (IU-B) & Room ES3138E (IUPUI)

Enroll in Either: **CEP** (P600, Section 5885) or **IST** (R680, Section B587)

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Course Description: The use of computers as educational tutors, tools, and tutees was advocated over a decade ago by Robert Taylor. While these three metaphors continue to promote innovative ideas about technological bridges to human learning, in this seminar, the notion of the computer as an educational tool will be prominent. We will consider how a range of educational tools (e.g., hypermedia, groupware, microworlds, electronic databases and retrieval mechanisms, notecards and planning aids, idea processors, scientific computer probes, grammar checkers, and animation and graphical aids) can accomplish differing learning goals. Though we advocate a student-centered learning approach, we hope to provide a roadmap to some of the key human learning and development principles underlying each of these technologies. Clearly, this course will be applicable to students interested in teaching or conducting research with computer tools. While we wrestle with cognitive, instructional, and sociocultural theory issues, we shall ground this discussion with researchable questions, actual tool development dilemmas, and school implementation possibilities. This class will incorporate an assortment of lectures, demonstrations, videos, and small and large group discussion activities, with IU students at both IU-Bloomington and IUPUI. Using these rich intercampus resources, we hope to design unique tools and curricula while discovering exciting conferences, campus resources, and success stories. After the course, students should be able to: appreciate the diverse application of learning technologies, design plans to use technology as a learning tool, understand that knowledge is not possession but access, and perceive new knowledge construction and peer collaboration prospects.

Required Texts:

1. E. Barrett (Ed.). (1992). *Sociomedia: Multimedia, Hypermedia, & the Social Construction of Knowledge*. Cambr: MIT.
2. Susan Lajoie & Sharon Derry (Eds.). (1993). *Computers as Cognitive Tools*. Hillsdale, NJ: Erlbaum.
3. *Course Book of Readings: A copy is in each respective library.*

Tentative Tasks and Grading:

30 pts/15%	A. Weekly Attendance and Class Participation (15%)
50 pts/25%	B. Weekly Electronic Starter and Wrapper Composing (<i>Due twice: Weds by noon; Must participate each week</i>) Grading: (1) Insight; (2) Clarity/Logic; (3) Original; (4) Complete: Depth/Breadth (5) Fdbk/responsive.
40 pts/20%	C. Definitions and Taxonomy of Cognitive Tools and Sociomedia (<i>Draft due Feb 20th; Final due March 6th</i>) Grading: (1) Ideas/Orig; (2) Flow/Unity; (3) Rel. Drawn/Relevant; (4) Complete: Breadth/Depth.
80 pts/40%	D. Major Project: Eight Options (<i>Due: Draft due Feb 27th; Final due April 10th</i>) Grading: (1) Review Lit/Purpose; (2) Hypoth/Questions/Intent; (3) Method/Proced; (4) Activity/Design; (5) Implics/Future; (6) Richness/Unique; (7) Coherence/Logic; (8) Complete: Breadth/Depth.
200	Total Points

We will use a point system for each project, evenly dividing points among aspects of each assignment. Total points will determine your final grade. We will use the following grading scale:

A+ = 193 or more points
A = 185-192 points
A- = 180-184 points
B+ = 174-179 points
B = 166-173 points

B- = 160-164 points
C+ = 153-159 points
C = 145-152 points
C- = 140-144 points
F/incomplete = no work received or significantly inadequate/impaired

Class Tasks:

A. Weekly Attendance and Participation. (15%--30 points = 15 points for attendance; 15 points for participation)

Because unique activities will be incorporated into each class, it is your responsibility to experience them. To maximize your learning, a combination of reading, verbal and written reactions to ideas, observing demonstration videos, and hands-on activities will be critical to your growth as a class. *Participation is encouraged at all times.*

B. Weekly Electronic Starter and Wrapper Composing. (25%--50 points)

We want to either create a newsgroup or have us use e-mail distribution lists for this class to reflect on the weekly reading, demonstrations, and discussions. Here, we can reflect and write thought papers on issues that are: theoretical or practical, recent or long-evolving, general or specific, relevant to class or work, etc. Each weekly thought piece or reflection activity will be about a concept or idea you found useful in thinking about your own teaching/learning/research (not mindless idea doodling). You must sign up once to be a starter of the upcoming week dialogue and one time to be a wrapper upper. During the remaining weeks you remain an active participant. *Starters and wrappers are responsible for their task by Wed at 12:00 (i.e., noon) of their assigned week(s). Please turn in a copy of typed papers, logs, and newsgroup contributions during the final class period (April 24th).*

As a starter, you might: (1) state reactions, questions, and suggestions for the upcoming readings; (2) point out the relationship of upcoming week topic or articles to past lectures or readings; (3) discuss the position of a pioneer the field or get everyone to write to him/her; (4) discuss a recent visit to a technology center, exhibit, school, or corporate setting using computer tools; or (5) generally relate to prior learning/discussion.

As a wrapper upper, you might: (1) react and reflect on lecture, discussion, or demonstration; (2) summarize and reflect on that weeks starter's initial points and prior week discussion; (3) point out questions and concerns that have yet to be answered; or (4) note any related current, future, or additional readings, or (5) react to a guest speaker's ideas or a unique class activity.

As a weekly participant, you might (1) get involved in the discussion; (2) answer questions and concerns; (3) question or respond to a peer at IU or IUPUI; (4) bring up a current issue, newspaper article, or governmental proposal; or (5) point to a conference coming up on this topic.

C. Definitions and Taxonomy of Cognitive Tools and Sociomedia (20%--40 points)

Two key indicators of learning here: (1) visual; and (2) verbal interpretation. How do these readings fit together? We want you to begin to indicate--through a visual representation--just what you have internalized by depicting the cognitive and sociomedia tools in your field of study. Maximum visual representation size is a folded 11 X 17 sheet of paper. First of all, give us some important terms here (perhaps 20-30 words) and provide broad tool-related definitions. Then link terms into common categories that relate to particular weekly discussions or important concepts. Above these categories provide a listing a learner-centered psychological and design principles. You might to create one overarching taxonomy of tools in your field. Or perhaps, you will prefer multiple taxonomies. Secondly, we want you to verbally describe what this visual representation of broad tool definitions, categories, and principles represents. Please summarize and interpret your visual display in a 2-3 page single-spaced paper. *First drafts are due Feb 20th; final reports March 6th.* (See Tidbit for Week 1 by Park and Hannifin for an example).

D. Major Project: Eight Options (40%--80 points)

With the eight options listed below, you have a chance to experiment with or observe the uses of technology tools in schools and nontraditional learning environments, propose a totally unique software tool, or provide help to your peers. We will discuss these briefly during the final class period. You have a choice of the following: (A) Naturalistic Study; (B) Research Intervention; (C) Research/Grant Proposal; (D) Tool Design Proposal; (E) Curriculum Integration Proposal; (F) Research Presentation; (G) Educational Tool Demonstration; (H) Usable Class Product. A joint pilot research project with a fellow student or faculty member is a possibility. CAUTION: For option A or B, you may need human subjects approval before proceeding. *Brief 2-4 paragraph written summaries of your topic is due prior to Feb. 27, while the project is to be completed by April 10th.*

Weekly Reading (typically we will read 3 of 4 articles)

Week 1. (Jan 9th) Trends in Computers as Cognitive and Sociomedia Tools

Cog Tools: Preface
Sociomedia: Intro

Week 2. (Jan 16th) Linking Tools to Learner Centered Psychological Principles

Cog Tools:
Ch. 3: Lepper et al., Motiv techn of expert human tutors: Lessons for design of computer-tutors
Ch. 10: Katz & Lesgold, The role of the tutor in computer-based collab lrng situations
1. Brown, J. S. (1985). Process versus product: A perspective on tools for communal & informal elect lrng
2. Kozma, R. B. (1987). The implications of cognitive psychology for computer-based learning tools.
3. Knuth & Cunningham (1991). Tools for constructivism
4. Pea & Gomez (1992). Distrib multimedia lrng environments: Why and how?

Week 3. (Jan 23rd) Learner Centered Design

5. Soloway, Kuzdial, & Hay (1994). Learner-centered design: The challenge for the 21st century.
6. Salomon, G. (1990). Cognitive effects with and of computer technology. Communication Research.
7. Belland. (1985). The inverse tool principle
8. Scott, Cole, Engel (1992). Computers and Educ: A Cultural Constructivist Perspective.

Week 4. (Jan 30th) Multimedia Composition and Knowledge Construction

Cog Tools:
Ch. 7: Lehrer, Authors of knowledge: Patterns of hypermedia design
Sociomedia:
Ch. 11: Landow, Bootstrapping hypertext: Student-created docs, Intermedia, & the soc cons of know
Ch. 15: Murray, Restruct space, time, story, and text in advanced multimedia envirs.
9. Horney (1991). Uses of hypertext.
Skim: 10. Spiro & Jehng (1990). Cog flex & hypertext: Theory & tech for nonlinear & multidim trav of complex.

Week 5. (Feb 6th) Writing Tools for Idea Generation and Cognition Enhancement

Cog Tools:
Ch. 6: Salomon, On the nature of pedag computer tools: The case of the Writing partner
11. Bonk, C. J. & Reynolds, T. H. (1990). The Dev of Children's Wtg Aware & Perf W/i a Gen\Eval Frame.
12. Bonk et al. (in press). The social and cognitive transformation of workplace writing environments.
13. Kellogg, R. T. (1989). Idea processors: Computer aids for planning and composing text.
Skim: 14. Salomon, Perkins, & Globerson, (1991). Partners in cognition: Extending human intell with intell tech.

Week 6. (Feb 13th) Distance Writing Collaboration Tools and Computer-Mediated Communication

Sociomedia:
Ch. 21: Adelson & Jordan, The need for negotiating in coop work
15. Bonk et al. (1994). Cooperative hypermedia: The marriage of collab wtg and mediated environments.
16. Neuwirth et al. (1993). Why write--together--concurrently on a computer network?
17. Schrage (1990). Ch 6: Approp tools: Ones that work; Ch 8: Collaborative tools: A first look
Skim: 18. Egido (1990). Teleconferencing as a techn to support coop work: Its possib and limitations

Week 7. (Feb 20th) Internet, Mosaic, World Wide Web, and Other Information Systems

Sociomedia:
Ch. 2: Slatin, Is there a class in this text: Creating know in an elect classroom
Ch. 7: Burnett, Multimedia and the library and the info studies curriculum
Ch. 23: Boy, Computer integrated documentation.
19. Ann Brown et al. (1993). Distributed expertise in the classroom.

Week 8. (Feb 27th) Science Tools for Collaboration in a Learning Community

Cog Tools:

Ch. 11: Schauble, Raghavan, Glaser, The disc & reflec notation: A graph trace for support self-reg

Sociomedia:

Ch. 19: Wilson, Engineering-design instructional computer system (EDICS)

Ch. 20: Gal, Computers and design activities: Their mediating role in engineering education.

20. Bonk (1993). Review of Labnet

Skim 21. Pea (1993), The collaborative visualization project

Week 9. (Mar 6th) Science Tools for Conducting Inquiry

Cog Tools:

Ch. 8: Teasley & Roshelle, Constructing a jt prob space: The computer as a tool for shar knowledge

Ch. 9: Lajoie: Computer enviro's as cog tools for enhancing learning

Sociomedia:

Ch. 17: Anderson, Medical center: A modular hypermedia approach to prog design

Skim: 22. Grant (1993). Wireless coyote: A computer-supported field trip.

Skim: 23. Rubin, (1993). Video labs: Tools for scientific investigation

Week 10. (Mar 20th) Math Tools for Problem Solving and Problem Representation

Cog Tools (read either Ch 1 or 4; must read Ch 5):

Ch. 1: Koedinger & Anderson. Reify impl plnng in geometry: Guide for model intell tutor sys des

Ch. 4: Derry & Hawkes, Local cognitive modeling of p/s behav: An application of fuzzy theory

Ch. 5: Ruesser, Tutoring systems and pedagogy theory: Rep tools for under, planning, & refl in ps'ing

24. Schwartz, J. (1989) Intell mirrors: A step in the direction of making schools knowledge-making places.

25. Bransford et al. (1990). Anchored instruction: Why we need it and how technology can help.

Week 11. (Mar 27th) Computer Programming and CAD Systems for Designing Knowledge

26. Soloway (1993) Reading and writing in the 21st century

27. Palumbo (1990). Programming language/problem solving research: A review of relevant issues.

28. Salomon G. & Perkins, D. N. (1987). Transfer of cognitive skills from programming: When and how.

29. Papert, S. (1993). The Children's Machine, Chapter .

Week 12. (Apr 3rd) Music, Art, Visualization, and Animation Tools for Creativity and Critical Thinking

Sociomedia:

Ch. 18: Davis, Prototyping multimedia: Lessons from the visual computing grp at Proj Athena Center

30. Schorr, J., (1994). Smart think: Eight programs that help you think creatively and plan. Macworld.

31. Pogrow, S. (1990). A Socratic approach to using computers with at-risk students.

32. Lakin (1990). Visual languages for coop: A performing medium approach to systems for coop work.

Week 13. (Apr 10th) Virtual Reality, Intelligent Tools, and Other Dreams of Reality

Sociomedia:

Ch. 3: Carlson, Varieties of virtual: Expanded metaphors for computer mediated learning.

33. Honebein, Duffy, & Fishman (1991). Constructivism & des of lrng enviro: Context & auth activs for lrng.

34. Resnick, L. B., & Johnson, A. (1988). Intell machines for intell people: Cog theory & future of CAL.

35. Dede, C. (1989). Workstation 2005: A few minutes of occupational educ in year 2005. Authorware, 2(1).

Skim: 36. Dede (1992). The future of multimedia: Bridging to virtual worlds

Week 14. (Apr 17th) Student Self Selection Week

Pick a Journal (or a book):

Communication of the ACM, (1993). 36(5), Soloway: Technology and education.

Computers in the Schools, (1994). 10(1-4), Reed: Anniv issue on hyper/multimedia in the schools

Educational Psychologist, (1992). 27(3), Lehrer: New directions in technology-mediated learning

Educ. Technology, (1991). 31(5) Duffy & Jonassen: Spec issue of constructivism for educ. tech.

Educ Technology (1993). 33(11) Schwen, Goodrum, & Dorsey: Spec issue: Dev of enriched lrng enviro

Harvard Educ. Review, (Feb or May, 1989). Visions for the use of computers in classroom instr.

Week 15. (Apr 24th) Cognitive and Sociomedia Tools Recap

Cog Tools:

Ch. 12: Chipman, Gazing once more into the silicon chip: Who's revolutionary now?

Ch. 13: Lesgold: Information tech and the future of education.

Sociomedia:

Ch. 25: Turkle, Paradoxical reactions & powerful ideas: Educ computing in a dept of physics.

37. Landauer, T. K. (1988). Education in a world of omnipotent and omniscient technology.

Week 1-15 Extra Tidbits:

38. Week 1 Park & Hannifin (1993). Empirically-based guidelines for the design of interactive multimedia

39. Week 2 APA/McREL: (1993). Learner centered psych principles: Guidelines for school reform and redesign.

40. Week 3 Edutopia (1993-94; & 94-95), Newsletter of the George Lucas Educational Foundation

41. Week 4 E. Brown & Chingell (1993). Lrng by linking: Pedagogical envirs for hypermedia authoring; Intermedia

42. Week 5 Salomon et al. (1989). The computer as a zone of proximal devel: Intern metacog from rdg part

43. Week 6 Wolfe (1989). Hypertextual perspectives on educ computer conferencing.

44. Week 7 (a) TERC: The Global Lab Project; (b) World School for Adventure Learning: Executive Summary

45. Week 8 Fulton, K. (1993). Teaching matters: The role of technology in education

46. Week 9 Bank Street College of Education (1993). Newsletter: Telecommunication and Teachers

47. Week 10 Optional Resp to Schwartz: Bredo (1989). Responses to "visions for use of computers in the class

48. Week 11 Papert, S., Literacy & letteracy in media ages; Inventing the future: Schools should be more like play

49. Week 12 Bonk, C. J. (1987). Thinking Skills and the Computer: One Possibility.

50. Week 13 Chaiklin, S. & Lewis, M. W. (1988). Will there be teachers in the future?...But we don't think of that.

51. Week 14 Conference Announcements: CSCL '95 Conf in Bloomington, Oct, 1995; ISTE, Orlando, FL, Feb. 1995.

52. Week 15 Nickerson, R. S. (1988). Technology in educ: Poss influences on context, purposes, content & methods.

Summary of Eight Major Project Options:

A. Naturalistic Study: You might perform a case study or pilot observation of workers/students using tools or teachers interacting with employees/students while they use a tool or curriculum application. For instance, you might decide to complete a case study of a child, young person, or adult using a software tool for the first time; including at least five careful observations and commentary of the person and tutor/teacher. The commentary should reflect your learning and provide insights as to how to make this tool more educationally meaningful. If you are looking at student-teacher-tool interaction patterns, teacher guidance, or simply tool use, you will need to design coding schemes and observation log sheets to help interpret tool functionality in this environment (*see reverse for details*).

B. Research Intervention: In Option B, you might want to try to use and analyze a specific task, tool, or theory. Based on your interests and existing theory, you should form specific research questions before your intervention. Though your study can take many forms, the research report you submit should detail the purpose and framework of the intervention (i.e., why was this particular project chosen), include a literature review, method section, a description of what occurred (were you successful?), explanation of the results, and possibilities for extending this study (*see reverse for details*).

C. Research/Grant Proposal: Option C can be either a grant or research proposal. In this option, students must write a paper on a possible study of thinking skills related to the use of new technologies within education which: (1) extends/modifies the research, or (2) suggests a totally unique but reasonable research project/study. It may be either a quantitative intervention or qualitative (e.g., ethnographic) study. It should include a(n): introduction, brief review of the important literature, methods section (e.g., hypotheses, subjects, materials/resources, variables, procedure, instruments, and anticipated analyses), and discussion of expected results (including the meaning and relationship to the field). Your proposal can be within any aspect of technology tools for impacting learning and thinking. You may target any age group or population (*see reverse for details*).

D. Tool Design Proposal: Choose Option D if you would you like to design a unique educational tool or at least propose the design of a unique educational tool, instructional design model, or unique curriculum application of an existing tool. Instructional design does not need to include any programming. However, it must clearly indicate: (a) the purpose (e.g., the skills addressed); (b) how it might be implemented; (c) the advantages of using this tool, theory, or application to accomplish your educational goals; (d) possible grant sources for programming or design; (e) a mock-up sample of design documents; and (f) description of applicable learner centered design principles.

E. Curriculum Integration Proposal: Here you might contemplate the curriculum impact of one or more learning tools. How are you going to use it? What would change? What training would there be needed for successful use? How might faculty, students, administrators, and parents react to all this? Include a description of tool, how it could or should be used in traditional or nontraditional learning, and what you believe to be its strengths and weaknesses.

F. Research Presentation: Again, in the spirit of an interactive seminar, the purpose of this option is to allow for student input and also provide practice in presenting information in the style required for conferences. Here, you are to orally present a research proposal or synthesize aspects of the research or readings for the class wherein you point out a new direction that researchers or teachers might want to head. Presenters should meet with us prior to the presentation in order to discuss the topic and proposed organization of the presentation. Given time constraints, the presentation length will be no longer than 20-25 minutes (*see reverse for details*).

G. Educational Tool Demonstration: You might want to demonstrate a software tool that is promoted for an educational setting such as a library, corporate training center, computer lab, museum, zoo, classroom, or learning center. See the instructors about the possibilities of demonstrating a particularly interesting tool you have found.

H. Usable Class Product: Students choosing Option H will create or perform a meaningful activity for the class. For example, you might summarize the learning principles embedded in all the articles we read this semester, uniquely categorize the tools studied, summarize the weekly class e-mail comments and questions, or create a database summarize major themes and trends in a technology or psychology journal for a 3-5 year period. Your final report, however, will be your own design as there is no preconceived format.

Sample Format Option A or B. Naturalistic/Research Activities: (8-16 pages)

- I. Title Page (Name, affiliation, topic title, acknowledgements)
- II. Topic Literature and Method (7-14 pages)
 - 1. Res topic & materials; 2. Brief stmt of problem and why impt (1-2 pages)
 - 3. Brief review of the relevant literature (3-4 pages)
 - 4. Methods: (2-6 pages)
 - a. Subjects & design (i.e., who/how selected); 2. Materials/setting (i.e., hard/software, text)
 - c. Procedure (i.e., how data was obtained)
 - d. Coding Schemes & Dep. meas/instr (i.e., how segment/code data); e. Analyses or comparisons
- III. Results and Discussion 1. Preliminary Results; 2. Discussion of results (4-8 pages)
- IV. References (APA style: see syllabus for example)
- V. Appendices (e.g., pictures, charts, figures, models, tests, scoring criteria, coding procedures)

Sample Format for Option C or D. Inquiry or Tool Design Grant Proposal: (14-20 pages)

- I. Title Page (Name, affiliation, topic title, acknowledgements)
- II. Review of the Literature (6-12 pages)
 - 1. Intro to Tool or Problem (purpose, history, importance) (1 page)
 - 2. Review of Relevant Lit (contrast related tools and relevant literature on the topic) (6-9 pages)
 - 3. Stmt of Design Questions or Hypoth (what do you expect to occur) (1 page)
- III. Method Section (3-7 pages)
 - 1. Tool Design (i.e., common features) or Subjects (i.e., sample, who and how assigned to groups)
 - 2. Tool Configuration (i.e., requirements) Or Setting (i.e., hardware, software, text, models, figures)
 - 3. Tool Options (e.g., windows, linkage features) or Dependent measures/instruments (i.e., tests)
 - 4. Tool Development Process (i.e., timeline) or Procedure (i.e., training);
 - 5. Other (e.g., related tools) or Other (e.g., coding, other materials);
 - 6. Pilot Tests, Anticipated Analyses or Comparisons
- IV. Results and Discussion (OPTIONAL) 1. Antic/dummied results; 2. Disc. of results
- V. References (APA style: see syllabus for example)
- VI. Appendices (e.g., pictures, charts, figures, models, tests, scoring criteria, coding procedures)

Sample Format for Option F. Research Presentation (20-25 minutes)

- I. Title of Topic
 - II. Purpose or Rationale for Study or Product
 - 1. Current dilemma in field, confusion, or need
 - III. Review of Existing Literature
 - 1. Intro to Topic/Problem (purpose, history, importance)
 - 2. Review of Lit (contrast relevant literature on the topic)
 - 3. Stmt of Hypoth/Res Q's (what do you expect to occur)
 - IV. Method Section
 - 1. Subjects and design (i.e., sample, who and how assigned to groups)
 - 2. Materials/setting (i.e., hardware, software, text, models, figures)
 - 3. Dependent measures/instruments (i.e., tests)
 - 4. Procedure (i.e., training); 5. Other (i.e., coding, other materials); 6. Exp analyses or comparisons
 - IV. Results and Discussion (OPTIONAL) 1. Antic/dummied results; 2. Disc. of results
 - V. Visuals (e.g., pictures, charts, figures, models, tests, scoring criteria, coding procedures)
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Sample Grading of Major Project (80 Total Points or 10 pts each dimension)::

- 1. Review of the Problem/Lit/Purpose (*interesting, relevant, current, organized, thorough, grounded*)
- 2. Hypothesis/Research Questions/Intentions (*clear, related to class and theory, current, extend field*)
- 3. Method/Procedures (*subjects/age groups approp, materials relevant, timeline sufficient, controls*)
- 4. Research Activity/Design/Topic/Tool (*clear, doable/practical, detailed, important*)
- 5. Implications/Future Directions (*generalizability, options available, short term and long-term focus*)
- 6. Overall Richness of Ideas (*richness of information, elaboration, originality, unique*)
- 7. Overall Coherence (*unity, organization, logical sequence, synthesis, style, accurate*)
- 8. Overall Completeness (*adequate info presented, explicit, relevant, precise, valid pts*)