

On-Line But Off Course: A Wish List For Distance Educators, 2(3)

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Abstract

While it is unrealistic for distance education developers to build on-line environments which can meet the specific learning needs of each course participant, it is not unreasonable for course developers to become cognizant of ways to design more "tolerant" on-line environments-- environments which can accommodate the greatest number of learners. This paper presents a wish list created for World Wide Web-based course instructors who are developing courses to be delivered entirely over the Internet. As part of an 87-item checklist, both technical and non-technical recommendations are provided which detail ways to build and facilitate better on-line courses.

The use of innovative technologies to deliver distance education programs has made it possible to teach students, certainly more efficiently and potentially more effectively. The World Wide Web continues to gain popularity as an instructional medium for post-secondary institutions. Learners can choose to take courses and, in many instances, entire educational programs from a distance. As the number of individuals wishing to learn on-line burgeons, it is becoming increasingly important for educators to create on-line learning environments which can accommodate the specific needs of each learner. Distance education programs, while reaching many students who may not otherwise have been able to take school courses, can be more destructive than constructive if improperly designed and delivered.

The electronic environment may be the only way for course content to be learned for students who do not have the ability to attend traditional classes on a school campus (see [Parker, 1996](#)). Learning can be stifled if course material is difficult to access or presented in an ineffective way ([Parker, 1996](#)). Further, ignoring individual differences can hamper the effectiveness of a computer-aided instructional session ([Burger, 1984](#); [Cordell, 1991](#); [Friend and Cole, 1990](#); [Gaston and Arndt, 1991](#); [Marcoulides, 1988](#);

Background

[Corno and Snow \(1986\)](#) wrote that "The success of education depends on adapting teaching to individual differences among learners" (p. 605). The authors stressed that it should be the teacher's goal to create a natural classroom environment for learners--one which is fostered by the teacher adapting the environmental conditions to the learner's present state. Failing to meet the individual needs of each student in the traditional classroom could have a detrimental effect on learning outcomes ([Corno & Snow, 1986](#)). The on-line classroom should be no different.

Much research in the area of individual differences and their impact on learning has been conducted over the last several years (see [Ross, 1997](#)). However, in the "mad rush" to repurpose content for Web-based delivery, course developers often overlook what has been learned about student differences in the classroom environment, and neglect to apply sound instructional design principles to the on-line learning environment ([Gunawardena & Boverie, 1993](#)). Research has shown that individual differences such as cognitive learning style, level of domain knowledge possessed, and attitudes towards technology impact the way learners interact with, and learn from, the computer ([Burger, 1985](#); [Cordell, 1991](#); [Friend and Cole, 1990](#); [Gaston and Arndt, 1991](#); [Marcoulides, 1988](#); [Ross, 1997](#); [Ye & Salvendy, 1994](#)). Thus, in order to avoid alienating certain learners, distance education courses should be developed in such a way as to address individual differences.

In terms of individual differences and computer technology, a study conducted by [Ross \(1997\)](#) found that computer-aided instruction (CAI) may alienate certain learners. In particular, students who desire social interaction as part of the learning process, and think in a multidimensional, random-like fashion have difficulty adapting to computer instruction (see also [Davidson Savenye & Orr, 1992](#); [Fauley, 1991](#); [Gregorc, 1985](#)). In contrast, students who think in a sequential, linear fashion, and enjoy working relatively independently in isolation, appear to enjoy working with the computer.

The implications from the study by [Ross \(1997\)](#) suggested that course developers need to be cognizant of how they design and implement new technologies. It would appear that not all learners benefit automatically from human-computer interaction experiences, a finding which has implications for educational institutions wishing to place entire courses on-line. If material is presented in an ineffective way, many learners could become "imperiled" computer users and may be "at risk" for doing poorly or dropping out of their on-line experience.

Rationale and Overview

There currently appears to be disparities that exist between on-line courses in regards to design and implementation. Some on-line environments are extremely effective, providing numerous features and intuitively designed interfaces which can be adapted to meet the individual needs of the learner. Other courses clearly need more work in order to ensure positive learning outcomes for all learners involved.

While it is not the intent of this article to find fault with current course delivery programs on the Web, it is hoped that the information presented will give course developers impetus to structure learning environments to better meet all students' needs. This article presents a number of suggestions for developing more tolerant learning environments, and provides the reader with a detailed checklist that can be used to evaluate current on-line courses.

The recommendations included in the checklist presented in the Appendix stem from literature in the area of distance education, and from my experience as an instructional designer for a post-secondary distance education program. Some of the points included in the "wish list" are nontechnical in nature; others require course developers to move beyond the default features included in most current distance education course environments (i.e., a plethora of text interspersed with some pictures, an animation or two, and a simple forward, back button navigation bar). Regardless of the technical nature of each of the points detailed in this article, course developers are encouraged to adopt, or at least consider, the recommendations to follow.

Student Tools

When creating on-line course environments, it is imperative that students are provided with tools to help with managing course information. The checklist contains seven tools detailed below.

Glossary:

This tool can be useful when a large amount of textual content is placed on-line. To give students a sense of the word in context, instructors are encouraged to link glossary items to their original location in the text. Making glossaries searchable may be necessary if the number of entries warrant such an organizational tool. Especially in courses with complex vocabulary, or where the population is comprised of English as a Second Language (ESL) students, an option for pronounced glossary terms would be useful. By clicking on a *pronounce* button located by each complicated word, learners could hear the narrated version of the term.

Index:

Akin to a table of contents, the index tool provides learners with a brief overview of the major topics of discussion. *JAVATM* or *Dynamic HTML* programming languages can allow for lists to be automatically expandable or contractible, a necessary function for organizing course material. If a *tracking* function is available (see [Functionality Section](#)), learners could be provided with an indication of what parts of the course they have or have not completed. A star or a bullet could be placed beside pages not yet visited, thereby allowing learners to keep track of what topical areas they have yet to cover.

Bookmarking:

This feature allows learners to return to the area of the course last visited before log-off. Bookmarking can quickly orientate the learner each instructional session. A message upon log-in, for instance, would ask the learner to choose whether to resume the session on page 'x', or to go to the main course home page as a starting point.

Searching:

Especially important in courses with vast amounts of information and resources, the search tool can help learners find specific information quickly and efficiently. To give the learner more searching flexibility and power, allow for Boolean operators (and, or, not), and provide the ability to search the course site or the entire Internet for the term.

Related Links Page:

When including detailed resource lists, the course facilitator should categorize links according to course subject areas; furthermore, links should be checked frequently to ensure they are accurate, and in cases where there are multiple pages of links, a search tool can be useful. A *submit links* button, which e-mails the suggestion to the instructor and appears at the bottom of the links page, is an effective way to invite student submissions. In this way, the instructor can use course participants as Internet "scouts," keeping watch for links which are relevant to the course site.

Notebook:

An electronic notebook with a print and edit feature is particularly helpful for the learner who prefers to summarize and paraphrase course material. A floating, pop-up window can allow the learner to move through course pages, while having constant access to the notebook. The learner should not be expected to open an external word processing program to create course notes. By providing a notebook tool, learners are able to perform all course tasks conveniently and integratively within the same browser program.

On-Line Help:

Although most on-line courses have some type of help feature available to learners, many do not provide detailed answers to frequently asked help questions. In order for the help feature to be of any use to the learner, it must be extensive and cover the areas which most often cause problems to learners while on-line. Including a webmaster's or course facilitator's e-mail address is useful for the learner who wishes to add a question to the frequently asked help inquiries. Further, on-line help is of little use if it is difficult to access or find; hence, it is recommended that a help button be included in the main navigation toolbar located on *every* course page.

Collaboration Tools

Some individuals prefer learning in social situations ([Butler, 1984](#); [Fauley, 1991](#); [Gee, 1990](#)). However, this may be a problem when having to learn course material in relative isolation at a distance. Unless collaborative experiences are created and encouraged on-line, the social learner may become disillusioned and unmotivated to achieve ([Sarasin, 1998](#)). The checklist contains three areas which emphasize collaborative learning while on-line: Asynchronous communication, synchronous communication, and class lists are offered as possible ways to help social learners adapt to on-line instruction.

Asynchronous Communication:

Like mailing a letter and having to wait for a response from the recipient, asynchronous communication systems can fragment and decontextualize a conversation. However, such a system of communication can provide learners with a record of previous discussions (in the form of posts), and can allow the student to respond to questions or comments regardless of how much time has elapsed since the original post.

Creating a course *Usenet Newsgroup* can provide learners with a relatively efficient way of communicating with others in the class. Newsgroups can be created within Usenet, a part of the Internet which offers subject-specific discussion groups. To access Usenet, though, the learner needs to have a newsreader program or a browser that is configured to access newsgroups.

A more integrated and effective way to encourage asynchronous communication is to implement a bulletin board system within the course web site. To be maximally effective the course bulletin board should allow for threaded discussions, sorting and posting attachments such as graphics, related documents or *URLs* (web addresses).

Another effective way to involve students in course-relevant discussions is to create--or encourage learners to subscribe to existing--course relevant listservs. A listserv is a discussion group that uses the e-mail medium to communicate. A question or a response given by a user is automatically disseminated to all subscribed members of the group. Similar to a newsgroup, a listserv provides subscribers with opportunities to engage in topic-relevant discussions in an asynchronous fashion.

Synchronous Communication:

Whereas asynchronous communication fragments a conversation, synchronous communication systems allow for learners to discuss course issues in *real-time*. Although learners use the keyboard as the means of participating in course discussions, on-line synchronous text *chatting* can be compared with telephone-facilitated conference calls.

Chat rooms within the course web site should allow for multiple participants and have a *record-to-transcript* feature. For those not able to participate in the discussion, a written transcript of the forum is beneficial. In addition to publicly-accessible rooms for general course discussions, learners should be able to create private chat rooms for group projects or topical discussions requiring privacy.

Web Board™ is recommended for instructors wishing to create chat rooms and bulletin board systems. The point-and-click interface allows instructors to create multiple rooms and conferences with little time or effort.

Class Lists:

To foster learner collaboration and socialization on- and off-line, instructors are encouraged to devise class lists with students' first (and possibly last) names, e-mail addresses and other particulars that students are comfortable disclosing. With permission, learners' e-mail, photographs, background information, and personal interests can be included. In courses where collaborative work is required to complete assignments, such information may be helpful for group member selection. To ensure privacy, class lists should only be circulated via e-mail or within student handbooks.

Administration and Security

Security and proper organization of information while learning on-line is of the utmost importance. The following checklist items detail features designed to ensure learners access course information in a safe and efficient way.

Log-In/Log-Out:

Learners should be required to log-in and log-out each on-line session. Sensitive information such as course performance, individualized instruction profiles, and on-line testing forms should be accessible only to the instructor and the individual learner. Log-ins also reduce the possibility of learners using false identities in the chat rooms and bulletin board systems, while log-outs ensure others cannot access anyone else's course information after the instructional session. To deter or quell incidence of password fraud, learners should be encouraged to change passwords on a weekly basis and instructed to never share passwords with others.

Counter:

A simple way to track the number of times a page is visited is to include a counter. In addition to helping the course instructor monitor the number of times the web site is visited, a counter also shows learners how many times a certain page has been accessed by their peers.

Multi-Browser Use:

Course material should be developed with both *Netscape Navigator*TM and *Internet Explorer*TM in mind. Each browser uses different protocols to decode and present material. For example, while *Java*TM programming language can be viewed on both browsers, *Javascript*TM cannot. In addition, page lay-out can vary between each browser, so it is important that frequent tests be conducted using both browser standards.

Testing and Recordkeeping

Testing and recordkeeping functions allow learners and instructors to monitor performance throughout the course. The checklist includes four features detailed below.

On-Line Gradebook:

Including a detailed gradebook can help learners monitor their performance in the course and view how their marks compare with others in the class. There should be opportunities for students to view statistics such as mean, median and mode results graphically or textually and see their current mark standing in the course.

Quick Quizzes:

Many learners like to test their knowledge frequently. Providing end-of unit quick quizzes with detailed explanations can be a beneficial learning tool and an indicator of what the instructor views as an expected competency level. In addition to being used as a study resource, quizzes can be formally timed and scored for student grades. On-line testing, like testing in the traditional classroom, should allow for varied question types such as multiple choice and short answer.

Essay Submission Forms:

In courses where learners are required to write essays or hand in case study analyses, the instructor should provide on-line submission forms where content can be attached automatically or simply cut and pasted into the form space. Within-course forms can simplify the submission process for learners who are not computer-literate.

Functionality

The following checklist recommendations focus on improving a site's functionality. Site maps, user tracking and multimedia technology are included in this section.

Site Map

According to [Hammond \(1989\)](#) students can become disoriented in hyperspace. The idea of not knowing where one is when on-line can severely affect learning ([Castelli, Colazzo, & Molinari, 1996](#)). Providing students with a detailed hierarchical and clickable structure of the course web site can improve the functionality of the course's web site. Especially for students who think in an unstructured, non-linear manner--and who will be more likely to follow links to places which may not necessarily be related to the lesson at hand--an on-line map may help these individuals to stay oriented and on-track.

A one-screen, clickable delineation of the entire site is a relatively simple feature to create (using an automated map-building program), and allows learners to quickly obtain an overview of the site's structure. Ideally, the site map, available from any page, should highlight the screen from where the learner is accessing the map (akin to a "you-are-here" marking on a map).

Tracking

Success in any type of distance education course requires the student to be a motivated, independent learner who can effectively manage time and pace learning to meet the demands of the course ([Coggins, 1988](#); [Eastmond, 1992](#); [Sadiq, 1996](#)). However, it can be difficult for the instructor facilitating an on-line course to maintain constant contact with each and every student.

Creating some type of user tracking system can be a highly effective way for the educator to monitor learners. The nature of the Web makes it easy for the instructor to track users as they traverse through the system of course pages. Information such as navigation patterns, specific time on pages, number of links followed, etc., are statistics that illustrate individual on-line learning "habits". Audit trail files, created from server records, can help course facilitators pinpoint those learners who are at-risk for doing poorly in the course. Moreover, this information can be used to help the course developer identify pages which may be causing difficulty for students, or areas of the course that are being under-visited.

Learners can use the same information to view how many pages they have visited (or have yet to visit), the time they have spent on-line, and how many times they have logged on. In this way, a student's user history becomes a tool for monitoring and facilitating the learning process.

Better Use of Multimedia Technology

Most of the current course environments rely heavily on text to present content. While uploading pre-existing text allows for rapid development of course pages, it does little to stimulate and engage students in the learning process. Providing properly employed audio and video streaming can enhance the learning experience for course participants who are auditory or visual learners ([Filipczak, 1995](#); [Sarasin, 1998](#)).

Streamed video is becoming commonplace on the Web. Software programs such as *Real Video*TM use highly complex compression algorithms, enabling instructors to provide students with lengthy video clips which take seconds to begin playing directly from the web page. When coupled with the fact that bandwidth will continue to increase over the next several years, institutions will find it increasingly difficult to rationalize not including video in their delivered courses.

Audio can also be streamed directly from web pages. No download time is necessary to take advantage of:

1. *Audio Messages*-- Instructors can record messages that would play automatically upon loading specific pages. These messages may be used to highlight important points, or serve as reminders for students (e.g., "Don't forget that tomorrow there will be a quiz on the Baroque period. Pay particular attention to sections 1-6.") .
2. *Tape Recorded Short Lectures*-- Instructors can take advantage of audio streaming to record entire lectures or shorter lecture summaries. Especially for auditory learners, such a feature is far more effective than reading the same material on-line.

3. *Pronounced Glossary Terms*--As was explained in the Student Tools section, instructors can choose to provide audio clips of glossary terms for ESL or auditory learners.

Many courses include simple animations to convey content and engage students in the learning process. With programs such as *Shockwave*™ (using *Macromedia Director*® files), interactive learning experiences are relatively easy to create and provide on-line. For instance, intricate animations detailing the process of chemical bonding or a specific weather cycle can clarify concepts a static textbook image simply cannot.

The question of bandwidth is often asked when dealing with multimedia on-line. Although video and audio streaming significantly reduce wait time, to allow for rapid loading of large files, some on-line course developers mail learners CD-ROMs containing course images and video/animation sequences. The Web site, programmed to load the files from the CD, is viewed as the structural backbone in this case. The nominal sum to produce and mail the CD makes it offset by the time and frustration students save while deciphering material on-line.

User Interface

The following suggestions focus on the needs of the learner, an often forgotten, yet essential, part of the design and delivery process ([Gunawardena & Boverie, 1992](#)). Most of these non-technical recommendations are meant to aid course developers in understanding--and applying to the "virtual classroom"-- the individual needs of learners.

Consistency of Layout:

When designing on-line course environments it is essential that the user interface is consistent from page to page. For example, if a navigation bar is located on the bottom of the page, then it should appear there on every course site page. If frames are used to divide the course material from the index of topics, then this layout should be consistent throughout the entire materials section. In this way, learners are able to focus on the course content, not the course interface.

Intuitive Interface:

To be intuitive an interface should be straightforward, self-explanatory and easy-to-use. Icons, for instance, should be designed in such a way so that the learner does not have to guess their function. In terms of navigation, it should not be difficult to move throughout the site. If learners are becoming lost or consistently fail to access certain parts of the site, then course design should be questioned.

User Feedback:

One way to improve a site's design is to provide user feedback. Feedback in the form of roll-overs (a feature which highlights a button so that the user knows it is clickable) and link descriptions, instead of link locations in the bottom of the browser window, can help the novice computer user learn how to navigate on-line.

Measures for Individualized Instruction

Using one method to teach all courses is simply not effective. [Schieman and Jones \(1992\)](#) argued that because each student learns differently, it is unreasonable and unfair for distance education courses to be delivered in one way only. For instance, the lecture approach only serves less than half of the student population in any classroom ([Butler, 1984](#); [D'Allura, 1983](#); [Farquharson, 1995](#)). Opportunities for group work, dialogue with the instructor, and self-directed projects are ways to meet the needs of different learners ([Johnson, 1995](#); [Kemp & Seagraves, 1995](#)).

When teaching on-line, a possible solution is to provide alternative learning strategies from which the student can choose. The literature has shown that some individuals involved in a computer-aided instructional session do not effectively manage their own learning ([Ross, 1997](#); [Small and Grabowski, 1992](#)). Some students make decisions which can be destructive, while others may simply not be motivated to learn using the computer. [Mills and Ragan \(1994\)](#) believe that adaptive interfaces, which match content presented to students' level of functioning, provide them with individualized instruction and improve learning outcomes.

[Carver, Howard and Lavelle \(1996\)](#) created virtual on-line learning environments that could accommodate students with different learning styles. An electronic learning style questionnaire (The Felder's Learning Style Inventory) was administered and used to match students to interfaces which were thought to be preferred by the different learning style groups. Reactions to the system were positive. The authors wrote:

Adaptive hypermedia based on student learning styles provides the ability to individually tailor the presentation of course material to each student. The underlying idea of adaptive hypermedia based on learning styles is quite simple: adapt the presentation of course material so that it is most conducive to each student learning the course material. To a certain extent, each student is taking a different course based on what material is most effective. This tailoring allows for efficient and effective student learning in the shortest possible period of time (1996 Ed Media CD-ROM Article # 486).

According to [Small and Grabowski \(1992\)](#), systems that give the user control over the learning process are empowering for some, while being destructive for others. The researchers warn that too much user control for some learners can lead to navigation decisions, resulting in skipping pertinent content or leaving the on-line environment before all content has been thoroughly covered (see [Schroeder, 1994](#)). [Castelli, Colazzo and Molinari \(1996\)](#) discovered that many users of hypermedia "get lost" in hyperspace. The notion of becoming disoriented due to incessant "jumping around" is consistent with findings from [Hammond \(1989\)](#).

Hence, a simple, yet effective, way to adapt instruction to meet the needs of all learners is to limit or expand the number of hypertext links provided. For example, students who find that they become lost in course content may wish to have the number of possible links to internal or external sources limited.

Auditory learners may wish to have information presented primarily through sound files, while visual learners may prefer to have mostly text or video-based instruction. Some students may

prefer multiple choice, whereas others may enjoy essay or short answer examinations. Regardless of the ways in which content or the interface is modified, course creators are encouraged to develop and perfect on-line adaptive systems of delivery. Continued research in the area will uncover better ways to deliver content so that each learner can achieve success.

Reasonable Load Time:

Course pages should be designed such that load time is minimized. Waiting any more than two minutes (using a 28.8 bps modem) for a page to be completely downloaded constitutes unreasonable load time. Using GIF image compression instead of the JPEG format can reduce the time it takes for pages to load graphical images. Streamed audio and video as opposed to downloadable media can reduce wait time drastically. In short, course instructors need not avoid using multimedia; rather, they should consider carefully the way such media are used.

Appropriate Use of Media:

New multimedia technologies can enhance the way material is delivered to learners; however, instructors should question how and where they incorporate multimedia. Developing an elaborate *Shockwave*™ animation to illustrate a concept that could just as easily be done with an *animated GIF* is one example of inappropriate media use. Creating a talking-head video (a person on video who moves only her lips to explain a concept, when an audio file complete with a static image of the lecturer could explain the concept just as effectively, is another example of misuse of multimedia. The message here is that media needs to be used judiciously and appropriately.

New Window for External Browsing:

A simple, yet potentially powerful instructional design feature to help students remain oriented in hyperspace, is to make all external site links load a new browser window. This would allow students to explore their current thought pattern, yet have the option at any time to return to their course pages. This dual-browser window feature can help allay students' fears of getting lost on-line.

Non-Technical Features

This section details non-technical suggestions to improve on-line learning environments. Each requires the instructor to be aware of learner differences and move towards accommodating students with computer anxiety, learning style differences and preferences for socialization.

Student Handbook:

Course registrants should be mailed--or provided on-line with-- a student handbook. Such a resource can help orientate the learner prior to the course's commencement, and provide information such as:

- course overview

- course chat room times
- class e-mail list
- plug-in information (how to download and use browser plug-ins such as *Shockwave* TM)
- course map (structure detailing sections of course and topical areas)
- frequently asked questions to address fears and misconceptions about on-line learning
- information on minimum computer system requirements

Orientation Day

[Bonne \(1996\)](#) wrote that orientation days can help anxious distance education learners adapt to the new learning situation. Ideally, opportunities for face-to-face orientations should be made available to course learners, although this may not be feasible for all students. Students who are unable to make the on-campus orientations could be provided with opportunities to engage in on-line video conferences or synchronous chat sessions with the instructor.

Student Survey

According to [Eastmond \(1992\)](#), many adult students taking distance education courses have difficulty completing their coursework due to factors such as anxiety towards technology, the lack of social opportunities presented, and the need for more instructor guidance. [Gee \(1990\)](#) posited that administrators who are aware of at-risk learners may be able to circumvent potential failure by putting in place specific intervention programs.

Administering an on- or off-line pre-survey of students' fields of experience and attitudes towards on-line learning is a relatively non-technical, simple, yet effective, way to help the instructor flag those students who may be at-risk for doing poorly. The survey results could potentially be used to adapt instruction to meet learners' needs. For example, if learner 'X' has three years of background in dealing with the course material, the instructor may give 'X' specific pointers to "must-read" pages, and modify assignments accordingly. Similarly, if learner 'Y' has expressed trepidation with using technology to learn material, the instructor may ask this student to give regular e-mail updates and provide the necessary support when needed.

A post-course survey is an excellent way to receive feedback on ways to improve both content and structure. Learner feedback can be incorporated into help section entries, and frequently mentioned concerns not addressed in the on-line help can be added. If they are concerns relating to design or delivery flaws, then the instructor may wish to revamp the problem areas for the next year's class.

Computer-as-Tool

Students learn materials in different ways ([Dryden & Vos, 1994](#); [Filipczak, 1995](#); [Sarasin, 1998](#)). While visual learners may process information best when presented with images and text, auditory learners learn best by hearing the material. Kinesthetic learners require their bodies to

be involved in the activity, whereas tactile learners like to involve touch as part of the learning process.

It is apparent that the computer simply cannot meet the needs of every course participant, regardless of how content is delivered. There are limits to what a student can do with the "machine" (see [Gregorc, 1985](#)). To meet the needs of the greatest number of learners, then, course facilitators is encouraged to design activities that give students choices in the way they learn course material ([Sarasin, 1998](#)). It is unfair to require *all* content learning to take place on-line. Options should be available for students to construct their own learning through other off-line experiences such as case study development, mini-experiments, and self-directed projects which can be submitted via e-mail or land mail. Off-line learning resources should be provided so that students who do not like computer technology can study away from the computer. In this way, the computer becomes a tool to facilitate student learning, even though it is still the primary delivery medium for the virtual classroom.

Although group work may be difficult to achieve on-line, the instructor may wish to give students the option to collaborate for certain assignments. Group work can be a highly motivating and effective learning tool ([Bowen, 1995](#); [Sarasin, 1998](#)), especially for those students who may be having trouble with learning from the computer and/or who are inherently social individuals ([Ross, 1997](#)). Ross recommended that, whenever possible, students who voice dissatisfaction with the computer should be allowed to work collaboratively on assignments. In this way, the focus shifts from learning from a machine, to learning with another human being while using a machine.

Assessing Learning Styles

According to [Wood, Ford, Miller, Sobczyk, and Duffin \(1996\)](#) merely knowing one's learning style can help at-risk computer users adapt better to the technology, provided that learners are given a number of intervention strategies which can be employed when encountering difficulty.

[Fauley \(1991\)](#) wrote that learning style can influence the way students view learning from the computer. Some learners can find computer-based instruction "dehumanizing...and cruel" (p. 34), as these learners require personal attention, interaction with others, and human intervention throughout the learning process. Other learners who can work relatively well alone, enjoy the opportunities that learning from the computer provides (Fauley, 1991) .

[Gee \(1990\)](#) investigated the effects of learning preferences on post-secondary students' success in a distance education course. Students identified as being independent thinkers were found to be more successful in the course than those who desired working with others throughout the learning process. The author recommended that a learning style inventory be given to help instructors meet the needs of the students, aid course designers in developing innovative instructional design methods, and assist advisors in helping students make informed decisions.

A number of self-scoring learning style batteries exist (such as The *Gregorc Style Delineator*™ or *Kolb's Learning Style Inventory*™) that help students quickly identify the way they learn best. Results can be used by the educator to:

1. Modify instruction to meet the individual student's needs. This would include offering a variety of options for assignments based on the learning style breakdown of the class.
2. Provide a *pointers and guidance* page based on the learning style categories assessed. Students who are having difficulties may benefit from the coaching tips provided.
3. Use a variety of teaching strategies. Even though the computer limits the kinds of teaching strategies a professor may employ in comparison to the classroom, there are still ways to use multiple teaching techniques to reach the learner. Students may be given opportunities to collaborate for completing assignments (virtual groupwork activities), ask questions and engage in rigorous discussions (in synchronous chat lounges), or complete independent studies under a professor's direction.

In summary, adapting instruction to meet students' needs does not have to involve extremely complicated, technical modifications to course interfaces. Many adaptations can be made to course delivery style which can address and, in some cases, circumvent potential adverse effects the technology can have on students.

Conclusion

In the "race" to develop on-line worlds which seek to bring the classroom to the home environment, the learner who possesses a number of individual differences should not be overlooked. While it is understood that implementing many of the recommendations presented in this article would be costly and time-consuming, there can be no excuse for alienating and isolating learners. If schools are going to move towards a web-based model of distance education, then more "tolerant" learning environments need to be constructed. Just as the educator must evaluate critically the methods and delivery style used in the traditional classroom, so the on-line course facilitator must continue to move beyond the idea of using one format to teach many learners.

Too many minds are at stake to go off-course while on-line.

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Appendix: Ross' Web-Based Evaluation Checklist

A detailed checklist has been devised to help distance educators evaluate on-line courses. Designed to be used as either a guide for the course developer or as an evaluation tool for the researcher, the checklist delineates features which should be present in on-line courses being delivered entirely via the Web.

Directions: There are 87 evaluation criteria, some of which have expanded lists. Place a check in the appropriate column to indicate the presence, absence or applicability of the criterion. Total the amount of checks in the 'Yes' column if you wish to obtain a final quantitative score for the course.

Note: This checklist should be used in cases where entire courses are offered on-line. It is not intended for on-line course material which supplements face-to-face class meetings.

FEATURES	YES	NO	NA	NOTES
Student Tools:				
Glossary				
Searchable				
Linked to Origins in Body Text				
Words Pronounced				
Course Content Indexed				
Expandable or Contractible Lists				
Indicates What Pages Completed				
Bookmarking/Resume Session				
Searching				
Boolean Operators				
Search for Internal/External Site(s)				
Related Links Page				
Links are Categorized				
Links are Current				
Links Can Be Searched				
Form for Submitting Links				
Note Book Management				
Edit Book's Contents				
Print Book's Contents				
Export Text				
On-Line Help				
Extensive				
Available At All Times				
Webmaster's E-Mail Provided				
Collaboration Tools:				
Asynchronous Communication				
Newsgroups				

Listservs				
Bulletin Board System				
Threading				
Sorting (by topic, poster, etc.)				
Post URL/Graphic				
Synchronous Communication				
Chat Rooms				
Transcripts Generated				
Supports Multiple Users				
Private Rooms Can Be Created				
Shared White Board				
Class Lists				
Student Pictures/Interests				
Student E-Mail Addresses				
Administration and Security:				
Log-In Required				
Ability to Change Password				
Log-Out Required				
Counter				
Multi-Browser Use				

FEATURES	YES	NO	NA	NOTES
Testing and Recordkeeping:				
On-Line Gradebook				
Class Statistics				
Student Statistics				
Quick Quizzes Provided with Answers				
Multiple Choice Questions				
Short Answer Format				
Timed and Scored				
Submission Forms for Essays				
Functionality:				
Site Map				
Available At All Times				
Clickable Map				
Extensive				
Student Tracking				
Shows Pages Visited/Not Visited				
Total Time Logged In				
Available to Instructor				
Multimedia				
Video				
Streamed (No Download)				
Audio				
Streamed				
Course Messages Area				
Lecture Files Available				
Animations/ShockwaveTM				
User Interface:				

Consistency of Layout				
Intuitive (e.g., Self-Explanatory Icons)				
User Feedback (e.g., Roll-overs)				
Adaptive Interfaces				
Based on Learning Style				
Based on Formative Evaluations				
Based on Field of Experience				
Based on Assignment Preference				
Appropriate Use of Media				
New Window for External Browsing				
Reasonable Load Time				
Non-Technical Features:				
Print Version of Student Handbook				
Face-To-Face Orientation Day(s)				
Student Survey/Feedback On-Line				
Computer-As-Tool Philosophy				
Off-Line Learning Materials				
Off-Line Assignments				
Learning Styles Assessed/Interpreted				
Total:				

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