# Using Multimedia In Classroom Presentations: Best Principles

Thomas E. Ludwig
Hope College

David B. Daniel
University of Maine at Farmington

Rick Froman
John Brown University

Virginia A. Mathie
James Madison University

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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 presenters 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.


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

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Stoloff, M. (1995). Teaching physiological psychology in a multimedia classroom. Teaching of Psychology, 22, 138-141. (*describes use of mm presentation course format - no diff bt mm version and traditional version of course)*

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**

Ahmed, C. (1998, November). Powerpoint versus traditional overheads. Which is more effective for learning? Paper presented at a Conference of the South Dakota Association for Health, Physical Education and Recreation, Sioux Falls, SD. (*no difference in college students' performance on test questions taken from lecture given in PP or as traditional lecture)*

Atkinson, C. (2004). An interview with Richard Mayer. Retrieved Dec. 20, 2004 from http://www.indezine.com/products/powerpoint/personality/richardmayer.html

Atkinson, C. (2004). Five experts dispute Edward Tufte on PowerPoint. Retrieved July 6, 2004, from http://www.sociablemedia.com/articles_dispute.htm

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)*

Bucholz, S., & Ullman, J. (2004, June/July). Twelve commandments for PowerPoint. *The Teaching Professor.* Magna Publications. Retrieved Dec. 20, 2004 from http://www.magnapubs.com/issues/magnapubs_tp/18_6/news/596302-1.html

Bushong, S. (1998). Utilization of PowerPoint presentation software in library instruction of subject specific reference sources. Master's Thesis, Kent State University. (*explores the efficiency of PowerPoint's effectiveness in explaining two specific reference materials)*

Daniel, D. B. (in press). Using technology to ruin a perfectly good lecture. To appear in Perlman, B., McCann, L. & Buskist, B., (Eds.). Voices of NITOP: Favorite talks from the National Institute on the Teaching of Psychology. American Psychological Society.

Magna Publications. (2004, November). To Read or Not to Read PowerPoint slides. *The Teaching Professor.* Magna Publications. Retrieved Dec. 20, 2004 from http://www.magnapubs.com/issues/magnapubs_tp/18_9/news/596791-1.html

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)*
Paradi, D. (2003). Survey shows how to stop annoying audiences with bad PowerPoint. Retrieved Dec. 20, 2004 from http://www.communicateusingtechnology.com/articles/pptsurvey_article.htm
Szabo, A., & Hastings, N. (2000). Using IT in the undergraduate classroom: Should we replace the blackboard with PowerPoint? Computers & Education, 35, 175-187. (*lecture using overhead transparencies, lecture using PowerPoint, lecture using PP plus lecture notes - no diff bt PP and PP + notes, both PP's resulted in higher test scores than overheads)*
Tufte, E. (2003, Nov. 9). PowerPoint is evil. Wired. Retrieved July 2, 2004 from http://www.wired.com/wired/archive/11.09/ppt2.html

**Computer Activities / Interactive Multimedia**

Atkins, M. J. (1993). Evaluating interactive technologies for learning. Journal of Curriculum Studies, 25(4), 333-342. (*Identifies potential strengths & limitations of interactive multimedia technology from 2 perspectives: learning as knowledge acquisition and learning as development of conceptual understanding & change)*
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.)*
Baxter, J. H., & Preece, P. F. W. (1999). Interactive multimedia and concrete three-dimensional modeling. Journal of Computer Assisted Learning, 15, 323-331. (*no difference in learning using mm vs conventional 3-dimensional model in teaching phases of the moon)*
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)*
ChanLin, L.-J. (1998). Students cognitive styles and the need of visual control in animation. Journal of Educational Computing Research, 19, 353-365. (*2 [self-controlled animation vs system-controlled animation]. X 2 [field-dependent style vs field-independent style]; only differences was self-controlled animation learned more than system-controlled)*
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)*
Cronin, M.W, & K.A. (1992). Recent empirical studies of the pedagogical effects of interactive video instruction in "soft skill" areas. Journal of Computing in Higher Education, 3 (2), 53-85. (*case study displaying the advantages of interactive video instruction (IVI). over traditional methods)*
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)*

DiFonzo, N., Hantula, D. A., & Bordia, P. (1998). Micorworlds for experimental research: Having your (control and collection). cake, and realism too. Behavior Research Methods, Instruments, & Computers, 30(2), 278-286. (Behavior*benefits of use of microworlds for research are increased experimental control, improved accuracy, greater internal validity, greater mundane realism, and greater external validity.)*

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)*

Ford, N., & Chen S. Y. (2000). Individual differences, hypermedia navigation, and learning: An empirical study. Journal of Educational Multimedia and Hypermedia, 9(4). 281-312. (*field-dependent differed from field-independent learners in strategies used with interactive hypermedia lesson but didn't differ in learning outcomes; field-dep > use of topic map, < use of topic index, < use of back/forward buttons, more random order app)*

Garg, A., Norman, G. R., Spero, L., & Maheshwari, P. (1999). Do virtual computer models hinder anatomy learning? Academic Medicine, 74, S87-S89.

Goldman, E., & Barron, L. (1990). Using hypermedia to improve the preparation of elementary school teachers. Journal of Teacher Education, 41, 21-31. (*Peabody College of Vanderbilt Univ developed interactive videodisc of classroom situations; no difference in performance on recall tests bt multimedia & traditional sections of course but multimedia group more confident in their skills)*

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)*

Herrington, J., Reeves, T. C., Oliver, R., & Woo, Y. (2004). Designing authentic activities in Web-based courses. Journal of Computing in Higher Education, 16, 3-29.

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)*

Isakowitz, T., Stohr, E. A., & Balasubramanian, P. (1995). A methodology for hypermedia design. Communications of the ACM, 38, 34-44.

Kettanurak, V., Ramamurthy, K., & Haseman, W. D. (2001). User attitude as a mediator of learning performance improvement in an interactive multimedia environment: An empirical investigation of the degree of interactivity and learning styles. International Journal of Human-Computer Studies, 54, 541-583. (*high interactivity (student controlled sequence, pacing, review, menu, etc): accommodators most favorable attitude, convergers & divergers least favorable attitude; low interactivity: assimilators most favorable, divergers least favorable)*

Koch, C., & Gobell, J. (1999). A hypertext-based tutorial with links to the web for teaching statistics and research methods. Behavior Research Methods, Instruments, and Computers, 31, 7-13. (*Compared*

*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))*

Lai, S.-L. (2000). Increasing associative learning of abstract concepts through audiovisual redundancy. Journal of Educational Computing Research, 23, 275-289. (*static graphic, static+full audio, animation, animation+cued audio, animation+full audio -- static graphic = animation+full audio both better scores than static+audio or animation)*

Lane, D. M. (1999). The Rice virtual lab in statistics. Behavior Research Methods, Instruments, and Computers, 31, 24-33. (*Describes Rice Virtual Lab in Statistics; gives examples of use of hypertext links and simulations/demonstrations of statistical concepts)*

Leahy, W., Chandler, P., & Sweller, J. (2003). When auditory presentations should and should not be a component of multimedia instruction. Applied Cognitive Psychology, 17, 401-418.

Lee, M. (1995, November 13). Leading the way. The Wall Street Journal, R28. (*Rensselear 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)*

Leutner, D., & Plass, J. L. (1998). Measuring learning styles with questionnaires versus direct observation of preferential choice behavior in authentic learning situations: The visualizer/verbalizer behavior observation scale (VV-BOS). Computers in Human Behavior, 14 (4), 543-557. (*observed preferential choice behavior in use of interactive multimedia program to enhance comprehension of 2nd language - provided data to support validity of VV-BOS)*

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] )*

Mangan, K. S. (2000). Teaching surgery without a patient. The Chronicle of Higher Education, 46 (25), A49 - A50. (*Doctors use virtual reality to practice routine and delicate procedures at Penn State University)*

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)*

Mayer, R. E. (1999). Designing instruction for constructivist learning. In C. M. Reigeluth (Ed.), Instructional-design theories and models: A new paradigm of instructional theory. (Vol. 2, pp. 141-159). Hillsdale, NJ: Lawrence Erlbaum Associates.

Mayer, R. E. (2003). Theories of learning and their application to technology. In H. F. O'Neil, Jr. & R. S. Perez (Eds.), Technology applications in education: A learning view (pp. 127-157). Mahwah, NJ: Lawrence Erlbaum Associates.

Mayer, R. E., & Moreno, R. (1998). A split-attention effect in multimedia learning: Evidence for dual processing systems in working memory. Journal of Educational Psychology, 90, 312-320. (*2 experiments, both compared 2 grps: concurrent animated graphics + audio [AN] or concurrent animated graphics + text [AT] - results: AN outperformed AT both times - integrate audio & graphics better than text & graphics)*

Mayer, R. E., Heiser, J., & Lonn, S. (2001). Cognitive constraints on multimedia learning: When presenting more material results in less understanding. Journal of Educational Psychology, 93, 187-198.

(*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)*

McNulty, J. A., Halama, J., Dauzvardis, M. F., & Espiritu, B. (2000). Evaluation of web-based computer-aided instruction in a basic science course. Academic Medicine, 75, 59-65. (*Examined usage of Web-based computer-aided instruction; found: computer literacy not good predictor of usage, degree & manner of usage correlated with performance in class)*

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)*

Mioduser, D., & Margalit, M. (1997). TTIPSS--a computer-based system for training problem solving and educational planning. Journal of Special Education Technology, 13(3), 1-13. (*Describes interactive software (text-based). designed to improve teachers' problem-solving skills in understanding challenging behavior and planning educational strategies for special education students)*

Mitchell, E. J., & Frisbie, S. H. (2001). An experiment with student-centered learning. Syllabus, 15 (2), 30-32. (*a study found that although students were satisfied with self-paced interactive multimedia lessons, they preferred teacher-centered lecture to self-paced materials)*

Moreno, R., & Mayer, R. E. (1999). Cognitive principles of multimedia learning: The role of modality and contiguity. Journal of Educational Psychology, 91, 358-368. (*Exp1: got modality effect (narration+animation > animation+close text or animation+far text). & spatial contiguity effect (close text > far text); Exp2: got modality effect (N+Anim > text). but temporal contiguity not supported)*

Morris, E. J., Joiner, R. & Scanlon, E. (2002). The contribution of computer-based activities to understanding statistics. Journal of Computer Assisted Learning, 18, 114-124.

Najjar, L. J. (1998). Principles of educational multimedia user interface design. Human Factors, 40, 311-323.

Nielsen, J. (2000). Designing web usability: The practice of simplicity. Indianapolis: New Riders Publishing.

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)*

Quealy, J., & Langan-Fox, J. (1998). Attributes of delivery media in computer-assisted instruction. Ergonomics, 41, 257-279. (*3 (text+still graphic; text+still graphic+audio; text+video+audio). X 2 (declarative vs procedural knowledge). x 2(graphic cue vs no cue for recall). - no media effects on short or long-term recall)*

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)*

Robison, S. A. (1997). Computer animation of trigonometric functions using mathematica. In J.A. Chambers (Ed.). Selected papers from the 8th national conference on college teaching & learning. Jacksonville, FL: Florida Community College. (*no diff in achievement, attitudes toward math, or attitudes toward computers due to use of still graphic vs animated graphic)*

Savery, J. R., & Duffy, T. M. (1996). Problem based learning: An instructional model and its constructivist framework. In B. G. Wilson (Ed.), Constructivist learning environments: Case studies in instructional design (pp. 135-148). Englewood Cliffs, NJ: Educational Technology Publications.

Schneiderman, B. (1998). Designing the user interface: Strategies for effective human-computer interaction (3rd ed.). Reading, MA: Addison-Wesley.

Siegle, D., & Foster, T. (2000, April). Effects of laptop computers with multimedia and presentation

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)*

van Daal, V. H. P, & Reitsma, P. (2000). Computer-assisted learning to read and spell: Results from two pilot studies. Journal of Research in Reading, 23(2), 181-193. (*kindergarteners using CAL learned in 16 hrs of comp practice what normally takes 3 mths classroom instruction - computer-based spelling practice < non-task beh in comp sessions & classroom)*

Welsh, J. A., & Null, C. H. (1991). The effects of computer-based instruction on college students' comprehension of classic research. Behavior, Research Methods, Instruments, & Computers, 23, 301-305. (*Comparison of computer-based labs to teach psychological research methods with traditional labs found higher performance and better understanding of research principles with traditional labs)*

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)*

Wilson, B. G. (Ed.). (1996). Constructivist learning environments: Case studies in instructional design. Englewood Cliffs, NJ: Educational Technology Publications.

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)*

Yarbrough, D. N. (2001). A comparative analysis of student satisfaction and learning in a computer-assisted environment versus a lecture environment. Journal on Excellence in College Teaching, 12, 129-147.

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)*

Bikson, T. K., & Panis, C. W. A. (1997). Computers and connectivity: Current trends. In S. Kiesler (Ed.). Culture of the Internet (pp. 407-430). Mahwah, NJ: Lawrence Erlbaum Assoc. (*households w/ comp & at least 1 child, children use comp ~75% of them - no diff in freq of use bt boys & girls; girls>boys related to sch, girls=boys educ games, boys>girls non-educ games)*

Bimber, B. (2000). Measuring the gender gap on the Internet. Social Science Quarterly, 81, 868-876.

Blum, K. D. (1999). Gender differences in asynchronous learning in higher education: Learning styles, participation barriers and communication patterns. Journal of Asynchronous Learning Networks, 3, 46-66.

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)*

Char, C. A. (1990). Interactive technology and the young child: Insights from research and design. Paper presented at the annual conference of the American Educational Research Association, Boston, MA. (*Provides historical, current and futuristic perspectives on the impact of interactive technology on the cognitive and social development of young children)*

Cordes, C., & Miller, E. (2000). Fool's gold: A critical look at computers in childhood. College Park, MD: Alliance for Childhood. (*Critical examination of the impact of interactive technology on social, emotional, physical and educational development of children)*

Federico, P. A. (2000). Learning styles and student attitudes toward various aspects of network-based instruction. Computers in Human Behavior, 16, 359-379. (*using Kolb's inventory: assimilators and accommodators had more favorable attitudes toward, beliefs about, and willingness to use network-based instruction & hypermedia than convergers or divergers)*

Griffiths, M. (1997). Friendship and social development in children and adolescents: The impact of electronic technology. Educational and Child Psychology, 14, 25-37. (*Reviews research on types of adolescent arcade game players - uses this literature to suggest future research on the impact of computer games on child and adolescent socialization)*

Jackson, L., Ervin, K., Gardner, P. D., & Schmitt, N. (2001). Gender and the Internet: Women communicating and men searching. Sex Roles, 44, 363-379.

Jennings, S. E., & Onwuegbuzie, A. J. (2001). Computer attitudes as a function of age, gender, math attitude, and developmental status. Journal of Educational Computing Research, 25, 367-384.

Katz, L., Maitland, M., Hannah, R., Burggraf, K., & King, S. (1999). The effects of gender & academic prog. on learning styles & attitudes of undergrad. students using mm., web-based anatomy labs. In J. A. Chambers (Ed.). Selected papers from the 10th Internat. Conf. on College Teach. & Learning. Jacksonville: FL Comm Coll. (*no diff due to gender; visual learners & those who like detail more comfortable with computer)*

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)*

Koch, J. V. (1998). How women actually perform in distance learning. The Chronicle of Higher Education, 45 (3), A60. (*no diff bt men & women in satisfaction with or how much they like dist-ed; at Old Dominion University, women outperform men in dist-ed courses)*

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; 12-17boys > girls for games; 12-17 girls > boys for school)*

MacGregor, S. K. (1999). Hypermedia navigation profiles: Cognitive characteristics and information processing strategies. Journal of Educational Computing Research, 20(2), 189-206.

Mitra, A. (1994). "Instructor-Effect" in determining effectiveness and attitude towards technology-assisted teaching: Report of a case study. Journal of Instruction Delivery Systems, 8 (3), 15-21. *(case study exploring the overall attitudes of students towards technology in the classroom)*

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)*

Ono, H. & Zavodny, M. (2003). Gender and the internet. Social Science Quarterly, 84, 111-121.

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)*

Parks, M. R., & Floyd, K. (1996). Making friends in cyberspace. Journal of Communication, 46(1). (*examines the social relationships created through Internet discussion groups)*

Reinen, I. J., & Plomp, T. (1997). Information technology and gender equity: A contradiction in terms? Computers in Education, 28, 65-78. (*survey male & female students at all levels in 10 countries in 1992 re access to computers, attitudes toward computers, enjoyment of use, knowledge about use - for most part USA showed gender equity in these measures)*

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)*

Rheingold, H. (2001). Face-to-face with virtual communities. Syllabus, 14 (12), 8, 9, 12. (*considers the question of virtual communities on campus - the role they play in education)*

Roschelle, J. M., Pea, R. D., Hoadley, C. M., Gordin, D. N., & Means, B. M. (2000). Changing how and what children learn in school with computer-based technologies. The Future of Children, 10 (2), 76-101. (*overview of how computers could enhance learning through active engagement, participation in groups, frequent interaction & feedback, and connections to real-world contexts)*

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)*

Subrahmanyam, 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)*

Wartella, E. A., & Jennings, N. (2000). Children and computers: New technology--old concerns. The Future of Children, 10 (2), 31-43. (*compares comp to intro of TV, radio; 2-5 yr olds: use comp 27 min/day; in sch shared comp --> grp interaction, cooperation, friendships, constructive grp play; comp can impact self-worth, self-efficacy)*

Wartella, E., O'Keefe, B., & Scantlin, R. (2000). Children and interactive media: A compendium of research and directions for the future. A report to the Markle Foundation. (*Discussion of critical issues regarding impact of interactive technology on children; length annotated bibliography)*

Yelland, N. A., & Lloyd, M. (2001). Virtual kids of the 21st century: Understanding the children in schools today. (*reports of interviews of 934 kids ranging from 10 to 13 about their ownership, use, and views of computer and video games)*

**Educational Technology and Pedagogical issues**

American Psychological Association. (1997). Learner-centered psychological principles: A framework for school redesign and reform. Retrieved July 2, 2004, from http://www.apa.org/ed/lcp.html

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)*

Biemiller, L. (2000, March 17). A computer scientist uses his art to question the embrace of technology. The Chronicle of Higher Education, p. A45. *Professor uses a combination of art, technology and culture in his teaching style)*

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)*

Boettcher, J. V. (2001). The spirit of invention: Edging our way to 21st century teaching. Syllabus, 14 (11), 10-13. *(a consideration of how developments at the edges of technological innovation change teaching and learning)*

Bork, A. (1991). Is technology-based learning effective? Contemporary Education, 63, 6-14. (*Points out problems & limitations of early research on effectiveness of technology in improving learning and need for large-scale studies, intensive small grp studies and compelling examples)*

Brandon, D. P., & Hollingshead, A. B. (1999). Collaborative learning and computer-supported groups. Communication Education, 48, 109-126. (*Highlights issues & decisions involved in developing and implementing learning activities for on-line collaborative groups in communication courses)*

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 its 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

realities. New York, NY: Cambridge University Press.
Buchanan, T. (1998). Using the World Wide Web for formative assessment. Journal of Educational Technology Systems, 27, 71-79. (*Describes PsyCAL, package of multiple choice questions students use as a formative assessment of their knowledge - some minimal evaluation provided)*
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)*
Carlson, S. (2001). A small college's mixed results with technology. The Chronicle of Higher Education, 47 (27), A35-A36. (*description of West Virginia Wesleyan's (a small college). efforts to bring technology to campus life - examples of how used on campus)*
Castellman, N.J.Jr. (1993). Evaluating information technology in teaching and learning. Behavior Research Methods, Instruments, & Computers, 25 (2), 233-237. *(how to appropriately evaluate the effectiveness of outcomes of instructional technology)*
Dijkstra, S., & Seel, N. M. (Eds.). (1997). Instructional design: International perspectives. Mahwah, NJ: Lawrence Erlbaum Associates, Inc.
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. (2003). Evidence for learning from technology-assisted instruction. In H. F. O'Neil, Jr. & R. S. Perez (Eds.), Technology applications in education: A learning view (pp. 79-99). Mahwah, NJ: Lawrence Erlbaum Associates.
Foster, A. L. (2001). How a Princeton classicist leads in instructional technology. The Chronicle of Higher Education, 47 (42), A28 - A29. (*Princeton moves to broaden online educational reach to alumni - one woman's journey to expand instructional )*
Gagné, R. M. (1984). Learning outcomes and their effects: Useful categories of human performance. American Psychologist, 39, 377-385.
Gilbert, S. W. (2000). Choosing between personalization and standardization. Syllabus, 14 (5), 14. (*talks about the advantages of bringing tech into the classroom, the process of doing it, and the options you have)*
Gilbert, S. W. (2001). Changing education is lifelong learning. Syllabus, 14 (10), 22. (*talks about how the changing educational process -- integrating technology -- is an education process in itself.)*
Goldman-Segall, R., & Maxwell, J. W. (2003). Computers, the Internet, and new media for learning. In W. M. Reynolds & G. E. Miller (Eds.), The handbook of psychology: Educational psychology (Vol. 7, pp. 393-427). New York: Wiley.
Gordon, H. R. D. (1998, April). Selected instructional delivery methods and teaching techniques for teaching school law courses. Paper presented at the American Educational Research Association, San Diego, CA. (*interaction of learning styles, instructional delivery methods, & hypermedia - good simple summary of learning styles & design issues to consider when using hypermedia)*
Gueldenzoph, L., & Chiarelott, L. (2002). Using educational technology to improve constructivist instruction in higher education. Journal on Excellence in College Teaching, 13, 43-56.
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.)*
Herson, K., Sosabowski, M. H., & Lloyd, A. W. (1999). Intranet-based learning: A one-year study of student utilization. Journal of Computer Assisted Learning, 15, 269-278. (*Developed intranet resources for pharmacy program & monitored usage - identified barriers to usage: concern re plagiarism of materials, peer scrutiny, additional time involved in preparation, competency of students & faculty to use intranet)*
Jakobi, P. (1999). Using the World Wide Web as a teaching tool: Analyzing images of aging and the visual needs of an aging society. Educational Gerontology, 25, 581-593. (*Describes assignment in which students evaluate images on web sites designed for older people and determine if consistent with needs of older people)*
Johnstone, S. M. (2001). Virtual worlds: Generating a whole new set of challenges. Syllabus, 14 (10), 20. (*a description Virtual Worlds: a new type of online resource for active learning)*
Jones, L.L., & Smith, S.G. (1992). Can multimedia instruction meet our expectations? Education

Communication Review, 27, 39-43. (*the effects and procedures of computer aided multimedia instruction)*

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)*

Lee, F. L., Liang, S., & Chan, T. W. (1998). An attempt to design synchronous collaborative learning environments for peer dyads on the world wide web. Journal of Educational Computing Research, 21, 221-253.

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

McClenney, K.M. (1998). Community colleges perched at the millennium: Perspectives on innovation, transformation, and tomorrow. Leadership Abstracts, 11 (8). *(factors, influences, and methods of taking innovations to a higher level in the new millennium)*

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.)*

McCollum, K. (1999). Technology and collaboration are needed for "lifelong learning", Presidents say. The Chronicle of Higher Education: Daily News, September 16, 1999. (*institutions need to teach more critical thinking skills and must upgrade technologies on campus to facilitate lifelong learning)*

McComb, M. (1994). Benefits of computer-mediated communication in college courses. Communication Education, 43, 159-170. *(explores how computer-mediated communication (CMC). can enhance communication between teachers and students)*

McConnell, D. (1999). Examining a collaborative assessment process in networked lifelong learning. Journal of Computer Assisted Learning, 15, 232-243. (*Case study of use of Internet networks to foster collaborative learning on assignments requiring peer assessment of course work; discusses benefits of this type of network learning)*

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)*

Rogers, P. L. (Ed). (2002). Designing instruction for technology-enhanced learning. Hershey, PA: Idea Group Publishing.

Ross, J. A., Hogaboam-Gray, A., & Hannay, L. (1999). Predictors of teachers' confidence in their ability to implement computer-based instruction. Journal of Educational Computing Research, 21, 75-97.

Rutherford, L.H., & Grana, S.J. (1995). Retrofitting academe: Adapting faculty attitudes and practices to technology. T.H.E. Journal, September 1995, 82-86. *(overcoming the risks and hardships of integrating technology into the classrooms.)*

Schneiderman, B. (2003). Leonardo's laptop: Human needs and the new computing technologies. Cambridge, MA: MIT Press.

Shaffer, D. W., & Resnick, M. (1999). "Thick" authenticity: New media and authentic learning. Journal of Interactive Learning Research, 10, 195-215. (*Brief overview of 4 types of authentic learning: personally meaningful to learner, relates to real world, think in modes of discipline, assess in real fashion; connectivity, modeling & pluralism of Internet facilitates "thick" authenticity)*

Shapiro, A. M. (1999). The relationship between prior knowledge and interactive overviews during hypermedia-aided learning. Journal of Educational Computing Research, 20, 143-167.

Shuell, T. J., & Farber, S. L. (2001). Students' perceptions of technology use in college courses. Journal of

Educational Computing Research, 24, 119-138.
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)*
Sonwalkar, N. (2001, December). The sharp edge of the cube: Pedagogically driven instructional design for online education. Syllabus, 15 (5), 12-14, 16. (*proposes learning cube combining 6 media with 5 learning styles with teacher vs student-centered orientation - suggests ways to use media for each learning style)*
Von Holzen, R. (2000). A look at the future of higher education. Syllabus, 14 (4), 56-57, 65. (*Does the shift in education away from the lecture format fortell a new role for faculty?)*
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. (2000). High-speed network will serve universities for 3 more years. The Chronicle of Higher Education: Daily News, April 12, 2000. (*national science foundation and MCI WorldCom have agreed to a three-year extension of the high performance Backbone Network)*
Carlson, S. (2000). Universities find wireless systems bring them convenience and savings. The Chronicle of Higher Education, 47 (7), (*wireless technology is often less expensive than standard wire-and-wall-jack installation.)*
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)*
Futhey, T. (2000). Wireless Andrew: Everywhere you want to be. Syllabus, 14 (4), 24, 26-27. (*campus-wide wireless network powers new learning applications at Carnegie Mellon - wireless classrooms, creation of virtual cluster for undergrad & grad students, use of handheld computers, etc.)*
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)*
Miltenoff, P. (2000). Integrating streaming media to web-based learning: A modular approach. Syllabus, 14 (1), 58-61. (*A glimpse of St. Cloud State Universities successful integration of streaming media technology.)*

Olsen, F. (2000). Bringing a university, a state and a region into the networking era. The Chronicle of Higher Education, 47 (17), A43-A44. (*Bonnies Neas put North Dakota State and the Great Planes on the map in technology)*

Olsen, F. (2000). Carnegie Mellon works to make computers invisible and pervasive. The Chronicle of Higher Education, 47 (7), A65. (*The Aura project provides wireless network that allows (among other uses). researchers to control research projects using robots)*

Olsen, F. (2000). Internet2 efforts aims to build digital -Video networks for higher education. The Chronicle of Higher Education, 46 (33), A49. (*improvements in live video and video clips as a result of Internet2 in distance learning.)*

Olsen, F. (2000). The wireless revolution. The Chronicle of Higher Education, 47 (7), A59-A60, A62. (*colleges seeking convenience and saving embrace 'nomadic' computing, but many educators worry about privacy and design issues)*

Olsen, F. (2000). Washington U. researchers invent an Internet technology and reap the rewards. The Chronicle of Higher Education, 46 (32), A65. (*professors invent a router for larger internet capabilities and form a multi-million dollar company)*

Sircar, J. (2000). Streaming media technology: Laying the foundations for educational change. Syllabus, 14 (3), 54, 56-57. (*author looks at the ways streaming media tech will change education in the engineering field.)*

Syllabus. (2001). University of South Florida nurses video conferencing onto the Internet. Syllabus, 15(5), 35. (*professor teaches nursing across live video feeds to students.)*

Young, J. R. (1999). Are wireless networks the wave of the future? The Chronicle of Higher Education, 45 (22), A25-A26. (*students can now attend courses in the library, dormroom or outside using wireless laptops - describes implementation of wireless technology at several universities)*

Young, J. R. (2000). SUNY's Morrisville campus sees wireless computing as a way to create a niche. The Chronicle of Higher Education, 47 (7), A62, A64. (*many departments at Morrisville are now requiring students to lease a laptop computer and a wireless network adapter - describes some benefits of wireless technology)*

**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)*

Albrektson, J.R. (1995). Mentored online seminar: A model for graduate-level distance learning. Technological Horizons and Educational Journal, 23 (3), 103-105. (*how to deal and develop long distance learning at the graduate level)*

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)*

Berge, Z. L., Collins, M., & Dougherty, K. (2000). Design guidelines for Web-based courses. In B. Abbey (Ed.), Instructional and cognitive impacts of web-based education (pp. 32-41). Hershey, PA: Idea Group Publishing.

Beyon, D., Stone, D., & Woodroffe, M. (1997). Experience with developing multimedia courseware for the World Wide Web: The need for better tools and clear pedagogy. International Journal of Human-Computer Studies, 47, 197-218.

Blumenstyk, G. (1998). A philanthropy puts millions into asynchronous learning. The Chronicle of Higher Education, 45 (12), p. A23. (*Alfred P. Sloan Foundation provides grants for distance learning courses offered anytime and anyplace)*

Bonk, C. J. & Cummings, J. A. (1998). A dozen recommendations for placing the student at the centre of web-based learning. Educational Media International, 35, 82-89.

Brooks, D. W., Nolan, D. E., & Gallagher, S. M. (2001). Web-teaching: A guide to designing interactive teaching for the World Wide Web (2nd ed.). New York: Kluwer Academic / Plenum Publishers.

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). How to proctor from a distance. The Chronicle of Higher Education, 46 (12), A47-A48. (*"experts say professors need savvy to prevent cheating in on-line courses" - points out increased difficulty of monitoring cheating in distance-education courses)*

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). Congressman worries aloud: Is online education any good? The Chronicle of Higher Education: Daily News, May 10, 2000. (*congress worries about lack of socialization with increasing online education - James Duderstadt responds that community aspect of classroom can be replicated online)*

Carnevale, D. (2000). Legislative audit criticizes Western Governors University. The Chronicle of Higher Education, 47 (October 6), A48. (*describes problems confronted by Western Governors University in recruiting students and implementing programs)*

Carnevale, D. (2000). Logging in with … Richard H. Hall: Scholar says "learning by doing" is the key to quality instruction. The Chronicle of Higher Education: Daily News, May 30, 2000. (*professor notices no difference in online and face to face styles of teaching - most effective pedagogy in either format is to engage students actively in learning process)*

Carnevale, D. (2000). Logging in With…Rob Kling: Indiana U. scholar says distance education requires new approach to teaching. The Chronicle of Higher Education: Daily News, February 21, 2000. (*case study focusing on distance learning effects on students - gives suggestions for course design of distance education courses)*

Carnevale, D. (2000). Study assesses what participants look for in high-quality online courses. The Chronicle of Higher Education, 47 (9), A46. (*high-quality online courses don't require anything fancy but aren't easy/people don't always agree on what makes good online courses)*

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). Videoconferencing technology permits lectures from a distance. The Chronicle of Higher Education: Daily News, April 6, 2000. (*a professor at New York U at Buffalo deployed an inexpensive, high-quality video-conferencing system to teach while he was overseas - uses Abilene high-speed Internet backbone)*

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)*

Carpenter, E. H., Wolfe, F. H., Ricketts, J., & Norvelle, E. (1998). Distributed learning course creation. Social Science Computer Review, 17, 357-381. (*Use Internet & CDs (high-graphic course content).*

*for distributed-learning course - currently conducting NSF-funded evaluation of course - describes multimedia classroom used for taping lectures)*

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). Psych students learn more through distance ed but are less satisfied. The Chronicle of Higher Education: Daily News, February 14, 2000. (*undergrad psych students score higher in online courses but report less satisfaction with them)*

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). Teaching distance courses is rewarding, surveys of instructors finds. The Chronicle of Higher Education: Daily News, March 15, 2000. (*instructors found opportunity to provide innovative instruction and access to place-bound students as a plus)*

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)*

Chamberlin, W. S. (2001). Face-to-face vs. cyberspace: Finding the middle ground. Syllabus, 15 (5), 10-11, 32. (*differences, similarities and middleground of Internet and traditional courses - identifies strengths of online courses)*

Chronicle of Higher Education (2000). Survey finds accounting professors skeptical of Internet-based courses. The Chronicle of Higher Education. *(Internet-based courses offer few improvements over traditional forms of distance ed, like mail correspondence courses)*

Clark, R. E. (1994). Assessment of distance learning technology. In E. L. Baker & H. O'Neil (Eds.), Technology assessment in education and training (pp. 63-78). Hillsdale, NJ: Lawrence Erlbaum Associates, Inc. (*Recommendations about when and how instructors should evaluate distance education programs/courses - distinguishes bt "delivery technology" (equip, machines, media). & "instructional technology" --ways to influence learning)*

Coble, P. (2000, August). Assessing learner performance in web-based courses. In symposium Comparison of theoretical perspectives in designing web-based courses, presented at meeting of American Psychological Association, Washington DC.. (*compares the objectivist viewpoint with the constructivist viewpoint in web based assessment strategies - rubric for assessment on 5 dimensions:*

*who assesses, what, when, & how assessed, why assessed)*

Daniel, J. (2001). Lessons from the open university: Low-Tech learning often works best. The Chronicle of Higher Education, 48 (2), B24. (*students use the net for specific reasons --administrative transactions, getting documents and info, communicating, not coursework)*

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)*

English, S., & Yazdani, M. (1999). Computer-supported cooperative learning in a virtual university. Journal of Computer Assisted Learning, 15, 2-13. (*Describes how various internet-based technologies used to simulate cooperative learning team projects - provides some evaluation data)*

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)*

Garrett, L. N., & Weiner, B. J. (1999). Keys to success in delivering distance learning on the Internet. Distance Education Report, 3(4), 6-7. (*Advice to administrators about staffing and preparing for distance education courses)*

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)*

Grasinger, M. F. (1999). Successful distance learning: Teaching via synchronous video. College Teaching, 47(2), 70-73. (*Describes use of synchronous video and insights gained by instructor)*

Hackmann, D. G., & Berry, J. E. (1999). Distance learning in educational administration doctoral programs: The wave of the future? Journal of School Leadership, 9, 349-367. (*Surveyed doctoral programs in Ed Admin to determine use of distance education - ~50% of 109 responding programs used distance education - faculty concerns: demands on faculty, resource availability, program quality, technical issues, program costs)*

Hantula, D. A. (1998). The virtual industrial/organizational psychology class: Learning and teaching in cyberspace in three iterations. Behavior Research Methods, Instruments, & Computers, 30 (2), 205-216. (*describes the development, evolution, successes and challenges from three iterations of a virtual industrial/organizational psych course)*

Inman, E., Kerwin, M., & Mayes, L. (1999). Instructor and student attitudes toward distance learning. Community College Journal of Research & Practice, 23, 581-591. (*Fac thought courses <= quality; best predictors of instruction qual: qual of fac's material, on-campus sessions & fac's availability; pred of course qual: qual of telecourse material, how much learned; pred how much learned: material, how much work req)*

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)*

Johnson, J. L. (1999). Distance education and technology: What are the choices for higher education? Journal of Educational Computing Research, 21(2), 165-181.

Johnstone, S. M. (2000). The evolving learning environment. Syllabus, 14 (1), 20. (*A commentary on the development of distributed and distance learning)*

Johnstone, S. M. (2001). Does accredited really mean accredited? Syllabus, 14 (6), 22. (*looks at the issues of distance learning providers and the various accreditation systems)*

Johnstone, S. M. (2001). Electronic learning generations. Syllabus, 15 (2), 14. (*the author talks about the importance of defining the term "distance learning")*

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)*

Key, C., & Mundell, R. (2004). Creating online case studies using LOGIC (Learning Object Generator in Case Studies). Retrieved July 2, 2004, from http://www.logicproject.ca/text/LOGIC_Whitepaper.pdf

Khan, B. (1997). Web-based instruction. Englewood Cliffs, NJ: Educational Technology Publications.

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)*

Lau, L. (2000). Distance learning technologies: Issues, trends, and opportunities. Hershey, PA: Idea Group Publishing.

Loeding, B. L., & Wynn, M. (1999). Distance learning planning, preparation, and presentation: Instructors' perspectives. International Journal of Instructional Media, 26, 181-192. (*Distance education instructors share what they learned regarding planning, preparation, and presentation of distance education courses using live televised instruction)*

Ludwig, B. (2000, August). Web-based instruction: Theoretical differences in treatment of subject matter. In symposium Comparison of theoretical perspectives in designing web-based courses. Presented at meetings of American Psychological Association, Washington, DC. (*views of learning and teaching have a direct relationship to the treatment of subject matter; compares objectivist and constructivist; & design of web-based courses)*

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)*

McCollum, K. (2000). Under new federal rules, satellite broadcaster offers university programming. The Chronicle of Higher Education: Information Technology, January 28, 2000. (*a satellite TV service began carrying four university channels this month to satisfy new federal guidelines requiring pub-interest programming)*

McHenry, L., & Bozik, M. (1995). Communicating at a distance: A study of interaction in a distance education classroom. Communication Education, 44, 362-371. (*Examined from students' perspective communication interaction in a live, interactive television classroom; noted problems: equipment failure, underused mikes, deadlines not clear, little evidence of "class community")*

McMahon, T., Gantz, W., & Greenberg, B. S. (1995). Interactive technology and inter-university team teaching. Journalism and Mass Communication Educator, 50, 62-70. (*Assessed student attitudes in distance ed class that used 2-way video & audio links; initially high expectations for video but preference for video over audio decreased by semester's end; concerns: poor quality of transmissions, lack of camaraderie)*

Merisotis, J. P., & Phipps, R. A. (1999). What's the difference? Outcomes of distance vs. traditional classroom-based learning. Change, 31(3), 13-17. (*Noted shortcomings in previous assessments of and research on distance ed; discusses implications for future of distance education)*

Miller, K. L. (2000, August). Selecting communication strategies and goals in web-based courses. In symposium Comparison of theoretical perspectives in designing web-based courses. Presented at meeting of the American Psychological Association, Washington, DC. (*communication needs and communication strategies to enhance learning in on-line courses based on information processing*

*theory and on constructivist theory)*

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)*

National Center for Education Statistics (2004). Distance education at postsecondary institutions. Retrieved July 6, 2004 from http://www.nces.ed.gov/programs/coe/2004/section5/indicator32.asp

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)*

Oliver, R., & Herrington, J. (2001). Teaching and learning online: A beginner's guide to e-learning and e-teaching in higher education. Perth, Western Australia: Edith Cowan University Press.

Olsen, F. (1999). 'Virtual' institutions challenge accreditors to devise new ways of measuring quality. The Chronicle of Higher Education, 45 (48), A29-A30. (*as distance education technology makes inroads in higher education, critics warn of approving "experiments" in distance education - must be mindful of accreditation issues)*

Olsen, F. (2000). Authors argue that 'distance education' is an oxymoron. The Chronicle of Higher Education: Daily News, June 2, 2000. (*Brown & Duguid, authors of new book "The Social Life of Information" say traditional higher education is being challenged by administrators eager to use technology to reduce expenses)*

Palloff, R. M., & Pratt, K. (1999). Building learning communities in cyberspace: Effective strategies for the online classroom. San Francisco: Jossey-Bass Pub. (*Describes new roles for students & teachers in distance ed; offers practical suggestions & poses questions to help instructors develop syllabus and design course to enhance collaborative & transformative learning)*

Papa, F., Perugini, M., & Spedaletti, S. (1998). Psychological factors in virtual classroom situations: A pilot study for a model of learning through technological devices. Behavior & Information Technology, 17(4), 187-194. (*Describes model for using psych variables to predict performance in distance ed courses; pilot showed +ve attitude to dist ed & +ve self-efficacy = improved perf but +ve att & -ve self-efficacy = lower perf; propose prediction model w/ several variables)*

Peirce, W. (2000). Online stradegies for teaching thinking. Syllabus, 14 (2), 21, 24. (*An insightful list of thought-provoking strategies for use in the online classroom.)*

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?)*

Phillips, M. R., & Peters, M. J. (1999). Targeting rural students with distance learning courses: A comparative study of determinant attributes and satisfaction levels. Journal of Education for Business, 74, 351-356.

Phipps, R., & Merisotis, J. (1999). What's the difference?: A review of contemporary research on the effectiveness of distance learning in higher education. Washington, DC: The Institute for Higher Education Policy. (*little "good" research examining effectiveness of dist ed; looks like dist ed = trad ed BUT studies seriously flawed; points out flaws, identifies gaps in research)*

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)*

Saba, F. (1999). Toward a systems theory of distance education. American Journal of Distance Education, 13(2), 24-31. (*Argues for a systems approach to describe, define and evaluate distance education)*

Schaad, D. C., Walker, E. A., Wolf, F. M., Brock, D. M., Thielke, S. M., & Oberg, L. (1999). Evaluating the serial migration of an existing required course to the World Wide Web. Academic Medicine, 74, S84-S86.

Schrum, L. (1999). Trends in distance learning: Lessons to inform practice. Educational Media and Technology Yearbook, 24, 11-16. (*Brief history of distance education and issues to consider in*

*designing distance education course)*

Shearer, R. L. (1999). Accreditation of distance learning in higher education. Distance Education Report, 3(4), 5. (*Very brief overview of issues from 1999 Council for Higher Ed Accreditation conference on distance education)*

Smith, P. L, & Dillon, C. L. (1999). Comparing distance learning and classroom learning: Conceptual considerations. American Journal of Distance Education, 13(2), 6-23. (*Identifies confounds in research evaluating distance ed; comparative research should identify & define attributes of delivery systems & media that support learning; attribute categories: realism/bandwidth, feedback/interactivity, branching/interface)*

Spector, M. (2000). Designing technology enhanced learning environments. In B. Abbey (Ed.), Instructional and cognitive impacts of Web-based education (pp. 241-261). Hershey, PA: Idea Group Publishing.

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)*

Thoms, K. J. (1999). Teaching via ITV: Taking instructional design to the next level. T.H.E. Journal, 26(9), 60-66. (*Practical recommendations for designing visual presentations for distance education course using interactive television)*

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)*

Tuovinen, J. E. (2000). Multimedia distance education interactions. Educational Media International, 37, 16-24.

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)*

United States Copyright Office. (2004). Retrieved July 24, 2004, from http://www.copyright.gov/title17/

Veronikas, S. W., & Shaughnessy, M. F. (2004, July/August). Teaching and learning in a hybrid world: An interview with Carol Twigg. Educause Review, 39, 51-62.

Wagner, E. D., & McCombs, B. L. (1995). Learner-centered psychological principles in practice: Designs for distance education. Educational Technology, 35, 32-35.

Wang, Y. C. (1998). Optimization learning in distributed education: Real-time interactive multimedia communication interface experience. Dissertation Abstracts International, 58(9-A), 3480.

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)*

Webster, J., & Hackley, P. (1997). Teaching effectiveness in technology-mediated distance learning. Academy of Management Journal, 40, 1282-1309. (*Examined extent to which characteristics of tech, instructor, course & students predicted students' involvement, cog engagement, tech self-efficacy, att toward tech, att toward distance ed & advantage in course)*

Weedman, J. (1999). Conversation and community: The potential of electronic conferences for creating intellectual proximity in distributed learning environments. Journal of the American Society for Information Science, 50, 907-928. (*Reviews literature on social dimension of distance ed & impact of computer-mediated communication on learning outcomes, reflective thinking, community-building; examines how prof students used electronic conf they set up)*

Welsh, T. M. (1999). Implications of distributed learning for instructional designers: How will the future affect practice? Educational Technology, 39(2), 41-45. (*Describes taxonomy for defining distributed instruction: mediation (human/technology), pacing (self/group), interaction (synchronous/limited synchronous/asynchronous); discusses implications of taxonomy for distance ed courses)*

Williams, M. L., Paprock, K., & Covington, B. (1999). Distance learning: The essential guide. Thousand Oaks, CA: Sage Publications, Inc. (*Provides strategies and helpful hints to structuring distance ed courses using voice teleconferencing, audiographics, Internet, one-way satellite, compressed video, full-motion video)*

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). Logging in with… Ken W. White: Advice for the online instructor: Keep it interpersonal. The Chronicle of Higher Education: Daily News, January 11, 2000. (*discusses design of online courses with Ken W. White, coauthor of The Online Teaching Guide, a book that explores benefits of and guidelines for online teaching)*

Young, J. R. (2000). Monograph reassures those afraid of creating distance courses. The Chronicle of Higher Education: Daily News, January 6, 2000. (*describes Judith V. Boettcher's book Faculty Guide for Moving Teaching and Learning to the Web - book includes practical suggestions for creating online courses)*

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). Scholar concludes that distance ed is as effective as traditional instruction. The Chronicle of Higher Education: Daily News, February 10, 2000. *describes Thomas L. Russell's book called The No Significant Difference Phenomenon - contains more than 400 studies that purport to assess the quality of distanced education courses - majority found traditional education = distance education)*

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. (2000). Web site provides advice on teaching with technology. The Chronicle of Higher Education: Daily News, April 5, 2000. (*web site Virtual Resource Site for Teaching with Technology gives examples of online courses & materials they use - provides tools for professors to gain ideas and information.)*

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)*

Young, J. R. (2002, March 22). 'Hybrid' teaching seeks to end the divide between traditional and online instruction. The Chronicle of Higher Education. Retrieved July 2, 2004, from http://chronicle.com/free/v48/i28/28a03301.htm