Using Multimedia In Classroom Presentations: Best Principles

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Overview of Classroom Media Use

The content of an introductory psychology course (and the supporting textbooks) is constantly evolving in response to advances in research and theory. The instructional methods and tools used in the course have also evolved, reflecting shifts in both the preferred pedagogical approaches and in the technological infrastructure available to the instructor and the students. Our goal in this paper is to identify some of the best practices in computer-enhanced classroom instruction. We will begin with some lessons learned from the past two decades of research and classroom experience with instructional technology. We will then consider how these principles can be applied to the use of computer-based technology (PowerPoint, Keynote, Flash, and web pages) in class lectures.

History of Media Use

In a sense, teaching has always been a “multimedia” enterprise; instructors have typically spoken aloud to, drawn pictures, and attempted demonstrations for the benefit of their students. What has changed has been the evolving technology available for combining and delivering that information. Instructors who began teaching in the 1960s or 1970s probably remember a time when the chalkboard was the main form of instructional media used in psychology classrooms, perhaps supplemented by mimeographed handouts and occasional glimpses of a sheep brain, an operant chamber, or a plastic model of an eyeball. These instructors may recall the enthusiasm with which students greeted the introduction of “new technologies” such as photocopied illustrations, slides depicting visual illusions, filmstrips with audio narration, and especially full-motion 16-millimeter films with reenactments of classic experiments.

As classroom technology continued to improve, the 1980s saw the introduction of overhead transparencies and videotapes, while the 1990s gave us first videodiscs and then CD-ROMs, the World Wide Web, and eventually digital projectors with the mixed blessings (see Atkinson, 2004b) of Microsoft PowerPoint. Technological innovation has accelerated in the first decade of the new century, with digital projectors as standard features in most classrooms, and CD-ROMs or DVDs accompanying many textbooks. Most classrooms (and dorm rooms) have high-speed Internet connections that allow reasonable-quality video streaming, and many students now bring wireless laptops, tablet computers, or hand-held devices into the classroom setting.

Rationale for Multimedia Use

Why would any instructor want to use multimedia materials in the classroom? To a certain extent, psychology instructors have adopted these new types of media simply “because they could.” As each improvement in technology became available (in many cases with the support of textbook publishers), instructors who saw themselves as “hip, cool, and hi-tech” quickly incorporated the new tools, correctly perceiving that slick
multimedia presentations have a certain amount of entertainment value for students. However, this rationale misses the point; in fact, the use of multimedia materials has substantial grounding in cognitive theory and research—although, as is often the case, the research evidence followed the widespread use of these materials rather than preceded it.

Several dozen studies indicate that computer-based multimedia can improve learning and retention of material presented during a class session or individual study period, as compared to “traditional” lectures or study materials that do not use multimedia (see Bagui, 1998; Fletcher, 2003; Kozma, 2001; Mayer, 2001). According to Najjar (1996), this improvement can be attributed mainly to dual coding of the information presented in two different modalities—visual plus auditory, for example (Clark & Paivio, 1991; Paivio, 1986)—leading to increased comprehension of the material during the class session, and improved retention of the material at later testing times (Mayer & Moreno, 1998). There is general agreement that multimedia presentations are most effective when the different types of media support one another rather than when superfluous sounds or images are presented for entertainment value—which may induce disorientation and cognitive overload that could interfere with learning rather than enhance learning (Mayer, Heiser, & Lonn, 2001).

Finally, a number of studies have suggested that student satisfaction and motivation is higher in courses that use multimedia materials (Astleitner & Wiesner, 2004; Yarbrough, 2001). In one particularly large study, Shuell and Farber (2001) examined the attitudes of over 700 college students toward the use of computer technology in twenty courses representing a wide range of academic disciplines. Students were generally very positive about the use of technology, although females rated the use of technology for learning and classroom instruction somewhat lower than did their male peers.

However, not everyone is excited about the new technology. On the basis of negative anecdotes described on student evaluations and in discussions at professional conferences, we can conclude that some students and some instructors have had bad experiences with multimedia in the classroom. It is important to keep in mind that a poorly developed and/or executed use of multimedia can do more harm than good (Daniel, in press).

In our opinion, these negative experiences often seem related to lack of experience with computer technology, instructors allowing the program to direct the flow of the course, or to overly optimistic expectations about the media (or to underpowered projectors that necessitate dimming the room lights). Our own classroom experiences, combined with the research evidence, lead us to summarize the potential pedagogical value and rationale for using classroom media in these three points:

- **To raise interest level** -- students appreciate (and often expect) a variety of media
- **To enhance understanding** -- rich media materials boost student comprehension of complex topics, especially dynamic processes that unfold over time
- **To increase memorability** -- rich media materials lead to better encoding and easier retrieval
Instructional Techniques for Appropriate Multimedia Use

Prepare a Class Plan. The class plan is perhaps the most important resource for the successful use of multimedia materials, because it guides the selection of media and provides the context for each media element. Conceived of in this way, multimedia programs and materials are tools to direct attention and emphasize key points that are best understood visually rather than all-purpose guides for every point of every lecture. Instructors who begin integrating multimedia into their classes often report that the media use forced them to improve the organization of their class sessions—which may be an added benefit to students.

Develop the Class Plan as a Slideware Presentation. Many instructors use PowerPoint, Keynote, Flash, or a series of linked web pages to organize and present their lecture outline and media. Because PowerPoint is available on nearly 100% of classroom computers, it has become the organizing tool for most instructors. Thus we will focus our comments on PowerPoint, even though we recognize that other tools have some specific advantages.

Build In Some Flexibility. One major objection to integrating slideware fully into classroom courses is that it would rob instructors of their flexibility – to diverge from the topic, or go into more depth on one topic, or make an adjustment in response to student questions. The perception of loss of flexibility is related to the amount of planning that it takes to develop a slideware presentation. Once developed, instructors feel that they have to stick to the order and get through all of the content. But there are ways to get around this situation. Remember that less is better when it comes to slideware. By creating guiding bullets as opposed to paragraphs of text, maximizing clarity, strategically including visuals for specific impact rather than just because they may be cute, and minimizing distraction, the slideware becomes more of a guide than a script, allowing instructors to take charge of the flow and use the program to direct it.

There are times, however, when you may want certain resources available just in case students have a particular question or you want the option to talk about a topic at greater depth. Again, slideware does not have to be linear and can be made to accommodate many contingencies. Such flexibility can be accomplished, for example, by creating custom shows (groups of slides arranged by topic) or menus of links to specific slides that you may or may not choose to access.

Fight Against the “Mind-Numbing” Properties of Slideware. Strong criticisms have been leveled against slideware in general and PowerPoint in particular. For example, Tufte (2003) argues that PowerPoint induces a “cognitive style” that encourages passivity and makes a complex issue seem more simple and clear-cut than it is. Here is a summary of Tufte’s criticisms of PowerPoint presentations:
PowerPoint encourages simplistic thinking, with complex ideas being squashed into bulleted lists, and stories with beginning, middle, and end being turned into a collection of disparate, loosely disguised points. This may present a kind of image of objectivity and neutrality that people associate with science, technology, and "bullet points”.

PowerPoint presentations seem designed to guide and reassure a presenter, rather than to enlighten the audience;

PowerPoint encourages the use of unhelpfully simplistic tables and charts, tied to the low resolution of computer displays and the need for text to be readable by a large audience.

PowerPoint lends itself to poor typography and chart layout, especially by presenters who use poorly-designed templates and PowerPoint’s default settings;

PowerPoint’s outline format leads presenters to arrange material in an unnecessarily deep hierarchy, itself subverted by the need to restart the hierarchy on each slide;

PowerPoint’s “click-for-next-slide” mentality enforces a linear progression through the presenter’s hierarchy of ideas (whereas with handouts, readers could browse and explore items at their leisure);

Other experts argue that we should blame the presenter, not the tool, for mind-numbing presentations (Atkinson, 2004a, 2004b; Daniel, in press). Some also argue that cognitive research demonstrates the value of hierarchical organization for comprehension and memory, and point out that the audience generally attends a presentation in order to hear the presenter’s organization of ideas rather than to explore the topic on their own. Many of the criticisms of such presentations are a result of using the program, rather than the lecture outline, to guide the development of the presentation.

Where Possible, Include Animations and Video Clips. Although it requires more effort to locate and insert these types of materials (not to mention the effort involved in creating your own animations and video), research suggests that these materials have a particularly powerful impact on student learning (Mayer & Moreno, 2002). As you go over the material you want to present in class, look for places where an animation or video clip would be particularly helpful in illustrating a dynamic process that changes over time or has multiple stages. Then look for suitable ready-made animations or video segments that you could plug into the presentation. If you can’t locate an acceptable animation, create it yourself, using the simple animation tools built into PowerPoint or Keynote. Even better, enlist the aid of a student or campus technology consultant to help you create it in Flash or some other powerful animation software.

Use Multimedia in Creative Ways. Although multimedia materials may have some value when merely added to a PowerPoint lecture outline, many instructors are exploring ways to incorporate these materials in collaborative learning activities involving case-based scenarios or problem-based exercises (Ludwig & Perdue, in press; Rogers, 2002; Savery & Duffy, 1996).
Some Specific Tips for PowerPoint Presentations

**Designing Presentations**

- **It’s not about you** – Avoid using the presentation as YOUR lecture notes. A presentation is for the audience and their learning is the primary objective. Write your lecture before opening the PowerPoint program and use slides for information that is best presented visually.
- **Minimize text** – Less is better. Narration is better than written words for learning and retention in a classroom context. Clarity, not comprehensiveness, is your primary objective. In most cases, this means using short phrases rather than full sentences in your bullet points.
- **Minimize distractions** – Plain is better than flashy.
  - Select non-distracting and simple backgrounds
  - Select simple, easy-to-read fonts (small fonts annoy audiences)
  - Select simple and smooth transitions
  - Don’t include irrelevant illustrations, animations, or sounds
- **Be strategic** – A good picture is worth a thousand words and a bad one needs explanation. Choose pictures, graphs and videos that clearly demonstrate the point you want to make.
- **Make it yours** – Customize publisher content. The slides that come with the book are outlines of the text. Delete slides to make room for yourself and add your own content to highlight your own objectives and style.
- **Save room for dessert** – Leave room for flexibility, questions, and the occasional tangent.

**Presenting the Material in Class**

- **Cover your backside** – Don’t turn your back on your audience and/or read directly from the slide. Audiences report being annoyed by presenters who simply read their slides. Instead, print out a copy of your bulleted lists and narrate the main points while facing the audience (or orient the classroom computer so that you can view the monitor screen while facing the audience).
- **Be relevant** – Students will write down everything on a slide. To avoid having them writing down point #3 while ignoring your current lecture on point #1, reveal info on the slide as you speak of it.
- **Fade to black (or white)** – There are times when you will want student attention away from the screen and on you or discussion. This can be accomplished by placing a blank slide at relevant points or, by simply hitting your B key (B blackens the screen, B again brings the slideshow back on-screen).
- **Experiment** – Instructor style and learning objectives interact with presentation mode. Try various strategies, evaluate, and select those that work best for you.
Some Concluding Thoughts

If done well, multimedia content organized with a slideware tool can generate productive and stimulating presentations that lead to greater retention, application to new situations, and performance on assessments. If not done well, they can be a distraction from learning and ultimately unproductive.

As the need for visual support varies as a function of content and objectives, the decision to use slideware should be made on a lesson-by-lesson basis. At each step in the process, you should ask yourself if the use of this technology is appropriate for your teaching style, the content, your audience, and your desired outcomes. If you decide that using slideware may have a positive effect on your teaching, it is important that you use it consciously, effectively, and strategically.

As we have watched each wave of improvements in hardware and software, as well as the evolving trends in educational pedagogy, it appears to us that the most important lesson is the necessity of keeping the focus on the instructional goal, not on the technology itself.

Appendix: Getting Started with Multimedia in the Classroom

Get the Right Equipment. The equipment is relatively straightforward, and already widely available in many classrooms (Eskicioglu & Kopec, 2003): a standard computer system equipped with a CD/DVD drive, external speakers, and an internet connection, with the computer output displayed through a digital projector. A TV/VCR may also be required for instructors who have not yet made the transition to an all-digital format, or for the presentation of commercial videotapes that cannot be digitized legally.

Obtain Good Multimedia Content -- Legally. However, the equipment won’t be of much use unless you have a good set of multimedia materials and a carefully developed plan for organizing the entire class session to incorporate the media effectively. In the past, obtaining good media materials was quite a challenge; early adopters of technology often spent many hours scanning images from textbooks and creating their own audio and video clips. Fortunately, many textbook publishers now provide libraries of images, animations, and video segments licensed for use in class—although instructors may still want to augment these collections with other materials.

The same computer technology that facilitates multimedia creation and distribution makes it temptingly easy to obtain materials from a wide variety of sources. Photos may be scanned from magazines, and images and animations may be captured from web pages; for example, search sites such as Google allow a user to scan the Internet for a vast selection of images using a powerful keyword search engine. Audio and video clips may be digitized from videotape or captured from CD or DVD sources, or downloaded from the Internet.
Although the fair use provision introduced by the 1976 Copyright Act grants educators and students remarkable latitude in the use of materials for non-commercial, instructional purposes (United States Copyright Office, 2004; specifically see Section 107 at www.copyright.gov/title17), instructors should be vigilant about the inclusion of copyrighted content in their presentations. If in doubt, it is always wise to seek permission from the copyright holder, or consult with a library media specialist. Some colleges or universities have adopted specific policies about the use of such supplementary materials, including limits on the number of images that may be obtained from a single source, the duration of video that may be sampled (e.g., 10% of a complete film, or three minutes of a television program), or the length of time that an instructor may make the content available to students (e.g., 9 presentations, 45 consecutive days, or a single semester).

Carefully Consider the Pitfalls of Slideware. A good place to start is by reading these key references on the various controversies surrounding PowerPoint presentations.


Then develop your own goals for the use of slideware in your courses, and try to work consistently toward those goals.
References Cited in the Report


Classroom Presentations – Value of Multimedia


   Unpublished manuscript, James Madison University, Harrisonburg, VA. (students who got a more interesting presentation/lecture retained more info than the ones who got a less interesting lecture - no difference due to amount of text: minimal text, minimal text w/ graphics, lots of text w/o graphics)


Erwin, T. D., & Rieppi, R. (1999). Comparing multimedia and traditional approaches in undergraduate psychology classes. Teaching of Psychology, 26, 58-61. (Compared multimedia & traditional sections of psychology courses; multimedia students had higher grades, better attendance and higher satisfaction for some courses but not for others)


Farley, F. H., & Grant, A. P. (1976). Arousal and cognition: Memory for color versus black and white multimedia presentation. The Journal of Psychology, 94, 147-150. (used slide/tape presentation - slides either black/white or color - more Ss in color cond increased retention from short to long-term test; fewer color Ss increased forgetting from short to long-term test)

Giannini, A. J., Giannini, J. N., Bowman, R. K., & Giannini, J. D. (2001). Teaching with symbols tangentially related to topic: Using a linked multimedia approach to enhance learning. Psychological Reports, 88, 403-409. (students heard lecture w/ course content slides only or course content + symbolic slides (art work, etc). - students w/ symbolic slides had higher test scores than those course content slides only)


Head, M. K. (1998, March). Using animated lectures to improve listening skills. Paper presented at the Annual Meeting of the Teachers of English to Speakers of Other Languages, Seattle, WA. (plan to develop audio lectures accompanied by animated illustrations on CD-ROM as a way to enhance the listening and note-taking skills of students)

interest in the course, or self-perceived level of knowledge due to participation in multimedia-based discussion sections of political science course at Northwestern University)

Johnson, L. (2001). The effects of technology on learning. Unpublished manuscript, James Madison University, Harrisonburg, VA. (summary of research examining effects of multimedia presentations in conjunction with gender differences and learning style differences)

Jones, A., & Pappalardo, K. (none). The effect of technology on learning. Unpublished manuscript, James Madison University, Harrisonburg, VA. (audio lecture accompanied by one of three presentations: minimal text, minimal text w/ graphics, lots of text w/o graphics; no differences in test of knowledge due to type of presentation (but did get more correct for "love" topic than "botany" topic)


Larrabee, M. J., & Blanton, B. L. (1999). Innovations for enhancing education of career counselors using technology. Journal of Employment Counseling, 36, 13-23. (Describes continuing education training in the use of multimedia presentations for counselor educators teaching career counseling courses; describes the modules available on CD developed for this training & use in the classroom)

Larson, T. D. (2001). A comparison of fifth grade children receiving both a traditional and a technology based means of instruction in social studies. Master's thesis presented at Johnson Bible College. (students participated in 2 weeks of traditional lecture and 2 weeks of PowerPoint presentations; no difference between two methods in knowledge scores)


McCannon, M., & Morse, G. E. (1999). Using multimedia visual aids in presentations: The demise of the transparency has been greatly exaggerated. TechTrends, 43 (6), 29-31. (surveyed businesses to determine how many use presentation software - 89% of respondents used presentation software - educators must train students to use it as well)

Michas, I. C., & Berry, D. C. (2000). Learning a procedural task: Effectiveness of multimedia presentations. Applied Cognitive Psychology, 14, 555-575. (text only, line drawings only, text + line drawings, video, video stills: text+line drawings > perf & test responses than either alone; video > video still or line drawings alone; video = text+line drawings)


Nowaczyk, R. H., Santos, L. T., & Patton, C. (1998). Student perception of multimedia in the undergraduate classroom. International Journal of Instructional Media, 25, 367-382. (assessed students' perceptions of commercially-prepared mm materials & instructor-prepared mm materials - mm = text slides, slides w/ graphics, slides w/ animation - rated mm favorably but concerned re student-instructor interaction in mm class)

Sammons, M. C. (1995). Students assess computer-aided classroom presentations. Technological Horizons in Education Journal, 22(10). (Survey of 500 Wright State University students enrolled in multimedia courses found 70% thought multimedia presentations very organized, interesting, helpful for taking notes; 65% thought helped clarify information; 53% thought helped them remember info)

Smith, S. M., & Woody, P. C. (2000). Interactive effect of multimedia instruction and learning styles. Teaching Psychology, 27(3), 220-223. (beg sem, mm < perf trad class – end sem, interaction bt learning style & class type: trad class, verbal learners > perf than visual learners BUT in mm class, visual learners slightly but non-sig > verbal learners)


Wright, R. (1993). Presidential multimedia. Technological Horizons in Education Journal, 21(3), 65-68. (Bakersfield College used multimedia classroom for introductory psychology course; students in multimedia section had higher grades & greater satisfaction than students in traditional section of his course)

Yaverbaum, G. J., Kulkarni, M., & Wood, C. (1997). Multimedia projection: An exploratory study of student perceptions regarding interest, organization, and clarity. Journal of Educational Multimedia and Hypermedia, 6, 139-153. (students rated screens on increased interest, organization of material, & clarity; each screen had text & graphics, some also had animation, music + animation, voice; viewed screens w/ animation, music, voice better org, clearer, more interesting)

Classroom Presentations – PowerPoint Issues


Brown, D. G. (2001). Judicious PowerPoint. Syllabus, 14(8), 27. (16 suggestions sent in by the magazines readers for how to use power point productivity)


Mantei, E. J. (2000). Using Internet class notes and PowerPoint in the physical geology lecture: Comparing the success of computer technology with traditional teaching techniques. Journal of College Science Teaching, 29, 301-305. (PowerPoint presentation + Internet notes compared to traditional course - mm resulted in better course performance than traditional (confound in that both PP and notes - not just PP)

Murray, B. (2002). Tech enrichment or overkill: Amid growing awareness that computerized slide presentations can bore students, academics look to use the software more interactively. Monitor on Psychology, 33 (4), 42-44. (a look at whether technology is being used in a dull manner, and insights
on how to use software in a more interesting way)

Computer Activities / Interactive Multimedia

Baird, B. (2001). Circular modules: 3D and immersive visualization tools. Syllabus, 14 (9), 23-26. (student/faculty teams use virtual reality & simulation and combine technology and art to create 3D projects that explain scientific and mathematical concepts difficult to understand with 2D models.)
Beckwith, D. (1993). Creative group problem-solving: An innovative computer application to facilitate learning and retention of difficult scientific principles. Collegiate Microcomputer, 11(2), 70-74. (Fr undergrads interested in medical career developed self-instructional, interactive, multimedia programs to facilitate learning concepts in biology & chemistry - this structured, prob-solving approach facilitated learning in creators as well as other fr)
Brown, M. F. (1999). Wildcat World: Simulation programs for teaching basic concepts in psychological science. Behavior Research Methods, Instruments, and Computers, 31, 14-18. (Describes Wildcat World, software that allows students to design, implement and analyze studies through computer simulations - studies deal with human facial features)
Cronin, M. W. (1993). Teaching listening skills via interactive videodisc. Technological Horizons in Education Journal, 21(5), 62-68. (Interactive videodisc gives students missions to identify bad listening habits & evaluate own listening skills; students who used disc showed significant improvement in listening skills; no control group, however)
Cronin, M. W., & Myers, S. L. (1997). The effects of visuals versus no visuals on learning outcomes from interactive multimedia instruction. Journal of Computing in Higher Education, 8 (2), 46-71. (interactive mm instruction (IMI), with visuals [pictures, video, animation], compared to IMI w/o visuals - found no difference in test scores or listening behavior - both groups enjoyed IMI)
Dewhurst, D. G., Macleod, H. A., & Norris, T. A. M. (2000). Independent student learning aided by computers: An acceptable alternative to lectures? Computers & Education, 35, 223-241. (six 1-hr lectures vs computer-based materials - students positive about CBL, were able to organize their own learning effectively, & were equivalent in performance to lecture group)
Diem, R. A. (1994, April). The socio/cultural effects of a technology based intervention in school environments. Paper presented at the annual meeting of the American Educational Research Association, New Orleans, LA. (Examined how students and teachers reacted to the introduction of computer-based tutorials in pre-algebra and English classes; for technology to be effective need to
redefine role of teacher & teacher must be active participant in learning process)


Ellis, T. J. (2001). Multimedia enhanced educational products as a tool to promote critical thinking in adult students. Journal of Educational Multimedia and Hypermedia, 10(2). 107-124. (written instructions vs interactive multimedia tutorials; assessed pre-post knowledge gain [facts]. & ability to solve problems; no diff in methods for overall learning or factual learning - mm > written in conceptual learning)

Eva, K. W., MacDonald, R. D., Rodenburg, D., & Regehr, G. (2000). Maintaining the characteristics of effective clinical teachers in computer assisted learning environments. Advances in Health Sciences Education, 5, 233-246. (delineate ways to construct instructional multimedia programs so they more closely mimic qualities of expert teachers so as to enhance learning, motivation, ability to transfer learning, ability to direct own learning, etc.)

Falk, D. R., & Carlson, H. L. (1990). Interactive technology impacts on increasing cultural awareness in education for the human services. Computers in Human Services, 7, 265-276. (Used interactive videodisc to provide self-paced instruction and simulations of interactions with Southeast Asian refugees and American Indians; majority of students found this a valuable learning activity)


Herrington, J., & Oliver, R. (1999). Using situated learning and multimedia to investigate higher-order thinking. Journal of Interactive Learning Research, 10, 3-24. (Developed interactive multimedia activities based on situated learning framework (learning embedded in social & physical context). - analysis of students' dialogue while working on activities indicated they used substantial levels of higher-order thinking)


Huang, S.-T. T., & Lin, M.-J. H. (2001). Designing efficient text presentation of multimedia CAI - the evaluation of dynamic text patterns and the negative repetition effect on memory. Computers and Education, 37, 127-140. (varied text pattern used to present definitions to be learned (static, stripe, checkboard, random row, vertical center-out). students preferred static & stripe to others but no difference in memory of terms due to pattern)

Ikegulu, P. R. (1998). Effects of screen designs in CBI environments. ERIC document ED 428 757. (overview of elements of screen design that should be considered when designing presentations - not very informative article)


students who used on-line tutorial w/ those who didn't; on-line grp more accurate in decisions about statistics to use, more confident in their decisions, showed improved prob-solving ability in later scenarios)

Koroghlanian, C., & Klein, J. D. (2000, October). The use of audio and animation in computer based instruction. Paper presented at the National Convention of the Association for Educational Communications and Technology, Denver, CO. (2 [Instructional Mode: Text vs Audio]. x 2 [Illustration Mode: static vs animated]. x 2 [Spatial Ability: low vs high]. - no differences for any variable on posttest - spent more time on animated than static programs - high spatial ability > effort than low)

Kruse, K., & Keil, J. (2000). Technology-based training: The art and science of design, development, and delivery (Chapter 4: Designing lessons for adult learners). San Francisco: Jossey-Bass Pfeiffer. (ideas for constructing presentations (e.g., gain attention from beginning, use list of objectives, chunk & organize content))


Lee, M. (1995, November 13). Leading the way. The Wall Street Journal, R28. (Rensslelear Polytechnic Institute uses multimedia studios for introductory physics course; students reported greater satisfaction with this approach compared to traditional labs but grades & tests scores no better with multimedia studio)


Liu, M., & Reed, W. M. (1994). The relationship between the learning strategies and learning styles in a hypermedia environment. Computers in Human Behavior, 10 (4), 419-434. (Field-dependent styles chose video [global], tools but field-independent chose relationship options of words to help understand passage; FI might do better in formal class setting, focused activities; FD learn better thru communication [interaction])


Mautone, P. D., & Mayer, R. E. (2001). Signaling as a cognitive guide in multimedia learning. Journal of Educational Psychology, 93, 377-389. (3 experiments: #1 - signaled vs non-signaled text; #2 - signaled vs non-signaled speech; #3 - signaled vs non-signaled narrated animation [multimedia pres] --- signaling improved prob-solving transfer but no effect on retention)


(adding text -- whether summary of audio or exact same as audio -- or adding seductive details decreases retention and decreases # creative solutions in transfer problems - video as seductive detail does not help learning)

Mayer, R. E., Moreno, R., Boire, M., & Vagge, S. (1999). Maximizing constructivist learning from multimedia communications by minimizing cognitive load. Journal of Educational Psychology, 91, 638-643. (3 groups: concurrent audio (A) + animated graphics (ANIM), "large bites"=all 140 sec of A (or ANIM), followed by all 140 sec ANIM (or A), "small bites"=16 segments, altered ANIM/A; results: small bites=concurrent - both>large bites for retention)


Mills, S., & de Araujo, M. M. (1999). Learning through virtual reality: A preliminary investigation. Interacting with Computers, 11, 453-462. (Describes prototype of virtual reality learning project; students in VR group performed no differently than students in traditional group; VR group enjoyed experience; small sample size)


O'Hanlon, N. (1999). Web-based tutorials: Does course use differ from general use? Journal of Interactive Learning Research, 10. (Tutorial --lessons, quizzes, supplementary material-- to boost Internet literacy; general uses more likely to view lessons & spend more time on them, less likely to do quizzes than course-affiliated users; few used supplementary materials)


Robertson, J. (1998). Paradise lost: Children, multimedia and the myth of interactivity. Journal of Computer Assisted Learning, 14, 31-39. (Discussions with teachers suggest that over the years there has been a reduction (not an increase). in the interactivity of instructional multimedia software for children)


software on student achievement. Paper presented at the Annual Meeting of the American Education Research Association, New Orleans, LA. (students used mm software & PowerPoint on laptops for anatomy/physiology course - students learned more when they had access to laptops, used mm software, created projects using PP)

Simpson, M. S. (1994). Neuropsychological considerations related to interactive multimedia. Educational Technology Research & Development, 42, 75-81. (Reviews neuroscience & communication research to show why interactive multimedia may improve memory & increase learning; research evaluating impact of interactive multimedia should include neurological measures)

Stevenson, A. K., Francis, G., & Kim, H. (1999). Java experiments for introductory cognitive psychology courses. Behavior Research Methods, Instruments, and Computers, 31, 99-106. (Describes selection, design & implementation of a series of on-line experiments for introductory cognitive psychology course; appropriate experiments: not easily demonstrated by other means, represent important findings, robust effects)

Summerville, J. B. (1998, February). The role of awareness of cognitive style in hypermedia. Presented at the National Convention of the Association for Educational Communications and Technology, St. Louis, MO. (field-dependent vs field independent learning style; 1/2 students knew their LS, 1/2 didn’t; for some, LS matched hypermedia design, for others mismatched; neither awareness or matching affected sat w/ learning environment)

Swan, K. (1996). Exploring the role of video in enhancing learning from hypermedia. Journal of Educational Technology Systems, 25, 179-188. (more learning when hypermedia materials included embedded video than when it didn’t include it)

Trautwein, U., & Werner, S. (2001). Old paintings, new technology: Does instructive animation make sense in art education? Journal of Educational Multimedia and Hypermedia, 10, 253-272. (4 grps viewed paintings: audio+animation, audio+relevant animation, audio+irrelevant animation, no audio/no animation; results: audio+relevant anim better understanding of art than other 3 - didn’t affect interest in art)


Williams, J. E., McGraw, K. O., & Tew, M. D. (1999). Undergraduate labs and computers: The case for PsychExps. Behavior Research Methods, Instruments, and Computers, 31, 287-291. (Describes PsychExps, an interactive on-line psychology laboratory designed to facilitate teaching and conducting research over the Internet)


Yang, S. C. (2000). Hypermedia learning and evaluation: A qualitative study of learners' interaction with the Perseus Project. Computers in Human Behavior, 16, 451-472. (study explores the Perseus project and attitudes and cognitive perceptions of hypermedia in general - attitudes were +ve but students liked mix of assignments, not just Perseus)


Yee, P. L., & Vaughan, J. (1999). A web-accessible tutorial for PsyScope based on classic experiments in human cognition. Behavior Research Methods, Instruments, and Computers, 31, 107-112. (Describes the on-line tutorial to facilitate use of PsyScope, a graphically-oriented script-based program to control lab experiments in cognitive psychology & linguistics; PsyScope is free & available on-line)

Developmental, Personality, Social, and Gender Issues
Barrett, E., & Lally, V. (1999). Gender differences in an on-line learning environment. Journal of Computer Assisted Learning, 15, 48-60. (Men & women were similar in cog & metacog content of messages but men's messages were more frequent, longer & more socio-emotional content whereas women sent more interactive messages)

Becker, H. J. (2000). Who's wired and who's not: Children's access to and use of computer technology. The Future of Children, 10 (2), 44-75. (comp in non-core courses>core courses (Eng, Math, Sci, SocSt); most common sch uses: wp, info gather; home - no gender diff overall - boys>girls games, girls>boys wp, boys=girls Internet use; Roper Youth Report: girls>b chat room/email, boys>g games, download)


Camp, T. (2001). Women in computer sciences: Reversing the trend. Syllabus, 15 (1), 24-25, 28. (what faculty and universities can do to reverse the decline of women getting bachelor's degrees in computer science)


King, J., Bond, T., & Blandford, S. (2002). An investigation of computer anxiety by gender and grade. Computers in Human Behavior, 18, 69-84. (in general, students had low to middle anxiety scores; gr 11 < anxiety than gr 7 or 9; interaction: gr 7 - girls > anxiety than boys, gr 9 - girls = anxiety to boys, gr 11 - girls < anxiety than boys)


Kraut, R., Patterson, M., Lundmark, V., Keisler, S., Mukopadhyay, T., & Scherlis, W. (1998). Internet paradox: A social technology that reduces social involvement and psychological well-being? American Psychologist, 53, 1017-1031. (longitudinal study of 73 households using Internet for 1 - 2 years; studied impact on social involvement and psyc well-being; greater use assoc w/ decreased communication w/ family, decreased soc circle, increased)
Lebo, H. (2000). The UCLA Internet report: Surveying the digital future. Los Angeles, CA: UCLA Center for Communication Policy. (girls 12-15/women 46-55 use Int more than men; other age grps, men > women; men = women for entertainment; women slightly more than men for school/work; men slightly more than women for commerce; 12-17 boys > girls for games; 12-17 girls > boys for school)


North, A. S., & Noyes, J. M. (2002). Gender influences on children's computer attitudes and cognitions. Computers in Human Behavior, 18, 135-150. (children had low "technophobia" scores (based on attitudes & cognitions); no differences bt males & females on computer attitudes or cognitions; no sex role differences on total attitude or cognition scores; boys had more computer experience than girls)


O'Toole, K. (2000, February 16). Study takes early look at social consequences of Net use. Stanford Online Report, February 16, 2000. (study of 35,000 people (some new Internet users, others with prior experience). provides evidence of people spending more time with computer and less time with people)


Reisberg, L. (2000). 10% of students may spend too much time online. The Chronicle of Higher Education, 46(41), A43. (10% of students use the Internet so much that it interferes with their grades, health, and social lives, especially at sci + eng schools)


Schumacher, P., & Morahan-Martin, J. (2001). Gender, Internet and computer attitudes and experiences. Computers in Human Behavior, 17, 95-110. (classes of 1989, 90, 97; 89/90-males more experienced w computers, more likely taken hs comp courses, reported higher skill; no gender diff in computers in 97; in 97 re Internet, boys > experience & self-reported skill but no gender diff w email)

Shaw, G., & Marlow, N. (1999). The role of student learning styles, gender, attitudes, and perceptions on information and communication technology assisted learning. Computers & Education, 33, 223-234. (students were uncomfortable w/ computers, unhappy about lack of personal contact, preferred to learn in more traditional mode; 1st yr students more +ve att; 3rd yr theoretical learning style more negative views of ICT --only 6% of variance though)

Subrahmanym, K., Kraut, R. E., Greenfield, P. M., & Gross, E. F. (2000). The impact of home computer use on children's activities and development. The Future of Children, 10(2), 123-144. (1999 national survey: 8-13 yr olds - boys>girls playing games but boys=girls in comp use for school, chatting, email, visiting web sites; 14-18 yr olds - boys=girls except boys visit more web sites; 97 Gallup survey: boys=girls # using comp & confidence)

Venkatesh, V., Morris, M.G., & Ackerman, P.L. (2000). A longitudinal field investigation of gender differences in individual technology adoption decision-making process. Organizational Behavior and Human Decision Processes, 83(1), 33-60. (men more strongly influenced by attitudes re technology than women in decision to use new software; women more strongly influenced by subjective norm (peer & superior's influence). & perceived behavioral control)


Educational Technology and Pedagogical issues


Ballard, R.M. (1998). What everyone should know about information technology: Questions for K-12 and post-secondary educators. (Paper dealing with commonly raised and important questions for all levels of education)

Bell, S. (2001). Web-based utilities for learning and collaboration in the classroom. Syllabus, 14 (12), 32-35. (How web-based utilities have potential as teaching tools, especially for collaboration and resource sharing)


Boettcher, J. V. (2000). Computer literacy spiral: What do students need to know? Syllabus, 14 (3), 42, 44-45. (The author contemplates the changing definition of computer literacy and the effect it has on students, classrooms, and ourselves)

Boettcher, J. V. (2000). What is meaningful learning?. Syllabus, 14(1), 54-56. (The author encourages instructors to consider the learning process as they integrate technology into course materials)


Brown, D. G. (2000). It's all about empowering students. Syllabus, 14 (3), 28. (Talks about the importance of the web to give students higher independence and confidence about their knowledge and access to it)

Brown, D. G. (2000). Teaching without "dumbing down" our courses. Syllabus, 14 (2), 28, 58. (College world is divided into those who assume students have internet access and those who don't - must design courses with assumption they do have Internet access and must provide this access)

Brown, D. G. (2000). The jury is in! Computer-enhanced instruction works. Syllabus, 14(1), 22 (Gives examples of how computer-enhanced instruction has demonstrated increased learning)

Brown, D. G. (2000). The low-hanging fruit. Syllabus, 14 (4), 28. (When learning new technology it's important to set realistic goals within the limits of time, advice, and equipment)

Brown, D. G. (2001). Hybrid courses are best. Syllabus, 15(1), 22. (Media enhanced courses that reduce lecture time are rated as the best according to research at U of Central Florida - gives advantages & disadvantages of using virtual communication)

Brown, D. G. (2001). The power of e-mail. Syllabus, 14 (12), 28. 12 recommendations for using e-mail effectively in courses to facilitate learning and communication)

Brown, J. S. (2000). Growing up digital: How the web changes work, education, and the ways people learn. Change, 32 (2), 11-20. (Importance of multiprocessing; describes 4 dimensions of learning, how students have shifted on these dimensions & how Internet facilitates this new type of learning; web facilitates sharing explicit & tacit knowledge)

Bruce, B. C., Peyton, J. K., & Batson, T. W. (Eds.). (1993). Network-based classrooms: Promises and


Carlson, S. (2000). Campus survey finds that adding technology to teaching is a top issue. The Chronicle of Higher Education, 47 (9), A46. (2000 Campus Computing Project: 60% college courses use e-mail; > 30% college courses have web sites)


Ehrmann, S. C. (2000). The flashlight program: Evaluating instructional uses of the web. Syllabus, 14 (2), 38, 40, 42. (institution must decide on clear criteria for measuring improvement in learning and teaching - offers six objectives on which assessment could be based - university should select at least one of these to guide assessment of web-based instruction)

Fletcher, J. D. (2000). Changing education is lifelong learning. Syllabus, 14 (10), 22. (talks about the changing educational process -- integrating technology -- is an education process in itself.)


Harley, D. (2001). Higher education in the digital age: Planning for an uncertain future. Syllabus, 15 (2), 10-12. (careful planning re how they use the Internet will be necessary for all institutions of higher education because there is no "one size fits all" model for the future.)

Katz, S. N. (2001). In information technology, don't mistake a tool for a goal. The Chronicle of Higher Education, 47 (40), B7-B9. (author points out the importance that technology serves the university, not the other way around - identifies issues universities must address to use new technology wisely and effectively)


Lindquist, C. (2000, April 6). Virtual Diploma. Upside Today, April 6, 2000. (The surge of "dot.com" into today's universities - issues they face in marketing their courses & programs to students and finding funding to support their activities)


McCollum, K. (1998). How a computer program learns to grade essays. The Chronicle of Higher Education, 45 (2), A37-A38. (Researchers have created technology that can scan an essay and report what a student has put in and left out.)


McMahon, J., Gardner, J., Gray, C., & Mulhern, G. (1999). Barriers to student computer usage: Staff and student perceptions. Journal of Computer Assisted Learning, 15, 302-311. (Examined students' perceptions of barriers to their use of computers; most important barrier was lack of sufficient training; other barriers: lack of support & information for users and lack of access & time to use computers)

Olsen, F. (2000). The role of the web Is expanding in accreditation reviews. The Chronicle of Higher Education, 47 (7), A67. (small but growing number of colleges are now using the web in accreditation reviews.)

Pear, J. J., & Crone-Todd, D. E. (1999). Personalized system of instruction in cyberspace. Journal of Applied Behavior Analysis, 32, 205-209. (Used computer-aided personalized system of instruction to present unit, midterms & final tests & assign grading to proctors (students who passed unit), GA or instructor; no class meetings; most students reasonably satisfied w/ course & >= avg grade)


Smith, K. L. (1990). Collaborative and interactive writing for increasing communication skills. Hispania, 73, 77-87. (Students using computer conferencing to respond to Spanish questions had higher oral performance in the language than those in traditional language lab)

Songer, N. B. (1996). Exploring learning opportunities in coordinated network-enhanced classrooms: A case of kids as global scientists. Journal of the Learning Sciences, 5, 297-327. (Compared to students using traditional, off-line resources, children using Internet showed similar improvement in understanding weather concepts, better at explaining weather in distant sites, provided richer explanations)


Weigel, V. (2000). E-learning and the tradeoff between richness and reach in higher education. Change, September/October, 10-15. (discusses issues related to the "com" approach to bringing education to the Internet - concerns that research shows "no diff" bt lecture & dist ed - commoditization of educ is not good)

Young, J. R. (2000). Merlot project brings peer review to web materials for teaching. The Chronicle of Higher Education: Daily News, June 1, 2000. (briefly describes Merlot project, a project that provides systematic reviews and ratings of academic websites)

Internet and Networking -- Technical Issues


Carlson, S. (2001). Obstacles remain to the creation of paperless campuses. The Chronicle of Higher Education, 47 (20), A44. (problems and advantages for large and small universities in setting up online mailing systems.)

Disz, T. (2001). The access grid collaboration environment. Syllabus, 14 (9), 14, 16, 18. (multiple video streams enable high-quality group-to-group interactions in a virtual space; need specially-designed dedicated space to make most effective use of this technology)

Evelyn, J. (2001). Internet2 project may broaden access for community colleges. The Chronicle of Higher Education, 47 (27), A37. (internet2 officials plan a new effort to reach out to colleges that aren't research oriented as well as elementary/secondary schools)

Feldman, A., Konold, C., & Coulter, B. (2000). Network science, a decade later: The Internet and classroom learning (Chapters 2, 3, & 6). Mahwah, NJ: Lawrence Erlbaum Associates, Inc. (Describes National Geographic Kids Network (Gr 3-9); Global Lab (Gr 8-10); Journey North (Gr 4-8). - points out current challenges & lessons learned in efforts to develop internet-based inquiry-based teaching & learning)


Lundsten, A. & Flick, E. (2001). Internet2: Making the connection. Syllabus, 14 (8), 10-12, 14. (The next cycle of Internet innovation promises profound change for higher education)

Distance Education / Distributed Education

Abrahamson, C. E. (1998). Issues in interactive communication in distance education. College Student Journal, 32(1), 33-42. (Identifies 4 issues relating to interactive communication in distance learning educ: personal contact bt primary instructor & student; primary & on-site instructor; on-site instructor & student; students)


Armstrong, L. (2000, November/December). Distance learning: An academic leader's perspective on a disruptive product. Change, 20-27. (potential benefits and disruptive nature of Internet-Mediated Distance Learning: IMDL --> greater pressure to take courses from "prestigious" universities, more h.s. students take college credit - impact on univ. more pressure to use IMDL on campus)


Carey, J. M. (2001). Effective student outcomes: A comparison of online and face-to-face delivery modes. DEOS NEWS, October 5, 2001. (compared outcome measures for identical courses offered in two delivery modes (web-based versus face to face). - no significant differences in gain in knowledge, final grades, satisfaction)


Carnevale, D. (1999). Instructor cuts dropout rate by giving extra attention to on-line students. The Chronicle of Higher Education: Daily News, December 16, 1999. (students who drop online courses also tend to have a low completion rate in classroom courses as well - author provides tips for increasing communication with and attention to these students in on-line courses)

Carnevale, D. (2000). A college's detailed policy on distance education. The Chronicle of Higher Education, 46 (36), A49. (San Diego State University's Senate sets guidelines for distance education courses, including course design, student rights, and faculty responsibilities and rights)

Carnevale, D. (2000). Assessing the quality of online courses remains a challenge, educators agree. The Chronicle of Higher Education, 46 (24), A59. (students want more information re quality of on-line courses; "neither federal officials nor accreditors offer much help"; many believe government shouldn't be involved in these evals - private sector should)


Carnevale, D. (2000). Turning traditional courses into distance education. The Chronicle of Higher Education, 46 (48), A37-A38. (talks about how colleges and companies are converting classroom courses into online formats (tells how they go about doing it)

Carnevale, D. (2000). Turning traditional courses into distance education. The Chronicle of Higher Education, 46 (48), A37-A38. (talks about how colleges and companies are converting classroom courses into online formats (tells how they go about doing it)


Carnevale, D. (2001). As online education surges, some colleges remain untouched. The Chronicle of Higher Education, 47 (24), A41-A42. (University of Texas at Austin, Boston College and University of New Hampshire all resist online courses - outlines need for selective distance education and need for sufficient support and funding for distance education)

Carnevale, D. (2001). Assessment takes center stage in online learning. The Chronicle of Higher Education, 47 (31), A43-A45. ("distance educators see the need to prove that they can teach effectively" - issues surrounding when and how assessments of on-line courses are conducted)

Carnevale, D., & Young, J. R. (2001). Telecourses change channels. The Chronicle of Higher Education, 47 (44), A29-A30. (telecourses may educate more people than online courses - compares telecourse technology and course design with online courses - telecourses making use of newest technology and Internet access as part of their design)

Carr, S. (2000). A tribal college sticks to its values as it embraces distance education. The Chronicle of Higher Education, 47 (5), A41-A42. (*how Salish Kootenai tribal college is developing online education for remote students with little/no access to technology - organizing online education centers for students - emphasize community & collaborative learning*).

Carr, S. (2000). As distance education comes of age, the challenge is keeping the students. The Chronicle of Higher Education, 46 (23), A39-A41. *Colleges are using online courses to raise enrollment, but the students are dropping the courses at a higher rate - discussion of type of students that benefit from distance education*.

Carr, S. (2000). Faculty members are wary of distance-education ventures. The Chronicle of Higher Education, 46 (40), A41-A42. (*differing opinions about for-profit distance education unit at Cornell University causes concerns among faculty*).

Carr, S. (2000). Many professors are optimistic on distance learning, survey finds. The Chronicle of Higher Education, 46 (44), A35. (*survey of members of National Education Association indicated teachers have favorable attitude toward distance education - those who have taught distance educ course more favorable than those who have not*).


Carr, S. (2000). Science instructors debate the efficacy of conducting lab courses online. The Chronicle of Higher Education: Daily News, March 10, 2000. (*science instructors have to decide if and how to teach labs online as more colleges seek to make full degree programs*).


Carr, S. (2000). Test of online advanced placement courses gets mixed reviews. The Chronicle of Higher Education, 46 (41), A42. (*California high school students that otherwise wouldn't have AP programs at their schools were able to take them online - program received mixed reviews from high school teachers & principals*).

Carr, S. (2000). Wisconsin project seeks to create a common standard for online courses. The Chronicle of Higher Education: Daily News, February 17, 2000. (*universities and government collaborate to develop technical platform standards to facilitate transition of online courses from one platform to another*).

Carr, S. (2001). Governors' association seeks expansion of distance education. The Chronicle of Higher Education, 47 (43), A31. (*National Governors' Association released two reports endorsing distance education, one stresses that more work is needed to evaluate specific courses/prog, other stresses need for public-private partnerships to develop online courses*).

Carr, S. (2001). PBS sticks to its strategy for telecourses, unafraid of competition from the internet. The Chronicle of Higher Education, 47 (44), A31-A32. (*PBS is expanding its Internet offerings but still sticks with telecourses - says online developers have lots to learn about distance education*).


who assesses, what, when, & how assessed)
Eleey, M., & Comegno, M. (1999). Using external collaborations to advance distributed learning at the University of Pennsylvania. T.H.E. Journal, 26(6), 62-64. (Describes benefits & risks of universities partnering w/ for-profit organizations to produce & implement distributed learning - e.g., Wharton School offers exec ed & Sch of Arts & Sciences offers undergrad courses for high school students)
Farber, J. (1998). The third circle: On education and distance learning. Sociological Perspectives, 41, 797-814. (Comments on 248+ studies showing no diff bt traditional classroom courses and distance ed courses -- these studies just assess measurable competence - don't assess socioemotional or attitudinal effects of college - need more & broader research on dist ed)
Frankola, K. (2001). The e-learning taboo: High dropout rates in online courses. Syllabus, 14 (11), 14,16. (how some schools are addressing the problem of high drop-out in dist ed - blend live sessions w/ asynchronous sessions, greater interactivity & more managerial oversight)
Freitas, F. A., Myers, S. A., & Avtgis, T. A. (1998). Student perceptions of instructor immediacy in conventional and distributed learning classrooms. Communication Education, 47, 366-372. (Students enrolled in conventional and distributed learning classes did not differ in perceptions of instructor verbal immediacy but conventional class students perceived higher rate of instructor nonverbal immediacy than distributed learning students)
Gibbs, G. R. (1999). Learning how to learn using a virtual learning environment for philosophy. Journal of Computer Assisted Learning, 15, 221-231. (Evaluates use of coMentor, a virtual learning environment supporting discussion, debate & writing - compared high-use coMentor students to other students - no diff in final grades but users showed higher levels of deep learning & strategic learning)
Gilbert, S. W. (2001). The hybrids are in bloom. Syllabus, 14 (6), 16. (some aspects of the Internet-based technology have been quietly integrated into teaching/learning in schools, colleges and elsewhere to create hybrid educational offerings & experiences)
Jehng, J-C. J. (1997). The psycho-social processes and cognitive effects of peer-based collaborative interactions with computers. Journal of Educational Computing Research, 17, 19-46. (Compared students in coop face-to-face interaction vs coop distributed ed environ; dist ed showed less interdependency, less intensity in communication, more reflective thought, more equality bt partners, more time on individ task, deeper thinking skills)


Johnstone, S. M. (2001). Engaging on-campus students online. Syllabus, 14 (8), 26.  (*account of a conversation between the author and her grad school profs about how the use of technology is changing higher education*).

Kalish, M., Lewandosky, S., & Dennis, S. (1999). Remote delivery of cognitive science laboratories: A solution for small disciplines in large countries. Behavior Research Methods, Instruments, & Computers, 31, 270-274.  (*Compared traditional lab to distance ed lab using videoconferencing & synchronous Internet connection; dist ed lab at least as effective as trad lab; students had no pref for trad or dist ed lab but more satisfied w/ dist ed lab partly due to its novelty*).


Lang, D. (2000). Critical thinking in web courses: An oxymoron? Syllabus, 14 (2), 20-21, 23-24.  (*the author argues that critical thinking skills can be honed in distance-education courses even without face-to-face interaction - on-line courses require writing to express self, give favorable impression - this promotes critical thinking*).


Marjanovic, O. (1999). Learning and teaching in a synchronous collaborative environment. Journal of Computer Assisted Learning, 15(2), 129-138.  (*Describes synchronous face-to-face electronic meeting systems to foster collaborative learning; students [all in same room], enter their contribution on their computer & information shows on all group members' screens and/or on public screen*).


Miller, L. G., Hyatt, S. Y, Brennan, J., Bertani, R., & Trevor, T. (1999). Overcoming barriers for "niche" learners through distance education. The Catalyst, 28(1), 14-16. (Describes how distance education used with non-traditional students and employee training through use of videocassettes and on-line courses)


O'Bannon, D., Scott, J., Gunderson, M. S., & Noble, J. (2000, January/February). Integrating laboratories into online distance education courses. On the Horizon. (educators at Missouri-Columbia have integrated video materials, lab kits, field trips, local resources, and world wide web into asynchronous learning network courses)


Perley, J., & Tanguay, D. M. (1999). Accrediting on-line institutions diminishes higher education. The Chronicle of Higher Education, 46 (10), B4-B5. (totally on-line institutions raise questions about quality and worthiness for accreditation (are on-line institutions nothing but a collection of marketable commodities?)


Presby, L. (2001). Seven tips for highly effective online courses. Syllabus, 14 (11), 17. (strategies for keeping online students enrolled and engaged)

Richardson, J. T. E., Morgan, A., & Woodley, A. (1999). Approaches to studying in distance education. Higher Education, 37, 23-55. (Large-scale survey of dist ed students showed dist ed (vs on-campus), students approaches to studying characterized by same concepts, are more appropriate for higher ed goals (due to students' background not dis ed per se), & can predict performance)


Stefanov, K., Stoyanov, S., & Nikolov, R. (1998). Design issues of a distance learning course on business on the Internet. Journal of Computer Assisted Learning, 14, 83-90. (Describes design for distance education course on business on the Internet; relates course design to learner-centered pedagogy; describes evaluation tools that will be used when course is offered)

Taraban, R., Maki, W. S., & Rynearson, K. (1999). Measuring study time distributions: Implications for designing computer-based courses. Behavior Research Methods, Instruments, & Computers, 31, 263-269. (Beginning & advanced students in both traditional & distance ed courses reported studying almost exclusively just before exams; students don't use new tech wisely - use Internet resources same as resources in trad course; need to restructure courses)


Treadwell, T. (1998). Collaborative inter-class teaching and research over the internet: Faculty & students' perspectives on the research and learning process. (paper dealing with the collaborative distance learning models)


Turoff, M. (2000). An end to student segregation: No more separation between distance learning and regular courses. On the Horizon, 8(1), 1-7. (face-to-face students may be suffering from the segregation of the college system into separate face-to-face and distance courses - to enhance learning of face-to-face classes, integrate w/ dist ed - issues re using distance educ)


Waschull, S. B. (2001). The online delivery of psychology courses: Attrition, performance, and evaluation. Teaching of Psychology, 28, 143-47. (attrition similar for trad & online courses; Study 1 - online more likely to fail but evaluated course similarly; Study 2 - perf & eval same for online & traditional)


Wiorkowski, F. (2000, August). Learner characteristics in a web based environment. In symposium Comparison of theoretical perspectives in designing web-based courses. Presented at meeting of the American Psychological Association, Washington, DC. (when designing dist ed courses must consider learner characteristics: learning style, spatial ability, metacognitive differences, prior knowledge)

Young, J. R. (1999). Author warns students -- and colleges -- to avoid on-line education. The Chronicle of Higher Education: Daily News, November 3, 1999. (Carole S. Fungaroli, author of Traditional Degrees for Non-traditional Students, says distance education fails to deliver most important aspect of higher education - inspiration; cites complaints by students who have taken distance education courses)

Young, J. R. (2000). David Noble's battle to defend the 'sacred space' of the classroom. The Chronicle of Higher Education, 46 (30), A47-A49 (describes David Noble's criticisms of instructional technology & distance education, his beliefs that motive behind distance educ is profit, his problems with administrators at several universities)

Young, J. R. (2000). Dispatches from distance education, where class is always in session. The Chronicle of Higher Education, 46 (26), A41-A42. (personal experiences of seven students who enrolled in online courses at several universities)


Young, J. R. (2000). Moving the seminar table to the computer screen. The Chronicle of Higher Education, 46 (44), A33-A34. (describes a "virtual classics department" that coordinate the online teaching efforts of 13 of the 15 institutions in the Associated Colleges of the South)


Young, J. R. (2000). Virtual reality on a desktop hailed as new tool in distance education. The Chronicle of Higher Education, 47 (October 6), A43-A44. (describes examples of courses that use virtual reality - classes conducted in a virtual world created by instructor; universities using virtual tours of campus to attract new students)


Young, J. R. (2002). "Hybrid" teaching seeks to end the divide between traditional and online instruction: BY blending approaches, colleges hope to save money and meet student's needs. The Chronicle of Higher Education, 58 (28), A33-A34. (steps toward meshing the traditional and online methods of instruction)