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WEB DESIGN FOR EFFECTIVE ONLINE TRAINING AND INSTRUCTION

BY

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The undersigned certify that they have read and recommend to the Athabasca University Governing Council for acceptance of a thesis *Web Design for Effective Online Training and Instruction* submitted by Peter J. Patsula in partial fulfillment of the requirements for the degree of MASTER OF DISTANCE EDUCATION.

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ABSTRACT

The following is a research/experimental thesis that surveys and examines web-design for effective online training and instruction. The purpose of the thesis is to create -- from a variety of relevant learning theories and practical web-design strategies advocated in the research literature -- a Web-based instruction checklist that can be used to develop and assess online instructional materials. This checklist, referred to as WeBIC, is structured around the common ISD processes of analysis, design, development, implementation, and evaluation, with a focus on 'Web Usability' and 'the Five Ps' of preparation, presentation, participation, practice and performance. To determine the usefulness of WeBIC as a design and evaluation tool, three studies have been generated: (1) an experimental *comparison* study of online instructional materials in two formats -- a web-study one that follows guidelines and strategies outlined by WeBIC, and the other that follows a text-only format based on a modified form of thesis writing guidelines; (2) an *analysis* study of server data related to website access and instructional activity at ESLenglish.com and during the comparison study; and (3) an *evaluation* study of the instructional materials used in the comparison study and the instructional materials available at ESLenglish.com. The comparison study showed 2.1% learning gains that under closer analysis were found to be non-significant. The server analysis study confirmed the importance of designing for 'speed of access' and 'navigation ease.' It also brought into question the reliability of web mining data and the need for proper operational definitions. The evaluation study produced WeBIC scores for ESLenglish.com and the comparison study learning materials that could be used as benchmarks for further research.

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CHAPTER I

INTRODUCTION

Thesis

Can a synthesis of web design strategies based on relevant learning theories and practical design strategies advocated by the research literature, improve the effectiveness of online instructional materials at ESLenglish.com, a website aimed at helping ESL learners develop their English skills and increase their motivation to study English? ESLenglish.com is a non-profit website developed by the author.

Opportunity

Educational technology has increasingly become important as a vehicle for educational reform. The *Emergency Librarian* (Trends, 1997) reports the following trends:

a. Computers are pervasive in schools and higher education institutions. Virtually every student in a formal education setting has access to a computer.
b. Networking is one of the fastest growing applications of technology in education.
c. Access to television resources in the school is almost universal.
d. Advocacy for the use of educational technology has increased among policy groups.
e. Educational technology is increasingly available in homes and community settings.
f. New delivery systems for educational technology applications have grown in geometric proportions.
g. There is a new insistence that teachers must become technologically literate.
h. Educational technology is perceived as a major vehicle in the movement toward education reform.

The Internet is also becoming more popular worldwide and is particularly pervasive in North America. According to a survey conducted by Coopers and Lybrand (1998, as cited in Go-Abacos, 1999):

> Consumers are turning on their computers and tuning out television. Fifty-eight percent of on-line users cut back on TV viewing to use the computer. Consumers with access to the Internet spend 40 to 45 hours a month on line. These consumers are surfing for information, rather than entertainment.

According to Resch (1999, as cited in Go-Abacos, 1999), now that more than two out of every five people in North America are Internet users, the Web is becoming an integral part of daily life. Resch adds, "with more than 30 percent of users being Internet consumers, we're seeing a tidal wave of e-commerce in North America." With more people accessing the Internet for information, Lefrere (1997) points out that the Internet has become a more instructionally sound medium that offers a new way of learning. He contends that the Web has the potential to become a place where:

> Students will learn to make sense out of nonsense and order out of chaos. They will ask essential questions and solve complex problems. They will join electronically with brothers and sisters around the globe to cast a spotlight on earth-threatening issues which deserve attention and action.

Owston (1997) also contends that "nothing before has captured the imagination and interest of educators simultaneously around the globe more than the World Wide Web" (p. 27). It is arguable that nothing ever before has captured the imagination and interest of the *entire world* simultaneously. While television has captured international attention by catering to national and local tastes, the Web is the first medium to fit a truly global role. The Web will open new doors, as well as close old ones, and no doubt, as Owston concludes, "merits serious consideration as we search for ways to revitalize and enhance what we do in our schools" (p. 33).

It is clearly evident that along with the increased importance of educational technology, the growing popularity of the Internet, and the new potential for learning that the Web offers, that online training and instruction will become one of the biggest waves to hit the Internet. Furthermore, it is destined to become a major component and instructional tool of traditional education activity, ranking as high as the chalkboard and printing press.

Problem

Although the online training and instruction wave will be slow to build and crest, due to the lack of infrastructure and hesitancy and prejudices on the part of existing educational institutions, the progression is inevitable, and as certain as the postal service changed correspondence and email changed the postal service. Billions of dollars of investment and opportunity exist as the Web increasingly impacts the way businesses do business, the way consumers buy products and services (Forrester Research, 1999), and soon, the way people assimilate new information. The problem is that the Web contains too much *junk* and not enough *quality*. In the last two years, there has been an estimated 800% increase in the amount of online documents (Go-Abacos, 1999), with no indication in sight that this trend is likely to slow down anytime soon.

Although search engines attempt to sort out this mess and assist users in tracking down the information they require, with over 1.2 billion pages (Google, 2000), the sheer size of the

Internet necessitates the need for quality online products that organize information for growing specialty and educational markets. In fact, it can be argued that the fundamental role of an educator in today's information economy is to help society sort out the junk. To assist in this growth, guidelines are necessary to help designers develop more effective online instructional materials in consideration of the fact that online materials are NOT the same as printed materials and other instructional media.

Solution

A possible solution to the above problem is to design a set of comprehensive strategies packaged within common instructional design (ID) processes that can be used as guidelines for developing and evaluating online instructional materials. These strategies should be based on relevant learning theories and other practical strategies advocated by the research literature and should also be tested on and applied to the development and evaluation of instructional materials.

Proposed in this thesis is a Web-based instruction checklist to assist in the development and evaluation of online instructional materials. This checklist is abbreviated as WeBIC and is structured around the ID processes of analysis, design, development, implementation, and evaluation with a focus on 'Web Usability' and 'the Five Ps' of preparation, presentation, participation, practice and performance. WeBIC functions on five levels:

1. *Five Main Processes*. The five main processes of analysis, design, development, implementation, and evaluation, similar to ADDIE Model (Clark, 1995), the TIP Model (Training, 1990), and the Gerlach and Ely Model (Braxton, Bronico & Looms, 1995), form the basic structure and sequence of WeBIC.

2. *Fifteen Sub-processes*. The 15 sub-processes, organized under the three main processes and supported by Andrews and Goodson's "Fourteen Common Tasks in Model Development" (1980), give further structure and sequence to WeBIC.
3. *Fifteen Objectives*. Fifteen objectives are used to clarify the 15 main processes.
4. *Eighty-four Web-based Instruction Strategies*. The strategies relate to the 15 objectives to clarify and support the tasks within each objective.
5. *Two Hundred Web-based Instruction Checklist Questions*. The questions relate to the strategies to provide guidelines for Web-based Instruction (WBI) development and a basis for evaluating WBI projects, including content websites.

WeBIC provides a model for WBI that is easy to use and yet at the same time comprehensive. It is founded on relevant learning theories and practical web design and training strategies advocated by the research literature. In this thesis, it has been tested on and applied to phrase exercises developed for an ESL website, ESLenglish.com, and further supported by an analysis of the site's server access logs.

Hypotheses

By applying WeBIC strategies to online instructional materials, designers should be able to produce more effective materials. This hypothesis will be tested by applying WeBIC to ESL instructional materials on ESLenglish.com. In a comparison study, consisting of a control group and a treatment group, the *control group* will receive online instruction developed using a modified thesis writing standard, while the *treatment group* will receive online instruction of the same content developed using WeBIC. It is hypothesized that the treatment group will perform better than the control group on an online evaluation quiz taken shortly after the content is reviewed. It is also hypothesized that study of site activity over a period of 30 days and site activity during the comparison study will reveal patterns of content interaction conducive to learning as encouraged by WeBIC design principles. The site activity will be recorded and analyzed using HitBox, AXS, WebTrends, NetTracker and OpenWebScope web mining software.

Significance

With the increasing use of the Internet as a means of distributing information, the need to develop strategies to facilitate this distribution is inevitable. Online materials are not the same as printed materials: screen fonts are not as crisp as printed fonts; scrolling is not the same as flipping a page; and hyperlinked text, a new revolutionary way to map and present information, in not the same as flipping through an encyclopedia or dictionary to look up a concept or word. “Because of the unique and interactive nature of multimedia, the designer needs to look beyond the boundaries of existing methods and incorporate techniques from film and video production, the visual arts, music, and the array of associated knowledge related to production of those media” (Edtech, 2000). A convenient and comprehensive design checklist is an appropriate solution to assist online instructional designers to develop more effective materials. At the same time, such a checklist helps relieve some of the pressures educational institutions face in having to become more accountable for the quality of their output and at the same time fiscally responsible by providing a standard of quality and procedures as advocated by research experts within the industry.

Server data analysis, more frequently referred to as ‘web mining’ is also a relatively unexplored field of Web research that is wide open for development. A quite “detailed profile of ‘what goes on in a person’s brain when they visit a site’ can be created by collecting second-by-second information about the route a user takes through a website, the rate at which s/he takes it, [and what s/he clicks on]” (Baggaley, 2000, April 10). There is also:

> A large gulf of understanding that exists in many institutions between the researchers and the systems analysts who control the web server facilities. At present, researchers tend not to recognize the wealth of server data that is available to their research; and the systems analysts do not typically recognize the many ways in which it could be useful to the researchers -- e.g. the analysis of daily site logs in studies of website effectiveness (Baggaley, 2000, April 10).

A study in web mining can provide webmasters and educational researchers with new insights into how such data can be used to improve instruction and how reliable the data truly are.

CHAPTER II

REVIEW OF RELATED LITERATURE

The purpose of the following literature review is to provide background information and definitions of important terms used in this thesis, an explanation and justification for the organization of WeBIC, and most importantly, design and evaluation criteria in the form of strategies and questions supported by learning theories and practical web design strategies. Among other sources, this review is based on more than 20 articles from related journals, over 60 web-based articles, and the following 18 texts:

1. *Basic Research Methods in Social Science* by J. L. Simon and P. Burstein (1985).
2. *Beyond Instruction: Comprehensive Program Planning for Business and Education* by W. J. Rothwell and P.S. Cookson (1997).
3. *Designing Web Usability* by J. Nielsen (1999).
4. *Designing Web-based Training* by W. Horton (2000).
5. *Distance Education: Crossing Frontiers*, edited by F. Nouwens (1998).
6. *Distance Education: New Perspectives*, edited by K. Harry, D. Keegan and M. John (1996).
7. *Distance Education: Strategies and Tools*, edited by B. Willis (1994).
8. *Foundations of Distance Education* by D. Keegan (1996).
9. *Instructional Media and Technologies for Learning* by R. Heinich., M. Molenda, J.D. Russell, and S.E. Smaldino (1996).
10. *Instructional Message Design: Principles from the Behavioral and Cognitive Sciences*, edited by M. Fleming and W. H. Levie (1993).
11. *On-line Teaching in Distance Education and Training* (MDDE 621, Study Guide) by P. J. Fahy (1999).
12. *Program Planning for the Training and Continuing Education of Adults: North American Perspective*, edited by P.S. Cookson (1998).

13. *Programme Evaluation and Quality: A Comprehensive Guide to Setting up an Evaluation System* by J. Calder (1994).
14. *Survey of Educational Technology Research* by M. Szabo (1998).
15. *Training for Improved Performance Series* by Athabasca University (1990).
16. *Web-Based Instruction*, edited by B. H. Khan (1997).
17. *Why the Information Highway? Lessons from Open & Distance Learning*, edited by J.M. Roberts and E.M. Keough (1996).
18. *Writing for the Web* by C. Kilian (2000).

Definitions

As used in this thesis, the following important terms have been defined: (1) instructional design; (2) online training and instruction, WBT and WBI; (3) online instructional designer; (4) online instructional materials (5) quality, efficiency, and effectiveness; (6) interaction; (7) usability; and (8) data mining and web mining.

Instructional Design

Briggs, Gustafson, and Tillman define *Instructional Design* (ID) as "the systematic application of a set of principles to achieve effective, efficient, and relevant instruction" (1991, as cited in Sisco & Cochenour, 1998, 331). More simply, Sicso and Cochenour define ID as a process involving "the analysis of learning needs and goals and the development of a delivery system to meet those needs." On the other hand, Merrill, Drake, Lacy and Pratt (1996) take a more scientific approach. They contend that "the discipline of Instructional Design is a combination of discovery and invention." They believe that there is "a scientific discipline of instructional design" that is "based on a set of specific assumptions" and "founded on scientific principles verified by empirical data."

Under WeBIC, ID is defined as: **the application of a set of objectives and strategies based on the processes of analysis, design, development, implementation and evaluation, to arrive at the most effective, efficient, and usable instructional solution**. Closely related to ID is the concept of *Instructional Systems Design* (ISD). ISD is a more specific branch of ID rooted in the instructional design theory of the United States military. Since its conception, the systematic approach of ISD "has exerted a profound influence over instructional design in business and industry" and subsequently has spawned a number of variations over the years (Rothwell & Cookson, 1997, 195). Andrews & Goodson (1980) have identified more than forty variations all of which include in some fashion or another the following five stages: analysis, design, development, implementation, and evaluation. The first letters of each of these stages make up the acronym for the classic ADDIE model.

WeBIC closely follows the ADDIE Model with a focus on strategies applicable to the design of online instructional materials. It must be clarified however that WeBIC is not being proposed as a new ID model. Rather, its ID model-like processes, based on existing ID and ISD models, are being used as a usable familiar structure to more effectively organize its strategies. It should also be kept in mind that the strategies outlined in WeBIC are not intended to address numerous factors pertaining to course and program development. Once again, its purpose is to provide guidelines for instructional design not program planning.

<u>Online Training and Instruction, WBT and WBI</u>

Horton (2000) defines web-based training (WBT) as "any purposeful, considered application of Web technologies to the task of educating a fellow human being" (p. 2). Kirby

(1997) defines WBT as "an innovative approach to distance learning in which computer-based training (CBT) is transformed by the technologies and methodologies of the World Wide Web, the Internet, and intranets." Khan (1997b) prefers the term *Web-based Instruction* (WBI). He defines WBI as "an innovative approach for delivering instruction to a remote audience, using the Web as the medium" (p. 5). More specifically, he defines the term as "a hypermedia-based instructional program which utilizes the attributes and resources of the World Wide Web to create a meaningful learning environment where learning is fostered and supported" (p. 6). Barron (1998) comments that:

> Other terms that have been used for this category of instruction include IBT (Internet-based Training), WBL (Web-based Learning), and WBI (Web-based Instruction). In the industrial arena, WBT appears to be emerging as the acronym of choice; the academic arenas seem to prefer WBI or WBL.

In this thesis, the terms 'online training', 'online instruction', 'Web-based Instruction', and 'Web-based Learning' will be used in preference to the terms 'Web-based training' and 'Internet-based Training,' as well as other similar terms such as 'online education,' 'Internet Learning,' and 'e-learning.' In this thesis, *online training and instruction* will be defined as: **a set of learning activities that are systematically designed to achieve planned instructional and institutional goals using the Web as a delivery medium**. In this thesis, the terms 'online training', 'online instruction', and 'WBI' will also often be used interchangeably, with the understanding that WBI and online instruction are broader in concept than online training.

It is interesting to note that other than 'online education,' 'online training' is the most popular search term with users of the GoTo search engine. By entering and submitting a search phrase using the GoTo Search Term Suggestion tool (GoTo, 2000), a researcher can survey how many times a particular word or phrase was searched on last month. Using a variety of terms related to online training, Table 1 shows results obtained for the month of June, 2000.

The results in Table 1 establish ‘online education’ (2,470) and ‘online training’ (2,253) as by far the most popular terms in the field of online ID, with Horton’s and Kirby’s ‘Web-based training’ (624) a respectable third, and Khan’s ‘Web-based instruction’ (25) a distant ninth. It is also interesting to note that the term ‘instructional design’ (588) is sought for more frequently than ‘instructional systems design’ (149) by a factor of almost four to one.

Online Instructional Designer

Instructional designers have been embellished with a variety of names and responsibilities. Braden (1996, 5) lists the following titles used by individuals whose role is to ‘design instruction’:

a. instructional designer
b. instructional developer
c. instructional technologist
d. educational technologist
e. performance technologist
f. training designer
g. curriculum designer
h. educational psychologist
i. computer educator
j. production expert/specialist
k. teacher trainer.

Table 1. *GoTo Search Term Suggestions*

Search Term	Searches Done in June 2000
1. online education	2470
2. online training	2253
3. online learning	1238
4. web based training	624
5. internet training	283
6. internet education	280
7. web based learning	64
8. internet learning	63
9. web based instruction	25
10. online instruction	19
11. web based education	19
12. internet instruction	12
instructional systems design	149
instructional design	588

Analysis and Technology Inc. (1995) provides a long list of "Competencies and Skills for Instructional Designers," under which instructional designers have the responsibility to:

1. Perform a needs assessment/analysis.
2. Plan and monitor training projects.
3. Assess the relevant characteristics of the target audience.
4. Assess the relevant characteristics of the setting.
5. Perform job, task, and/or content analysis.
6. Write criterion-referenced, performance-based objectives.
7. Select instructional media.
8. Recommend instructional strategies.
9. Develop performance measurement instruments.
10. Develop training program materials.
11. Prepare end-users for implementation of courseware materials.
12. Evaluate instruction, program, and process.
13. Demonstrate an ability to grasp technical content.

14. Communicate effectively by visual, oral, and written form with individuals, small group, and in front of large audiences.
15. Interact effectively with other people.
16. Demonstrate good work habits.

Surrounded by this potpourri of titles and responsibilities, the term ‘instructional designer’ becomes rather nebulous. Cookson, Knowles, Nadler and Nadler (1998) simplify the matter by defining the term *designer*, as the “person responsible for the design process” (p. 58), hence an instructional designer, would likely be defined as the person responsible for the instructional design process. However, this definition lacks conviction and direction, and perhaps is not much better than no definition at all. Braden professes that consistency and agreement is important in definitions, because when using such terms “if the names are not the same, how can we expect that the intent or the approach or the results will be the same?” (p. 5). Nevertheless, despite this caveat, he skirts the issue himself discussing only the similarities between instructional designers, especially: (1) a concern for the facilitation of learning, (2) a belief that their design principles are “a prescription for learning,” and (3) a shared common base of literature, full of theory and advice.

What is clear from the above myriad of titles, responsibilities, and somewhat non-committal definitions is that the ‘instructional designers’ of today, like ‘program planners’, must aspire to become modern day jacks-of-all-trades, capable of solving a number of design and planning problems that often change dramatically from one project to the next. As Shipp (1998) points out, “today’s programmer [like today’s instructional designer] needs to have a much broader understanding of the overall objectives of [an] organization, more managerial skills, more budgeting skills, and the ability to interact on a peer level with higher levels of management" (p. 105).

With the above discussion in mind, under WeBIC, an *online instructional designer* is defined broadly as **an individual who is responsible for developing online learning activities to achieve planned instructional and institutional goals**, and more specifically, as an individual with a wide variety of design and planning roles and responsibilities delineated by the purpose and function of their organization. Many of these roles and responsibilities can be extracted from the list of strategies outlined in WeBIC (see Appendix A). In the application of this definition, it should also be pointed out that the gap between *instructional designer* and *program planner* has been narrowed substantially, so that for most purposes instructional designers and program planners share the same responsibilities and roles, with only the level of importance or degree of responsibility varying from one to the other. Practically speaking, what this means is that online instructional designers must be fully aware of budgetary and institutional constraints, often the domain of program planners who are "responsible for preparing planned learning experiences" (Rothwell & Cookson, 1998, 18), while program planners must be fully competent in the finer points of instructional design, as well as, web design.

It should also be understood that it is often impossible to find instructional designers and program planners with all the necessary skills to succeed on their own. And even though Merrill et al., (1996) advise that "those persons who claim that knowledge is founded on collaboration rather than empirical science . . . are not instructional designers," under

WeBIC, the use of course teams is encouraged, under the belief that "a group of specialists of various types working together to prepare a course will do a better job than and single subject expert" (Harry, 1998). WeBIC course teams, when possible, should consist of at least three members:

1. *Subject matter specialist* -- "responsible for the determination of *what* to teach (Shaw & Taylor, 1984);
2. *Design specialist* -- "responsible for *how* to teach" (Shaw & Taylor, 1984);
3. *Project manager* -- responsible for monitoring progress and coordinating other logistical problems (normally oversees several projects at once).

Online Instructional Materials

In this thesis, *online instructional materials* refers to web-based tutorials, training modules, chained exercises, chained CGI quizzes, and general online instructional content available on educational, information and content-based websites. This term is used interchangeably with the term *instructional materials*. However, instructional materials may also be defined to include printed materials as supplementary and reference resources.

Quality, Effectiveness and Efficiency

Quality. *Quality* is not an easy term to define. Its chameleon nature has proven difficult for even the most respected theorists to pin down. Berge (1995) believes that high quality instruction must promote "active learning using higher-order thinking skills such as evaluation, analysis, and synthesis, rather than simply rote memorization" (p. 22). Bradbery (1991, as cited in McIlroy & Walker, 1993) argues that "the fundamental criterion of quality must be value to the learner" (p. 42). He stresses the importance of the learning process as a central issue in quality in distance education. These ideas are consistent with the ideas of

Paul (1990, as cited in McIlroy & Walker, 1993) who defines institutional success in terms of producing independent learners (p. 42).

From a different perspective, Viljoen, Holt and Petzall (1990, as cited in McIlroy & Walker, 1993) focus their definition of quality on the process of interaction between the learner, the materials and the facilitator (p. 42). They argue that "quality is as much determined by the input of the customers as it is by the providers of the experience" and thus there are no guarantees that a product will work to a pre-specified level of performance. From still yet another perspective, Nunan and Calvert (1991, as cited in McIlroy & Walker, 1993) surmise that "the literature of distance education has generally focused on quality in terms of *what*" (p. 42). They argue that "distance education must now focus on quality for *whom* and in *whose interests*" (italics by author).

What is clear from this barrage of definitions is that *quality* is based on assumptions. As McIlroy and Walker (1993) point out, "these assumptions help determine how quality is defined" (p. 43). The problem however is that the above assumptions, both collectively and separately, do not provide a useful definition of quality. A more promising definition of quality has been proposed by quality management proponent Juran (1989). Juran states that *quality* can be defined as "fitness for use," or as McIlroy and Walker (1993) interpret, "fitness for purpose" (p. 42). Fahy explains (1999, September 24, citing the MDDE 620 Study Guide, p. 39):

> This definition has the advantage of brevity, while recognizing the essential relativity of the term. In other words, what one source may regard as 'fit' may not suit the purposes of another; similarly, fitness standards may vary over time, and thus standards of what constitutes quality may change.

However, although Juran's definition is both brief and broad, it is also somewhat vague. Any agency using this definition must further elaborate upon what they mean by "fitness for use." Instead, it would be better to define *quality* as a set of *standards* that can be used to *evaluate* a product or project. This definition is equally applicable to cars, dishwashers, traditional education, academic research, online training, online instruction, and any other conceivable invention of the human mind. This definition is more practical as well because as Fahy (1999) states, in defining quality, "there must be goals, or targets, and there must be measurement of the degree to which these are being met" (p. 104). In other words, in any definition of quality, two critical components must be clarified: *standards* and *evaluation*.

It can also easily be argued that quality is impossible to determine without systematic *evaluation*. A point supported by Fahy who contends that "constant assessment . . . is the key to quality" (p. 104). Likewise, it can be argued that evaluation is impossible without *standards*. At Everyman's University in Israel (Guri, 1987, as cited in McIlroy & Walker, 1993) "the emphasis is on developing the best possible course materials according to predetermined standards and goals. Thus, quality control is seen as being primarily concerned with adjusting operations to predetermined criteria" (p. 41). In reflecting on the above arguments and definitions, under WeBIC, *quality* will be defined as . . . **a set of *standards* that can be used to *evaluate* online instructional materials**. These standards can be derived from the objectives, strategies and questions outlined in WeBIC.

The potential weakness of this operative definition of quality as applied to traditional education, distance education, and online training and instruction, is the inherent “difficulty of applying quality control mechanisms . . . because of the concepts of academic freedom and professional autonomy (Guri, 1987, as cited in McIlroy & Walker, 1993, 41). The very nature of academic research, and for that matter product and corporate research, demands that standards of quality vary from project to project making it difficult for an agency to apply useful quality criteria to specific situations. In recognition of this, an agency’s quality standards must be flexible enough to accommodate professional and situational differences, yet at the same time, rigid enough to provide useable criteria to evaluate program plans, research activities, and a wide variety of instructional initiatives, including online training. Either that or individual quality standards must be derived for each separate project based on the agency’s more general quality standards. These multiple levels of standards would ultimately lead back to an institution’s mission and goal statements, or in the case of WeBIC, the organization’s *purpose definition*.

<u>Effectiveness</u>. Quality is an abstract concept that suggests an order of perfection or excellence. It is a defined term based on the application of standards and evaluation. The link between evaluation and quality is explored by Lewis (1989, as cited in McIlroy & Walker, 1993) who argues that “evaluation is a process of making judgments about the effectiveness of programs” (p. 42). From this statement, the following relation can be derived: since evaluation cannot occur without standards, *effectiveness* can be defined as the process of determining how well or how closely a product or project meets standards of quality. In other words, the more effective a product or project, the closer it is to meeting its quality standards.

But this definition of effectiveness is limited. It is also confusing and misleading, as it seems to interpret quality and effectiveness as being one in the same. Thus, what is really needed is a more universal definition that is both practical and to the point, and more specifically, one that separates *quality* from *effectiveness*. This operative definition can be derived as follows: if *quality* is based on whether a product or project lives up to a set of *standards*, along a similar line of reasoning, *effectiveness* can be defined as whether or not a product or project accomplishes its *goals*. These goals are derived from an agency's mission statement, its own standards of quality, or any other means an agency wishes to define itself by. To evaluate effectiveness, a continuum or range of low and high also needs to be defined.

More simply stated, the concept of *effectiveness*, as applied to online training and instruction, can be defined as . . . **the *evaluation* of whether online instructional materials accomplish their *goals* or *objectives.*** In support of this, Steele (1970, as cited in Rothwell & Cookson, 167) describes that when evaluating the effectiveness of a program, one should ask the following questions:

1. What did the program accomplish?
2. How well did it accomplish its objectives?

This definition is also supported by Calder (1994) who contends that "to demonstrate effectiveness, it must be shown that goals are met" (p. 35). Calder stresses the importance of making all program goals and objectives explicit, followed by a clear system to measure actual outcomes with stated goals. Interestingly enough, the above definition of effectiveness, as well as the earlier definition of quality, can create some curious predicaments. In some cases, depending on the standards of quality and goals of an online training company or agency, high quality projects could be evaluated ineffective and low quality projects could be evaluated effective.

For example, suppose that an online educational agency wishes to make use of an award winning RealAudio lecture on the Philosophical Disputations of Plato and Aristotle as part of its freshman Philosophy 101 course. Although this lecture may have been evaluated as high quality by closely meeting judiciously chosen standards of quality regarding philosophical pedagogy, it could prove to be ineffective if being used as a tool of instruction for learners who are hearing-impaired or who have access to computers with only 14.4 k modems, and hence insufficient bandwidth to download RealAudio files. Using the same example, a simply formatted transcript of the RealAudio lecture, posted on the Internet, that under the same set of standards would be evaluated as lower quality, could be considered more effective in meeting the needs of both these groups of learners. It is interesting to note however that if the above agency incorporated the concept of *a suitable delivery method* as one of its standards of quality, and conducted an analysis of potential learners to determine suitability prior to the course start date, then the RealAudio lecture may have been evaluated as lower quality, and the simply formatted transcript as higher quality.

Efficiency. Calder (1994) asserts that to demonstrate efficiency, "you have to show that you are making good use of the resources available" (p. 35). Similarly, in this thesis, *efficiency* in online training and instruction is defined as . . . **demonstrating effectiveness within existing constraints**. More specifically, to be evaluated as *efficient*, an online instructional agency must be able to operate and provide instruction effectively under any given time or resource limitations and constraints imposed by such factors as its unique financial, political, social, technological, environmental situation, and learning goals. This operative definition is quite functional to the extent that it factors in both the concept of *resource efficiency* (i.e., how well funds are being used to meet instructional goals) and *learning efficiency* (i.e., how fast learning goals are being met). For example, a non-profit online instructional agency offering a course on 'How to Lose Weight,' to be considered *efficient*, would have to show that revenues from course fees are equal to or greater than costs, and at the same time that learners are actually losing weight and meeting other instructional objectives within a reasonable length of time.

Interaction

The term *interaction* like the term *quality* yields a plethora of conflicting definitions and view points. Szabo (1998) reports that "people who use the term *interactivity* rarely provide operational definitions. Some call pressing the space bar an interaction, while others require deep cognitive processing to occur" (p. 44). Berge (1995) argues that there are essentially two kinds of interaction. One is where students interact *individually* with content. The other is more of a *social activity* where students interact with *others* about the content. Berge adds that "both types of interaction are necessary for efficient, effective, and affective learning" (p. 22-23). He also further categorizes interaction into four types:

1. between student and course materials;
2. between student and learning activities/examination;
3. between student and instructor; and
4. among students.

Similarly, Moore (1996) describes three types of interaction relevant to distance education:

1. learner-content interaction;
2. learner-instructor interaction; and
3. learner-learner interaction.

The first type of interaction is "interaction between the learner and the content or subject of study" (p. 20). The second type of interaction is "interaction between the learner and the expert who prepared the subject material, or some other expert acting as the instructor." The third type of interaction could be called inter-learner interaction, that is interaction "between one learner and other learners, alone or in group settings, with or without the real-time presence of an instructor" (p.22). Moore surmises that learner-instructor interaction, in particular, is regarded as essential by many educators, and as highly desirable by learners.

Under WeBIC, *interaction* in online training and instruction will be broadly defined as: **that which "takes place when the student is in two-way contact with another person or persons or intelligent agent in such a way as to elicit reactions and responses that are specific to the student's own requests or contributions"** (Szabo, 1998, 42). This *social interaction* may be "*synchronous* (real-time, live and conversational-like during the instructional session) as in the case of two-way audio and two-way video, or *asynchronous* (delayed, before or after the instruction session: as with correspondence, computer-mediated, and mailed communication" (Threlkeld & Brzoska, 1994, 46). In this thesis, *interaction* will also include the reactions and thinking that takes place as students interact with content.

Usability

Jakob Nielsen is considered the world's acknowledged authority on web usability. Nielsen (2000) advises that the Web is "the ultimate customer-empowering environment" whereby "he or she who clicks the mouse gets to decide *everything*" (p. 9). Hence, "usability rules the Web." He argues that the importance of usability in web design can be defined by the following simple equation: (a) "In product design and software design, customers pay first and experience usability later"; (b) "On the Web, users experience usability first and pay later" (p. 10-11). Web usability can be further defined by the following principles:

1. "Web users want to find what they are after quickly"; and
2. "If they do not know what they are after, they nevertheless want to browse quickly and access information they come across in a logical manner."

Under WeBIC, in consideration of the guidelines and principles set out by Nielsen, *usability* is defined as . . . **all factors in the design of online instructional materials that foster speed of access and ease of navigation**.

Data Mining and Web Mining

"Data mining is one of the hottest topics in information technology" (Chau, 1999). Essentially, it is the process of automatically and exhaustively exploring very large datasets to uncover hidden relationships (Moxon, 1996, as cited in Chau, 1999). Chau reports that currently, "data mining itself is in the second generation of artificial intelligence" whereby "once particular patterns or trends have been discovered in the data searched," new sophisticated "machine-learning ability allows modification of search criteria automatically before the next execution." Data mining has also advanced to the state that it can now be used to ask a processing engine to provide answers to questions that researchers perhaps do not even know how to ask (Yevich, 1997, as cited in Chau, 1999). Chau provides this example:

> Bank customers' data are kept in different databases, thus, they are isolated from each other. Data mining technology can search all the different databases together, and provide a better customer view so that the bank can concentrate more on potentially good customers.

Chau adds that "it is important to understand that data mining is a discovery-oriented data analysis technology and not a single product or a system." It cannot be equated to, for example, a simple search engine such as Yahoo.com or Google.com. Rather, it functions more like a highly focused data transformation framework (Davydov, 1997, as cited in Chau, 1999). Data mining technology uses techniques borrowed from "the field of mathematics, cybernetics and genetics" (Chau, 1999), such as clustering, association and classification (Moxon, 1996, as cited in Chau, 1999), and has been successfully applied to the fields of science, health, marketing and finance (Solheim, 1996).

One of the fastest growing applications of data mining is discovering and organizing information from the World Wide Web. Simply put, *web mining* can be defined as the "data mining" of the World Wide Web. More specifically, Cooley, Mobasher, and Srivastava (1997) believe that among current research two distinct types of web mining have evolved. They refer to these as: "Web content mining" and Web usage mining." *Web content mining* is "the process of information or resource discovery from millions of sources across the World Wide Web." On the other hand, *Web usage mining* "is the process of mining Web access logs or other user information user browsing and access patterns on one or more Web localities."

In this thesis, the focus will be on *Web usage mining*, and its application to the daily server access logs of ESLenglish.com as outlined in the second study of WeBIC. The common techniques for Web usage mining as outlined by Chau (1999) are:

1. *Clustering/Classification*. This technique allows researchers “to develop a profile for clients who access particular server files based on demographic information available on those clients, or based on their access patterns” (Mobasher, 1997a). Using this technique, the classification of server access logs can lead to the discovery of relationships such as: learners from XYZ organization who visited the XYZ website tend to be interested in the page ../foldername/XWZ.htm; or 10% of the students who visited http://www.xyzwebsite.com were from Brazil. The clustering/classification technique can be particularly effective if the users actively complete a form or survey when visiting the site, so that additional demographic data can be compared with the server access log data.
2. *Association Rules*. This techniques allows researchers to discover “the correlations among references to various files available on the server by a given client” (Mobasher, 1997b). For example, using association rule discovery techniques a researcher can find correlations such as: 20% of the learners who accessed a certain web page with URL ../foldername/XWZ.htm, also accessed ../foldername/ABC.htm; and 1% who accessed ../foldername/XWZ.htm took the “DEF.htm” quiz.
3. *Path Analysis*. Using this technique some kind of graph is generated to “represents relation[s] defined on Web pages” (Mobasher, 1997c). Common graphs are of the physical layout of a website or the most frequently visited paths. Using path analysis, a researcher can determine what paths users travel to get to a certain URL or where they came from. For example, path analysis can be used to discover that 50 % of the learners who visited XYZ.com entered through the home page and 15%, entered from ../foldername/ABC.htm; or 30% of the visitors left after visiting four pages.
4. *Sequential Patterns*. This technique allows researchers to discover sequential patterns in server access logs that indicate user visit patterns over a certain period

(Mobasher, 1997d). Specifically, this technique looks at the 'time stamp' and attempts to estimate how long users stay on a page before leaving the site. By analyzing this information, the web mining system can determine for example: the percentage of clients who visited a certain URL, had done a search in Yahoo, within the past week on the keyword 'XXX'; or 60% of students who visited a certain URL returned with 15 days.

Practical Web Strategies

What follows is a collection of important web-design strategies, media selection criteria, and evaluation guidelines for online instructional materials advocated by experts in the field of online design and training. Each collection of strategies or guidelines is numbered and listed under its author. Each strategy within the collection is also numbered. At the end of this section, the most relevant strategies are summarized in tabular form with an explanation of how these strategies have been incorporated into WeBIC. Each author's strategy contributions are referred to later on in this review using the author's name or an abbreviation of the author (usually the first two letters e.g., Guay = Gu) and the number of the strategy (e.g., Guay 1.1 = Web Design 1.0 -- Guay's Design Goals; 1. *Content*).

Web Design 1.0 -- Guay's Design Goals

Guay (1995) outlines the following general design goals:

1. *Content*. The content must be directed towards a specific audience and have a specific communications goal.
2. *Layout*. The layout must be aesthetically pleasing, balanced, and uncluttered.
3. *Physical Bandwidth*. Physical bandwidth must be minimized as to ensure quick response times.

4. *Cognitive Bandwidth*. Cognitive bandwidth must be minimized to ensure the user easily and accurately grasps your message. Guay defines *cognitive bandwidth* as "the time and mental effort it takes for the senses to take in, and the mind to process information."
5. *Navigation*. Navigation must be intuitive, clear, and flow well.
6. *Interactivity*. The highest possible level of interactivity must be provided.

<u>Web Design 2.0 -- Winn's Ideas for Learning in Hyperspace</u>

Winn (1997) suggests the following ideas for the development of hyperspace learning materials, based on the constructivist premise that knowledge is constructed by learners, knowledge is constructed in a context, and knowledge is constructed socially:

1. *Provide guidance to help students construct knowledge from information*:
   a. Provide specific guidelines about how to study on-line material, about what to look for at various websites, about how to apply and assess newly-acquired knowledge.
   b. Provide useful paths through information by limiting the number of links students can follow from any one place.
   c. Design pages so that student attention is directed to what is important and away from what is of secondary importance or merely embellishment.
   d. Use the entire repertoire of navigation aids so that students always know where they are, where they have been, and how to get to where they need to go.
   e. Embed guidance in organization/layout of web pages. "Visual and audio cuing can direct attention, highlight information, and suggest structure and sequence" (Project 25, 1997).
   f. Build interactive displays that provide feedback to students' actions. "Use strategies that require students to interact with material in multiple ways, such as interactive Web pages or tutorials" (Project 25, 1997).

2. *Provide opportunities for 'situated learning'*:

a. "If possible, use real-time simulations of situations relevant to the discipline" (Project 25, 1997).
b. "Use role-playing strategies."
c. "Use Internet resources to put students in contact with professionals in the discipline."

3. *Provide support for social learning*:
   a. Provide easy and quick access to faculty and other students through email and chat facilities, ultimately establishing a virtual community where students can freely exchange ideas.
   b. Use Internet forums, discussions, or other methods "to promote a virtual community for students to interact with students, teachers, and other members of community" (Project 25, 1997).

4. *Provide library resources*. Winn (1997) also recommends "providing easy electronic access to other resources such as libraries, databases and laboratories."

Web Design 3.0 -- Jones and Farquhar's Web-Design Pedagogy

Jones and Farquhar (1997) propose the following style guidelines to increase the effectiveness of Web-based instruction:

1. *Provide multiple versions of your material*. Offer a text only version, a version with smaller graphics, and a version that contains larger graphics and multimedia.
2. *Offer help in configuring your learner's browsers*. Provide users with information on which 'plug-ins' they need to take full advantage of the materials being presented e.g., RealAudio, Shockwave, Java, Acrobat Reader, etc. Include links to the sites where the plug-ins can be downloaded.
3. *Keep pages short*. Long pages take too long to download. Research on the Web also suggests that users do not like to scroll (Nielsen, 1996, as cited in Jones & Farquhar, 1997, 243).

4. *Link to other pages, not to other points in the same page*. “Jumping within the same page ads to the confusion of the learner” (p. 243) This is especially apparent on very long pages, where a jump to another section within a page may appear to be a jump to another page.
5. *Select and space your links carefully*. Place related links at the bottom of the page or at the end of the text (that’s where readers expect them). Links placed within the passage can offer learners further information, clarification or exploration opportunities. Bear in mind that if too many links are offered, confusion may set in. Too much emphasis is no emphasis.
6. *Label links appropriately*. Do not label links cryptically. Say “more information on the migratory path of whales is available” (p. 243) rather than “go to http://www.whales.com/migratory-path/index1.html for more info.
7. *Keep important information at the top of the page*. When learners come to a page, they immediately scan for interesting and important information. Good web-design teaches to give learners whatever they want right away. A large graphic at the top of a page may look nice, but takes up too much of the immediate viewable space to be considered instructional valid.
8. *Clearly identify selectable areas using the royal blue convention for “hot’ items and selections made using the standard purple convention*. Unless there is a good reason to violate the standard of using the ‘royal blue’ color to indicate selectable areas, and the ‘dark red’ or “purple” color for selections made and progress through the site, Jones and Farquhar recommend to follow the standard. They even go as far to recommend avoiding the use of graphic maps which do not conform to these standards.

Web Design 4.0 -- Berge’s Guiding Principles in WBI Design

Berge (1998) describes eight principles under pedagogical, technical/support and social categories that have been created to assist designers in the development of web-based learning environments:

1. *Identify goals*. Identify and describe the list or goal(s) of each learning activity and the level of interaction (both social and instructional) that is required.
2. *Define the levels of teacher-control, student-control, and group-control*. The level of control determines whether the framework is based on positivism (i.e., training by objectives), behaviorism (i.e., focus on behavioral changes), and constructivism (i.e., active participation and reflection by the learner). Student-centered learning methods are more problem-solving and inquiry-based while in teacher-centered learning, the primary goal is to transmit the expert knowledge of the instructor to the novice students.
3. *Limit levels of quantity*. Quantity of content should be inversely related to the level of synchronous communication that exists within the web-based learning environment. The challenge for the designer is to select media that helps match the quantity of content with the required and desired quality and level of interaction.
4. *Text and graphics are presently the easiest form of multimedia to use*. Berge warns that although online environments support multiple forms of full-motion video and streaming audio, text and graphics are presently the most user-friendly. If such forms of media are required, a CD-ROM, videotape or audio-cassette can be used in conjunction with the Web-based instruction to avoid bandwidth problems.
5. *Use the principle of technological minimalism*. Berge emphasizes the importance of designing an online environment suitable for the learner's technical abilities. In general the more 'bell and whistles' a delivery technology has, the more expensive and complex the equipment needed, and thus the greater the limitations on student access. It is also important for the designer to make the technology 'seamless', in order for the learner to remain totally focused on the learning experience.
6. *Provide adequate technical support and training for both student and instructor*. Designers need to consider the technical skills of both the learner and the instructor. This is vital to success of the online learning environment. "The more technology used, the greater the need for technology support" (p. 75).

7. *Create a learning environment that fosters co-operation and trust among students and the instructor*. Berge remarks that “one definition of education is that education is what is left after you have forgotten all you learned in school” (p. 75). Considering this it is important to establish a secure comfortable environment for students and not penalize them for unsophisticated attempts at dealing with new technology. To promote learning, an online environment should also be friendly and social.
8. *Synchronous communication is more costly than asynchronous*. Berge asserts that both modes of communication are important web-based tools in teaching and learning. However, synchronous communication is more expensive in terms of equipment costs and infrastructure required, and in terms of inconvenience regarding time and space requirements for the learner and instructor. This needs to be balanced with “the richness that is sometimes experienced in face-to-face interactions” (p. 75).

<u>Web Design 5.0 -- Daunt’s Choosing the Right Technology Strategies</u>.

Daunt (1998, 168-169) outlines the following strategies for choosing the right technology:

1. *Establish your need-then choose the technology*. Daunt maintains that “a common mistake is to start with the technology and then find a use for it.” She advises that “your needs should always dictate which (if any) technology should be used.”
2. *Look at the range of technologies*. Do not be seduced by just one technology or media. Daunt advises that “no single technology is superior to all the others.” She suggests that you ask yourself: “How available/accessible is this technology? Will the students be comfortable using it?”
3. *Include the users in your selection process*. Daunt warns us that “in some cases, resistance [to new technology] has been so high that the implementation of the technology has failed completely.” She adds that “technologists are very good at knowing the technology, but often don’t have educational experience. They

should be part of your team, but remember, they are seeing the technology with a different set of values to educators."

4. *Consider the needs of your learners*. Daunt believes that "just as teachers have to be comfortable with a new technology, so do the learners."

Web Design 6.0 -- Paquette-Frenette and Larocque's Collective Approach

When needing to link "design, delivery, and organizational structures" in an effort to implement a "collective approach" in distance education, Paquette-Frenette & Larocque (1995, 164) advise selecting technologies that are:

1. easiest to use and that build on acquired competencies;
2. most interactive in real time;
3. the least expensive to operate, install, buy, and maintain;
4. easiest to connect in networks for group work; and
5. easiest to connect with existing installations (at the local, regional, provincial, and national levels).

Web Design 7.0 -- Bates' ACTIONS Model

Bates (1995) provides the 'ACTIONS Model' criteria for selecting technology to be used in distance and online education (Bartolic-Zlomislic, 2000):

1. *Access*. How accessible is the technology for the learners? How flexible is it for the target group? Will the teacher have adequate access to be able to prepare materials?
2. *Costs*. What is the cost structure of each technology? What is the overall cost of implementation? What is the unit cost per-student cost? What is the cost of not using other possible technologies?
3. *Teaching and Learning*. What kinds of instructional approaches will this technology support? How are teaching and learning methods limited and

enhanced by this technology? What teaching/learning activities will make the best use of this technology?

4. *Interactivity and User-friendliness*. What kind of interaction does this technology support? Is it easy to learn and use?
5. *Organizational Issues*. What are the barriers to be removed, before this technology can be used successfully? What changes in the organization need to be made? How do learners and teachers interact? What is the quality of interaction? Will students and instructors require a great deal of training to use this technology?
6. *Novelty*. How new is this technology for the users? Is it motivational? Is it fun to use? Has it stimulated funding?
7. *Speed*. How quickly can course material be prepared using this technology? How quickly can materials be changed or updated? How quickly can learning materials be accessed using this technology?

Web Design 8.0 -- 100+ Great Sites' Selection Criteria

ALA.org (1997), which lists over 100 great sites for children, outlines the following criteria for a great site:

1. *Authorship/Sponsorship -- Who put up the site?* A great site has: (a) a clearly stated name of the individual or group who created the site; (b) sources of information are provided where necessary; (c) a way for users to make comments or ask questions is provided; and (d) the website author is careful not to infringe upon the copyright and trademark rights of others.
2. *Purpose -- Every site has a reason for being there*. A great site has: (a) a clear purpose; (b) advertising that does not overshadow content; and (c) content that enriches the user's experience and expands the imagination (does not promote social, gender, racial or religious biases.
3. *Design and Stability -- A great site has personality and strength of character*. A great site has: (a) information that is easy to find and use; (b) an appealing design for the intended audience; (c) text that is easy to read and not cluttered with

distracting graphics, fonts, and backgrounds; (d) easy navigation; (e) well-organized links to other pages; (f) interactive features that are clearly explained; (g) reasonable load times; (h) consistent availability, i.e., site is always up and running; (i) links to required ‘plug-ins’; (j) design elements and site features, such as searchable databases, animations, graphics, sound files, etc. enhance the accessibility and enjoyment of the site; and (k) no special fees or login requirements to use the site.

4. *Content -- A great site shares meaningful and useful content that educates, informs, or entertains*. A great site has: (a) an appropriate title; (b) content that is easy to read and understand by its intended audience; (c) enough information to make the site visit worthwhile; (d) well thought out outlines and some kind of search function for sites providing large amounts of information; (e) correct spelling and grammar; (f) current and accurate information; (g) links to more information on the topic; (h) graphics that are relevant and appropriate to the content; (i) subject matter that is relevant to and appropriate for the intended audience; (j) a viewpoint that is comprehensible to the intended audience; (k) appropriate levels of skill requirements to use the site’s features; and (l) high quality of content for information based sites.

<u>Web Design 9.0 -- Jakob Nielsen’s Top Ten Mistakes in Web Design</u>

In May 1996, Nielsen posted the “Top Ten Mistakes in Web Design” in his Alertbox newsletter (Nielsen, 1996), which to date has received over 400,000 hits. Three years later, he updated this list (Nielsen, 1999), which he concludes “is still surprisingly relevant today.” Outlined below are each of his original ten mistakes and the “implications for the usability of a website today” as well as a score, which indicates the seriousness of the problem today:

1. *Use of Frames*. Back in 1996, splitting a page into frames can be very confusing for users. Frames pages could not be bookmarked, URLs did not work properly and printouts become difficult. However, due to some advances in browser technology, Nielsen reports that “frames are no longer the disaster they were in

1995 and early 1996." IE 5 for example, has finally regained the ability to bookmark pages despite the use of frames. Score: Medium.

2. *Gratuitous Use of Bleeding-Edge Technology*. Using the latest technology is a sure way to discourage users, especially if their system crashes while visiting a site. Many users will not come back. Mainstream users care more about useful content rather than glitz. Nielsen (1999) reports that "users who encounter as much as a single JavaScript error usually leave a site immediately. It's just not worth the time to figure out how to make something work when there are 5 million other sites to go to." Score: Very Severe.
3. *Scrolling Text and Constantly Running Animations*. Nielsen advises to never include page elements that move constantly. He comments that "users have started equating such designs with advertising which they routinely ignore." Score: Very Severe.
4. *Complex URLs*. Many users try to decode the URLs of pages to infer the structure of a website. It is thus a good idea that a URL contains a human-readable directory and file name that reflects the nature of the information. Longs URLs also cause problems when users email page recommendations to each other. Score: Severe.
5. *Orphan Pages*. Even though most users have learned the trick of getting to the home page by 'hacking' the end off the URL, and since users access pages directly without coming in through a home page, all pages should include a clear indication of what website they belong to, a link to the home page, and some indication of where the page fits into the structure of a site. This is especially important for novice users. Score: Medium.
6. *Scrolling Navigation Pages*. Back in 1996, Nielsen reported that "only 10% of users scroll beyond the information that is visible on the screen when a page comes up." Thus, he advised that "all critical content and navigation options should be on the top part of the page." However, this has changed somewhat. He reports now that "more recent studies show that users are more willing to scroll now than they were in the early years of the Web" (Nielsen, 1999). Scrolling

navigation pages cause fewer usability problems and can be allowed "if caution is taken in their design." Score: Smaller Problem.

7. *Lack of Navigation Support*. Nielsen recommends not to assume that users know as much about a site as the site designer. They need support in the form of a strong sense of structure. He suggests providing a site map and let users know where they are and where they can go. It is also a good idea to include a search feature since even the best navigation support is never enough. Nielsen (1999) adds that "people are now getting used to certain canonical navigation elements such as a site logo in the upper left corner (linked to the home page) or a clear indication of what part of the site the current page belongs to (linked to the main page for that section). If these elements are missing, users feel lost." Score: Severe.
8. *Non-standard Link Colors*. Links to pages that have not been seen by the user are blue; links to previously seen pages are purple or red. Nielsen (1996) advises not to "mess with these colors since the ability to understand what links have been followed is one of the few navigational aides that is standard in most web browsers." Nielsen (1999) reports more recently that he often sees users "bounce repeatedly among a small set of pages, not knowing that they are going back to the same page again and again." He adds that "because non-standard link colors are unpleasantly frequent, users are now getting confused by any underlining of text that is not a link." Score: Severe.
9. *Outdated Information*. "With the growth in e-commerce, trust is getting increasingly important, and outdated content is a sure way to lose credibility" (Nielsen, 1999). "Maintenance is a cheap way of enhancing the content on your website since many old pages keep their relevance and should be linked into the new pages" (Nielsen, 1996). Score: Very Severe.
10. *Slow Download Times*. Contrary to many pronouncements, Nielsen (1999) cautions that "the bandwidth problem has not been solved . . . nor will it be solved during the next three years. Not until 2003 will high-end users have sufficient bandwidth for acceptable Web response times. Low-end users have to wait until about 2008." Nielsen (1996) advises that "traditional human factors

guidelines indicate 10 seconds as the maximum response time before users lose interest." However, on the Web, since users have been trained to endure so much suffering, "it may be acceptable to increase this limit to 15 seconds for a few pages." Score: Very Severe.

Web Design 10.0 -- Vincent Flanders' Web Pages that Suck

Vincent Flanders (2000) offers the following practical to help web designers learn good design from the mistakes of others. Many of his strategies are based on the improper and ineffective use of 'bleeding edge' technology i.e., the newest and latest technology:

1. *Too Many Things Wrong*. Avoid using different colored buttons, popup windows, sound files, animated GIFs, blinking text, black borders on a white background, and 'click here' buttons.
2. *Pretentious Front Page*. Avoid using large animated gifs or other display techniques that at first look 'cool' but quickly becoming overused and cliché, tedious and boring. "Try to create a more interesting and informational front page."
3. *Forcing the Browser*. Do not "[irritate] visitors to your site by making ridiculous demands." Do not ask visitors to make their browser window a certain width, change their default fonts, or other such nonsense. As it is, most people do not know how to change browser defaults. Flanders also advises against requiring people to force people to load plug-ins to view a site.
4. *Domain Name Issues*. "It's a very good idea to acquire domain names with multiple variations of spelling and punctuation." Flander's provides the sample of coolpages.com which has to compete with websites like cool-pages.com, coolpage.com and cool-page.com owned by completely different companies. An agency's target market can easily confuse its website with the competition.
5. *High on Kai*. In the world of graphic design, 100 MB files are quite common. Flanders remarks that *Kai's Power Tools* has been a great staple of graphic designers and can create amazing yet huge files. In web design however, it is

necessary to “fight the urge to make really complex images” to keep load times reasonable.

6. *Free Backgrounds that Suck Page*. Flanders advises to avoid using complicated background images which, although perhaps beautiful in their own right, distract from the text and content. He believes this particular problem is frequent on sites designed by high school students wishing to express themselves with images that are only meaningful to themselves or their family and friends.
7. *Widen the Background Image*. Make sure background images are wide enough to be viewed by all kinds of monitor screen sizes 640 x 480 to 1800 x 1350. Otherwise the user will end up seeing text and images combined in unintentional ways that can instantly destroy a well designed site.
8. *Fonts and Drop Shadows: The Controversy*. Flanders reports that there is about a 50-50 split between sites that use drops shadows and those that do not. Web designers have also been unable to agree on the use of special fonts to attract audiences. In general, if instructional designers are not absolutely sure whether to use a font technique, they should stick to the norm.
9. *Too Much Text*. “It’s a common tendency -- especially for beginning designers -- to try to cram every piece of information on one page.” In most cases, it is better to break up a long document or condense it using categories.
10. *Bad Text*. Avoid using “multiple animated GIF images, <BLINK>ing text, multiple font sizes, multiple colored text, JavaScript status bar messages, rainbow-colored divider bars,” and centering text.
11. *Java Jive*. Flanders believes that ‘Java Applets’ are a waste of development time, and should not be seriously incorporated into web design until the Internet has more bandwidth.
12. *Needless JavaScript*. One of the most commonly used JavaScript techniques is the ‘mouse over’ whereby the user places their mouse pointer over an image and a new image pops up. This can be great for assisting navigation, but should be avoided unless genuinely adding to the usability of the site.
13. *Cascading Stylesheets*. Cascading Stylesheets (CSS) allow designers to have more control of the way text and images appear on a page. However, if users do

not have Netscape Communicator or IE 3.0, CSS will not work and generally reduce a site to a jumble of mismatched fonts . Flanders cautions that although stylesheets are among the latest in bleeding edge technology, “the problem with using [such] technology is that the blood on the floor ends up being yours.”

14. *Sliding Menus (DHTML)*. Sliding menus are created with DHTML. When a user hovers their mouse over a link or tab, a menu pops open. Flander’s believes that most sliding menus and many other uses of DHTML are just plain silly. His point is that “just because you can doesn’t mean you should.”
15. *Sliding Curtain Effect (DHTML)*. The ‘sliding curtain effect’ is another silly use of DHTML.
16. *Misusing the Meta Tag*. Flanders warns about misusing the META tag by adding popular key words not related to a site to try and trick search engines to rank a site higher and increase traffic. The problem is most users will angrily leave your site if greeted with content not related to their search.
17. *Internet Explorer Page Transitions (META)*. Flanders recommends to stay away from IE-only techniques that only work under IE and not Netscape such as IE’s page transitions and hover buttons.
18. *Cookies*. “A Cookie is a little nugget of information that is sent to your browser from a World Wide Web Server.” Flanders believes that cookies are universally hated and designers should think twice about using them. He advises web surfers to set up their browsers to alert them, whenever cookies are being sent.

Web Design 11.0 -- Ann Barron’s Design Considerations for WBT

Barron (1998) presents the following ‘rules of the road’ as she likes to call them “derived from the wealth of literature on the design of computer-based training and multimedia instruction” and guidelines “based on style recommendations for Web pages.” She adds that the “guidelines should be interpreted broadly, based on specific content, the intended audience, and the format of the data”:

1. *Conduct a thorough media analysis*. WBT is feasible for delivery of a project if: (a) information needs to be updated constantly; (b) the target audience is widely dispersed and there is no other efficient and effective distribution method; (c) the content does not rely heavily on audio of video which can bog down on the Web; and (d) the students would benefit with email and chat communication with the instructor rather than rely solely on self-study.
2. *Place course objectives first and foremost*. Barron advises that "if we do not focus on the content, the strategies, and the learning experiences of the student, we will lose the effectiveness of the program, regardless of the medium or the authoring environment." Instructional designers must create flowcharts to outline the sequence of a course, and use storyboards to detail the content, design, and interactions for each screen (page).
3. *Analyze the platforms of the target audience*. Characteristics of the target audience must be clearly defined. "With WBT, the audience analysis is vital because the users may be scattered throughout the world, and they may be using a wide variety of network, hardware, and software options." The speed of access might range from a 28.8 modem to a 100Mbps network. Information should also be provided to notify users about the recommended platforms.
4. *Make interactions meaningful*. "Simply adding a Next and Previous button on each page may require 'physical' interactions, but they may not engage the student's mind." Barron suggests the use of JavaScript, and/or courseware in Java or Shockwave, but only if it requires "cognitive engagement on the part of the students."
5. *Consider visual guidelines*. Before incorporating a graphic into page design, online instructional designers must assess its pertinence to the overall message. Barron suggests the following guidelines: (a) use high contrast between background and foreground to ensure maximum readability; (b) keep graphic files as small as possible with no one graphic being larger than 40 KB and use thumbnails to let the user decide if it is worthwhile to display the whole image; (c) limit the number of unique graphics on each page and if possible recycle graphics on a site so they can be accessed from the cache rather than the server;

and (d) limit the width of graphics to less than 472 pixels so learners will not have to scroll (this is especially important for a worldwide audience who may be using 640 x 480 resolution).

6. *Differentiate among the hyperlinks*. To prevent students from wandering the Web to visit other sites and lose focus, instructional designers need to make it easy for students to distinguish between links that branch off to other pages on the course website and links that lead to external sites. Barron recommends to: (a) include visual or textual clues to inform students when they are leaving the site (e.g., 'offsite link') and avoid using words like 'click here' which provide no navigation information; (b) include fixed links to provide structure and sequence for the WBT, such as 'previous page,' 'next page' and 'main menu'; and (c) provide information for links that involve large file transfers including file type and size.
7. *Limit the length of web pages*. If instruction materials are screen-based, the length of each page does not matter. However, if the materials are page-based, Barron recommends that the initial page of a website should not exceed one page. On other sections, she advises that "a good limit seems to be one-to-three lengths. The disadvantage of this approach is that it makes it more difficult for users to print pages. Thus, it is wise to provide a link to a separate file with the entire text.
8. *Minimize the use of audio, video, and plug-ins*. Non-streaming media files such as WAV, AVI or QT formats should be kept as small as possible "using only pertinent segments, sampling at minimal rates, and compressing the files as much as possible." Users should also be informed of the file size and download time. Streaming technologies such as RealAudio and Shockwave Audio offer faster access, however users may have difficulty downloading and installing the plug-ins and thus it is wise to consider other alternatives prior to using them.
9. *Encourage collaboration*. A major advantage of WBT, Barron contends, is that is it relatively easy to incorporate and encourage asynchronous (e-mail, CMC, etc.) or synchronous (chat, videoconferencing, etc.) communication between the instructor and the students.

Web Strategies 12.0 -- Ed's Oasis Website Evaluation Guidelines

The editorial board of Ed's Oasis (2000) uses the following 30 guidelines to evaluate educational sites (the following guidelines have been reproduced almost word for word with the exception of the italicized headings added by the author of this thesis):

Student action:

1. *Person-to-Person Interaction*. The site facilitates person-to-person interactivity and increased understanding through the use of Web-based communication technology.
2. *Contributions Screened*. Student communications and contributions are screened before being posted to the site.
3. *Related Links Provided*. Learners are able to link to additional online resources which provide related information or examples and support for the learning objectives of the program.
4. *Reliable Authorities Cited*. A reliable authority is cited for all information.
5. *Up-to-Date Content*. The online resource is stable and is updated to maintain the reliability and timeliness of data.
6. *Student Work Displayed*. The site provides ways for learners to share and display their work.
7. *Student Projects Supported*. There is support for the development of a variety of student projects.
8. *Online Feedback Forms*. There are online forms for student data input or collection.

Interface:

9. *Content-rich and Aesthetically Pleasing*. The site is content-rich and aesthetically pleasing: text is easy to read, and graphics enhance the basic instructional design of the site.
10. *Ease of Navigation*. Learners can navigate easily through the website.

11. *Navigation Tools*. The site is well-structured. User control is supported through elements such as a searchable index, a site locator map, or help screens.
12. *Bandwidth Conservation*. The site is designed to conserve bandwidth demands and incorporates new features of the World Wide Web only to increase the learning experience, rather than to display programming virtuosity.
13. *Plug-in Help*. There are clear directions for installing and/or locating plug-ins or helper applications necessary for the optimal use of the site.

<u>Curricular design</u>:

14. *Consistency of Objectives*. The instructional objectives and content of the program provide a very high degree of correlation to curriculum content appropriate for the targeted student group, and to national content and performance standards.
15. *Clearly Stated Objectives*. Program objectives are clearly stated, well-implemented, and are obvious and relevant to teacher and learner.
16. *Learner Needs Addressed*. The online resource addresses the needs of English learners, e.g. via providing alternate pages.

<u>Program design</u>:

17. *Unique Advantages of the Web Utilized*. The site's use of the unique features of the Web medium, including the ability to communicate, access extensive and current information, and publish, promotes a deeper and/or broader understanding of ideas, concepts, and theories than would be possible with more traditional instructional materials.
18. *Sharing of Ideas With Peers*. An online email group, conference, newsletter, or website offers opportunity for teachers to share their opinions and experiences in using the program and their suggestions for classroom activities.
19. *Non-biased*. The program is without cultural, gender, or racial bias in content and format, nor does it use demeaning labels or stereotyping of the elderly or disabled.

Instructional design:

20. *Multiple Learning Styles Accommodated*. The online resource accommodates multiple modalities and learning styles.
21. *Off-line Activities Provided*. The site contains suggestions for varied off-line activities.
22. *Multiple Points of View*. Various points of view are represented in the program, when appropriate.
23. *Creativity Stimulated*. The online resource stimulates student creativity and imagination.
24. *Self-study and Collaboration Facilitated*. The resource facilitates independent investigations as well as cooperative group work.
25. *Critical Thinking Skills Developed*. The program encourages learners to formulate strategies and offers opportunities to develop critical thinking skills in managing information.

Support materials:

26. *Support Materials Provided*. Support materials contain suggested student activities, specific objectives, management strategies, program descriptions, a project time line, and/or an online address for additional help.
27. *Performance Assessment Templates Provided*. The online resource contains templates or examples of performance assessment strategies which are well designed and simple to implement, as well as corresponding samples of evaluation criteria.
28. *Student Publishing Resources Provided*. Resources are provided for the teacher to facilitate the development of student products to be shared online.
29. *Special Needs Considered*. Strategies for using the resource with English learners or students with special needs are provided in the support materials.
30. *Community Involvement Suggestions*. Support materials contain suggestions for parent and community involvement.

Summary of How Web Design Strategies are Applied to WeBIC

Thirty-nine unique web-design strategies and common themes appropriate to the design of online training and instruction materials can be extracted from the above practical web design strategies. Table 2 outlines the concentration of these strategies and themes among the twelve groups of strategies reviewed (see note at end of chart for explanation of author abbreviations). Not all strategies from the summaries above have been referenced, as some are not pertinent to the focus of WeBIC.

Although by no means does Table 2 accurately represent a scientifically-measured consensus of practical web design strategies, it does give a clear indication that the most important factors in web design revolve around the concept of 'usability' which demands: user friendliness, technological minimalism, plug-ins help, interactivity, appropriate linking, appealing layout that is clutter-free, suitable content, fast speed and access, and navigation ease. The concept of 'usability' has been highly advocated by Nielsen (2000) who has pretty much based his career on the following maxim: "Put USABILITY first. Practice SIMPLICITY" (p. xii). With this in mind, WeBIC has been designed to be 'usable.' More specifically, its objectives and strategies have been targeted to increase the 'usability' of online instructional materials, as well as their effectiveness and efficiency. All strategies listed in Table 2 have been incorporated into WeBIC.

Table 2. *Practical Web Design Strategies and Themes Summarized from the Research Literature*

Theme	Frequency of Design Strategy in the Research Literature											
	Gu	Wi	JF	Be	Da	PFL	Ba	GS	Ni	Fl	Br	Ed

	Gu	Wi	JF	Be	Da	PFL	Ba	GS	Ni	Fl	Br	Ed
Accessibility							✓[1]	✓[3h]		✓[3]	✓[1b]	
Clutter-Free [Low Cognitive Bandwidth]	✓[4]							✓[2bc]	✓[3]	✓[1]		
Configuration and Plug-in Help		✓[1a]	✓[2]					✓[3i]			✓[3]	✓[13]
Content Non-biased								✓[2c]				✓[19]
Content Up-to-Date								✓[4cf]	✓[9]		✓[1a]	✓[5]
Content Sources Cited								✓[1bd]				✓[4]
Content Usability	✓[1]							✓[4]		✓[2]		✓[9]
Cost Efficient Technology Used						✓[3]	✓[2]					
Credibility and Authorship								✓[1a]				
Friendly and Motivational				✓[7]			✓[6]					
Guidance Elements (visual cuing)		✓[1ce]						✓[3j]			✓[5]	
Implementation Ease						✓[4,5]	✓[5]			✓[4]		
Interactivity	✓[7]	✓[1f]				✓[2]	✓[4]	✓[3f]			✓[4]	✓[1]
Layout Usability [Screen Design]	✓[2]	✓[1ce]	✓[7]					✓[3b]	✓[1]	✓[6,7]		
Learner Needs Considered					✓[1,3]			✓[3b]			✓[3]	✓[16]
Learning Format Supported				✓[2]			✓[3]					✓[7]
Links Have Appropriate Labels			✓[6,8]						✓[8]		✓[6a]	
Links Limited in Quantity		✓[1b]	✓[5]									
Links to Outside Resources								✓[4g]				✓[3]
Links Well Organized			✓[4]					✓[3e]	✓[4]		✓[6b]	
Multiple Versions Provided			✓[1]								✓[7]	✓[20]
Navigation Ease	✓[5]	✓[1d]						✓[2ad]	✓[4,5]	✓[14]	✓[6b]	✓[10]
Objectives and Goals Stated				✓[1]							✓[2]	✓[15]
Online Access to Experts		✓[2c]									✓[1d]	
Purpose Clear								✓[2a]				
Quantity of Material Limited				✓[3]						✓[9]		
Readability								✓[4b]		✓[10]	✓[5a]	
Search Function, Site Map								✓[4d]	✓[7]			✓[11]
Short Page Length			✓[3]						✓[6]		✓[7]	
Simulations, Role Playing		✓[2bc]										
Social Learning Support (CMC)		✓[3ab]		✓[8]							✓[9]	✓[18]
Speed (Low Bandwidth)	✓[3]			✓[4]			✓[7]	✓[3g]	✓[10]	✓[11]	✓[1c]	✓[12]
Student Work Displayed												✓[2,6]
Study Guidelines Provided		✓[1a]										
Support Services/Tools Provided		✓[4]		✓[6]								✓[26]
Technological Minimalism				✓[5]				✓[4k]	✓[2]	✓[5,12]	✓[8]	
Title/Headings Appropriate								✓[4a]				
User Feedback and Input Forms								✓[1c]				✓[8]
User Friendly (Technology)				✓[4]	✓[2,4]	✓[1]	✓[4]			✓[11]		
	Gu	Wi	JF	Be	Da	PFL	Ba	GS	Ni	Fl	Br	Ed

Note (Table 2). (1) Gu = Guay, (2) Wi = Winn, (3) JF = Jones and Farquhar, (4) Be = Berge, (5) Da = Daunt, (6) PFL = Paquette-Frenette and Larocque, (7) Ba = Bates , (8) GS = 100+ Great Sites, (9) Ni = Nielsen, (10) Fl = Flanders, (11) Br = Barron, (12) Ed = Ed's Oasis. Numbers in columns under author abbreviations provide a reference for strategy e.g., in row "Appropriate Layout," Gu ✓[2] references Web Design 1.0 -- Guay's Design Goals; 2. *Layout*.

Learning Theories

Some of the most commonly used pedagogical practices of the twentieth century stem from the learning theories of behaviorism and cognitivism. Both these theories have practical implications for the use and effectiveness of technology in teaching. Fahy (1999) asserts that "it is important to know these theories as they each impose somewhat different standards of *good practice* and *success*" (p. 80). "Behaviorist theory is rooted in the assumption that the proper manipulation of environmental stimuli is the key to learning" (Fahy, 1999, 31). Ross-Gordon (1998) explains that "observable behavior rather than internal thought processes is the focus of study" (p. 215). According to the behaviorist view, "the teacher's role is one of designing an environment that will elicit desired behavior and extinguish undesirable behavior." Under this view, it is important to clearly state learning objectives as well as make the navigation of online materials conducive to meeting those objectives. Other behaviorist instructional strategies include "programmed instruction, competency-based education, and computer-assisted instruction."

On the other hand, constructivists such as Bruner emphasize the process of "learning though discovery, with the process of transforming evidence to gain new insights" (Ross-Gordon, 1998, 215). Ross-Gordon surmises that "the instructor's role is limited to arranging the environment to facilitate the learner's independent discovery" (p. 216). Under the constructivist view, it is important to incorporate problem based learning strategies to develop a learner's internal thought processes. Other constructivist inspired innovations include the use of "schema theory, information processing models, and 'learning to learn' models." A balance of theories based on behaviorism and constructivism, along with some theories based on humanism by Knowles and Rogers provide the theoretical foundations of WeBIC. In total, eleven learning theories have been summarized. Each theory has been chosen on the basis of its potential applicability to the general design of online instructional materials and as support for specific strategies in WeBIC.

At the end of this section, the most relevant aspects of each theory applicable to the design of online training and instruction are summarized in tabular form along with an explanation of how these strategies have been incorporated into WeBIC. Each theorist's contributions are referenced later in this thesis using the theorist's name and number (e.g., Gagné 1.0 = Learning Theory 1.0 -- Gagné's Conditions of Learning Theory).

Learning Theory 1.0 -- Gagné's Conditions of Learning Theory.

Although Gagné's theoretical framework covers many aspects of learning, "the focus of the theory is on intellectual skills" (Kearsley, 1994a). Gagné's theory is very prescriptive. In its original formulation, special attention was given to military training (Gagné, 1962, as cited in Kearsley, 1994a). In this theory, five major types of learning levels are identified:

1. verbal information;
2. intellectual skills;
3. cognitive strategies;
4. motor skills; and
5. attitudes.

The significance of these classifications is that each requires "different internal and external conditions" (Kearsley 1994a): i.e., each learning level requires different types of instruction. Kearsley provides the following example: "For cognitive strategies to be learned, there must be a chance to practice developing new solutions to problems; to learn attitudes, the learner must be exposed to a credible role model or persuasive arguments."

Gagné also contends that learning tasks for intellectual skills can be organized in a *hierarchy* according to complexity:

a. stimulus recognition
b. response generation
c. procedure following
d. use of terminology
e. discriminations
f. concept formation primary significance of this hierarchy is to provide direction for instructors
g. rule application
h. problem solving

The primary significance of this hierarchy is to provide direction for instructors so that they can "identify prerequisites that should be completed to facilitate learning at each level" (Kearsley, 1994a). This learning hierarchy also provides a basis for sequencing instruction, as outlined by Gagné's 'nine instructional events' and corresponding 'cognitive processes':

1. gaining attention (reception)
2. informing learners of the objective (expectancy)
3. stimulating recall of prior learning (retrieval)
4. presenting the stimulus (selective perception)
5. providing learning guidance (semantic encoding)
6. eliciting performance (responding)
7. providing feedback (reinforcement)
8. assessing performance (retrieval)
9. enhancing retention and transfer (generalization).

Learning Theory 2.0 -- Bruner's Constructivist Theory

Bruner's constructivist theory is based upon the study of cognition. A major theme in this theory is that "learning is an active process in which learners construct new ideas or concepts based upon their current/past knowledge" (Kearsley, 1994b). Cognitive structures are used to provide meaning and organization to experiences and allows the individual to *go beyond the information given*. According to Bruner, the instructor should try and encourage students to construct hypotheses, makes decisions, and *discover principles by themselves* (Kearsley, 1994b). The instructor's task is to "translate information to be learned into a format appropriate to the learner's current state of understanding" and organize it in a spiral manner "so that the student continually *builds upon what they have already learned*." Bruner (1966, as cited in Kearsley, 1994b) states that a theory of instruction should address the following aspects:

1. the most effective sequences in which to present material; and
2. the ways in which a body of knowledge can be structured so that it can be most readily grasped by the learner.

Learning Theory 3.0 -- Bandura's Social Learning Theory

Bandura's social learning theory "emphasizes the *importance of observing* and modeling the behaviors, attitudes, and emotional reactions of others" (Kearsley, 1994c). It has been applied extensively to the understanding of aggression (Bandura 1973, as cited in Kearsley, 1994c) and psychological disorders. Bandura states:

> Learning would be exceedingly laborious, not to mention hazardous, if people had to rely solely on the effects of their own actions to inform them what to do. Fortunately, most human behavior is learned observationally through modeling: from observing others one forms an idea of how new behaviors are performed, and on later occasions this coded information serves as a guide for action (1977, as cited in Kearsley, 1994c).

The main processes underlying observational learning include:

a. *attention*;
b. *retention* (including cognitive organization and motor rehearsal);
c. *motor reproduction* (including physical capabilities, self-observation of reproduction, and accuracy of feedback);
d. *motivation* (including external and self reinforcement); and
e. *observer characteristics* (such as sensory capacities, arousal level, perceptual set, and past reinforcement).

<u>Learning Theory 4.0 -- Carroll's Minimalist Theory</u>

The Minimalist theory of J.M. Carroll focuses on the instructional design of training materials for computer users and has been extensively applied to the design of computer documentation (e.g., Nowaczyk and James, 1993, van der Meij and Carroll, 1995, as cited in Kearsley, 1994d). It is based upon studies of people learning a wide range of computer applications including word processors and databases.

As Kearsley (1994d) explains, this theory suggests that:

1. All learning activities should be meaningful and self-contained.
2. Activities should exploit the learner's prior experience and knowledge.
3. Learners should be given realistic projects as quickly as possible.
4. Instruction should permit self-directed reasoning and improvising.
5. Training materials and activities should provide for error recognition and use errors as learning opportunities.
6. There should be a close linkage between training and the actual system because "new users are always learning computer methods in the context of specific preexisting goals and expectations" (Carroll, 1990, as cited in Kearsley, 1994d).

The critical idea behind Carroll's minimalist theory is that course designers must "minimize the extent to which instructional materials obstruct learning and focus the design on activities that support learner-directed activity and accomplishment" (Kearsley, 1994d).

Learning Theory 5.0 -- Vygotsky's Theory of Social Cognitive Development

Vygotsky's theory of social cognitive development is complementary to Bandura's social learning theory. Its major thematic thrust is that "social interaction plays a fundamental role in the development of cognition" (Kearsley, 1994e). Most of the original work of this theory was done in the context of language learning in children. An important concept in Vygotsky's theory is that "the potential for cognitive development is limited to a certain time span which he calls the 'zone of proximal development' (Kearsley, 1994e). He defines this zone as having four learning stages. These stages "range between the lower limit of what the student knows and the upper limits of what the student has the potential of accomplishing" (Gillani & Relan, 1997, 231). The stages can be further broken down as follows (Tharp & Gallimore, 1988, 35):

1. *Stage 1* **--** assistance provided by more capable others (coaches, experts, teachers);
2. *Stage 2* **--** assistance by self;
3. *Stage 3* **--** internalization automatization (fossilization); and
4. *Stage 4* **--** de-automatization: recursiveness through prior stages.

Another notable aspect of Vygotsky's theory is that it claims "that instruction is most efficient when students engage in activities within a supportive learning environment and when they receive appropriate guidance that is mediated by tools" (Vygotsky, 1978, as cited in Gillani and Relan, 1997, 231). These instructional tools can be defined as "cognitive strategies, a mentor, peers, computers, printed materials, or any instrument that organizes and provides information for the learner." Their role is "to organize dynamic support to help [learners] complete a task near the upper end of their zone of proximal development [ZPD] and then to systematically withdraw this support as the [learner] move to higher levels of confidence."

Learning Theory 6.0 -- Skinner's Operant Conditioning

Skinner's operant conditioning theory is based upon the idea that "learning is a function of change in overt behavior" (Kearsley, 1994f) and that behavior patterns can be changed though the reinforcement of desired responses using an appropriate stimuli (i.e., event or reward). Reinforcement can be either *positive* (e.g., a good grade, verbal praise, reward, privilege, feeling of increased accomplishment or satisfaction) or *negative* (e.g., punishment, restriction, bad grade, pain inducement). Operant conditioning is "the key concept in behaviorism" (Fahy, 1999, 32).

In applying operant conditioning to reinforce learning:

a. Reinforcement often occurs in the form of a question (stimulus) and answer (response).
b. The difficulty of the questions should be arranged so the response is always correct and hence a positive reinforcement.
c. "The steps in the development of a stimulus-response chain should be small and gradual" (p. 32).
d. Feedback should be immediate.
e. Intermittent reinforcement is more effective than constant reinforcement.

Operant conditioning has been widely applied to behavior modification in clinical settings, classroom management in teaching, and instructional development, in the form of programmed instruction (Kearsley, 1994f).

Learning Theory 7.0 -- Broadbent's Single-Channel Learning Theory

Broadbent's theory of single-channel processing, proposed in 1958, states that "humans are capable of processing information through only one channel at a time and that it is not possible to process two channels simultaneously" (Hsia, 1968, as cited in Szabo 1998, 32). If this were to happen, audio and visual stimuli would arrive at the central nervous system simultaneously, causing the information to jam, and lead to poorer retention of material (Broadbent, 1958, as cited in Szabo 1998, 32). This theory suggested that "attention [is] a limited capacity channel" and that stimuli must be properly filtered prior to full processing by the perceptual system (Kearsley, 1994g). Although, multiple-channel learning research by Piaget and Bruner (cited in Szabo, 1998), suggests that attention and learning may be more complex than Broadbent's filter theory suggests, filter single-channel learning theory does implicate the importance of organizing data to help learners filter excess information. As Guay (1995) advises, "cognitive bandwidth should be minimized to ensure users easily and accurately grasp the message."

Learning Theory 8.0 -- Rogers' Theory of Experiential Learning

Under this theory, two types of learning are defined:

1. *Cognitive Learning*. Meaningless learning derived from academic knowledge such as learning vocabulary or multiplication tables); and

2. *Experiential Learning*. Significant learning resulting from applied knowledge. Addresses the "needs and wants of the learner."

The theory also suggests that "all human beings have a natural propensity to learn." The role of the teacher is to "facilitate such learning" (Kearsley, 1994h) by:

1. setting a positive climate for learning;
2. clarifying the purposes of the learner(s);
3. organizing and making available learning resources;
4. balancing intellectual and emotional components of learning; and
5. sharing feelings and thoughts with learners but not dominating.

Experiential learning is based on the following principles (Kearsley, 1994g):

a. "Significant learning takes place when the subject matter is relevant to the personal interests of the student."
b. "Self-initiated learning is the most lasting and pervasive."
c. Learning which is threatening to the self (e.g., new attitudes or perspectives) are more easily assimilated when external threats are at a minimum.
d. Learning proceeds faster when the threat to the self is low.

Roger's theory of experiential learning "evolved as part of the humanistic education movement" (Kearsley, 1994h) and "applies primarily to adult learners."

Learning Theory 9.0 -- Bloom's Taxonomy of the Cognitive Domain

In 1948, a group of educators began the development of a classification system for the cognitive, affective, and psychomotor domains. Completed in 1956, their work is now referred to as *Bloom's Taxonomy of the Cognitive Domain* and is commonly applied to the development of educational objectives. The major idea of the Bloom's taxonomy is that "what educators want students to know can be arranged in a hierarchy from less to more complex" (Huitt, 2000). The taxonomy is illustrated below, as applied to a sequence of learning objectives related to nails (Fahy, 1999, 43):

1. *Knowledge*. Know enough about nails to be able to explain what they are and what they are used for. Be able to recognize a nail as a fastening device from a non-fastening devices.
2. *Comprehension*. Be able to identify a nail and distinguish it from other fastening devices.
3. *Application*. Be able to use a nail to fasten something competently, and actually do so.
4. *Analysis*. Be able to determine what kind of nail and nailing technique would be required for most effective use of the device for a specific purpose.
5. *Synthesis*. Be able to compare nails to other fastening devices, and to compare various types of nails and nailing techniques for their specific qualities and characteristics in specific situations.
6. *Evaluation*. Be able to assess examples of the use of nails for fastening, and different nailing techniques, and to pass judgment as to which were more effective, more artistic, more secure, more skillful, more workmanlike, etc.

For the most part, "research over the last 40 years has confirmed the taxonomy as a hierarchy with the exception of the last two levels" (Huitt, 2000). Theorists are uncertain whether *synthesis* and *evaluation* should be reversed or whether they should be reclassified at the same level. The latter view is based on the idea that both processes are equally dependent on analysis, with the difference being that synthesis requires more *creative* analytical cognitive processing (i.e., rearranging the parts in a new way) and evaluation requires more *critical* analytical cognitive processing (i.e., comparison to a standard and judgment as good, better or best).

Learning Theory 10.0 -- Knowles' Theory of Andragogy

Influenced by Rogers' theory of experiential learning, Knowles' theory of andragogy was developed specifically for adults with the following basic assumptions in mind (Fahy, 1999, 29-30; Ross-Gordon, 1998, 218-219; Kearsley, 1994):

a. Adults approach learning as a form of problem-solving.
b. Adults need to know why they need to learn something.
c. Adults learn best when the topic can be immediately applies to some real world problem or issue.
d. Adults often prefer to learn experimentally, and should not be penalized for exploring to test hypotheses.
e. Adults readiness to learn is influenced by their roles and responsibilities in their family and work life.
f. "Adult learners generally have a psychological disposition towards self-direction" (Ross-Gordon, 1998, 218), and since they exert self-direction in most aspects of their lives, they "resist educational environments which restrict their ability to exercise self-direction."
g. Adults bring a vast reservoir of experience to learning situations.

In practical terms, andragogy focuses more on the *process* and less on the *content* (Kearsley, 1994i). It supposes that "adults need to be involved in the planning and evaluation of their instruction" and "experience (including mistakes) provides the [most effective] basis for learning activities." In the andragogical process, instructors "adopt a role of facilitator or resource rather than lecturer or grader." Types of andragogic teaching strategies include case studies, discussion, role playing, simulation, and a concentration on problem solving activities. This approach has been "used extensively in the design of organizational training programs."

Learning Theory 11.0 -- Scandura's Structural Learning Theory

According to Scandura's structural learning theory, problem solving is facilitated when "higher order rules are used, i.e., rules that generate new rules" (Kearsley, 1994j). Higher order rules "account for creative behavior (unanticipated outcomes) as well as the ability to solve complex problems by making it possible to generate (learn) new rules." Central to the structural learning theory is the methodology of structural analysis, which involves "identifying the rules to be learned for a given topic or class of tasks and breaking them done into their components." The major steps in structural analysis are (Kearsley, 1994j):

1. *select* a representative sample of problems;
2. *identify* a solution rule for each problem;
3. *convert* each solution rule into a higher order problem whose solutions is that rule;
4. *identify* a higher order solution rule for solving the new problems; and
5. *eliminate* redundant solution rules from the rule set (i.e., those which can be derived from other rules); and
6. *continue* the process iteratively with each newly-identified set of solution rules.

"Structural learning prescribes teaching the simplest solution path for a problem and then teaching more complex paths until the entire rule has been mastered." More specifically, it advocates using the following principles (Kearsley, 1994j):

a. Whenever possible, teach higher order rules that can be used to derive lower order rules.
b. Teach the simplest solution path first and then teach more complex paths or rule sets.
c. Rules must be composed of the minimum capabilities possessed by the learners.

Structural learning theory "also suggests a strategy for individualizing instruction by analyzing which rules a student has/has not mastered and teaching only the rules, or portions thereof, that have not been mastered." Structural learning theory has been applied extensively to mathematics.

Summary of How Learning Theories are Applied to WeBIC

In Table 3, the eleven learning theories as discussed above have been referenced to support selected web-design strategies from Table 2, as well as list and support additional web-design strategies to be incorporated into WeBIC.

Table 3, a survey of the most important themes, suggests that instructional designers should incorporate into their ID projects learning objectives, realistic and practical examples, examples and feedback, and instructional content based on prior knowledge. Effective ID also means minimizing elements that can obstruct meaning, and most importantly, creating a proper structure or sequence to deliver content. All strategies listed in Table 3 have been incorporated into the fourth and fifth levels of WeBIC.

In Table 4, the application of the eleven learning theories to the structure of WeBIC has been summarized. In general, the learning theories provide ample support for the sequential nature of WeBIC; its focus on providing practical tools, examples and strategies to aid in the process of instructional design; and its hierarchy of five levels where each level is defined by criteria or rules.

Table 3. *Application of Learning Theories to WeBIC's Fourth Level Strategies*

Theme	Frequency of Learning Theory in the Research Literature										
	Ga	Br	Bn	Ca	Vy	Sk	Bo	Ro	Bl	Kn	Sc
Based on Past Knowledge		✓		✓						✓	✓
Clutter-Free Low Cognitive Bandwidth				✓			✓				
Friendly and Motivational								✓			
Interactivity					✓					✓	
Objectives and Goals Stated						✓		✓	✓		
Practical, Meaningful Material		✓		✓						✓	
Purpose is Clear								✓		✓	
Sequencing and Structure	✓	✓				✓					✓
Simulations, Examples, Models		✓	✓	✓							
Social Learning Support					✓						
Support Services/Tools Provided					✓			✓			
Technological Minimalism				✓			✓				
User Feedback				✓		✓					
Variety of Instructional Methods	✓							✓	✓		

Note. (1) Ga = Gagné, (2) Br = Bruner, (3) Bn = Bandura, (4) Ca = Carroll, (5) Vy = Vygotsky, (6) Sk = Skinner, (7) Bo = Broadbent , (8) Ro = Rogers, (9) Bl = Bloom, (10) Kn = Knowles, (11) Sc = Scandura. Abbreviations provide a reference for learning theory e.g., in row 'Variety of Instructional Methods,' Ga ✓ references Learning Theory 1.0 -- Gagné's Conditions of Learning Theory.

Table 4. *Summary of Learning Theories and their Application to WeBIC*

Learning Theory Summary	Application to WeBIC
1.0 -- *Gagné's Conditions of Learning Theory*. Supports the need to establish a hierarchy and sequence to provide direction and help facilitate learning.	WeBIC sequences 15 sub-processes and related objectives in a 5-level hierarchy.
2.0 -- *Bruner's Constructivist Theory*. Supports the need for sequencing material and carefully structuring material so it can be more easily grasped by the learner.	WeBIC has been organized around the familiar structure of the ADDIE model to provide users with general and comprehensive guidance quickly.
3.0 -- *Bandura's Social Learning Theory*. Emphasizes the importance of observing and modeling.	WeBIC provides numerous strategies and examples of the application of its objectives.

4.0 -- *Carroll's Minimalist Theory*. Emphasizes the importance of minimizing the extent to which instructional materials obstruct learning.	WeBIC provides five layers ranging from general processes to specific strategies. Only essential information is explained in each layer.
5.0 -- *Vygotsky's Theory of Social Cognitive Development*. Supports the creation of a supportive learning environment mediated by tools.	WeBIC provides practical strategies and tools users can use to improve their instructional design.
6.0 -- *Skinner's Operant Conditioning*. Emphasizes the importance of providing reinforcement and feedback.	WeBIC provides examples of its strategies in application.
7.0 -- *Broadbent's Single-Channel Learning Theory*. Supports the development of simple, uncluttered concepts and strategies.	WeBIC uses criteria to select each of its components at various levels to help eliminate unessential ideas and clutter.
8.0 -- *Rogers' Theory of Experiential Learning*. Supports the importance of addressing the needs and wants of the leaner.	WeBIC has been designed to meet the practical needs of online instructional designers, rather than advocate a new theory. It is meant to be used, not analyzed.
9.0 -- *Bloom's Taxonomy of the Cognitive Domain*. Supports the use of a variety of objectives to develop a rounder more complete learning experience.	WeBIC uses 15 objectives in its third level to cover a wide variety of skills and task development needed for effective ID.
10.0 -- *Knowles' Theory of Andragogy*. Emphasizes the importance of process over content, explaining the 'why'of key problems, and immediate application to real world settings.	WeBIC can be immediately applied and used to evaluate any ID situation without study, and at any point in the ID process.
11.0 -- *Scandura's Structural Learning Theory*. Emphasizes the importance of using higher order rules i.e., rules that generate new rules.	WeBIC defines criteria for the selection of components at each level. These criteria act as 'rules' that can be used to evaluate and add new components if necessary

CHAPTER III

WEBIC

The following chapter details the further development of and literature review for WeBIC. Listed, described and explained in this chapter are (1) the five levels of WeBIC, and (2) the 15 objectives, 84 strategies and 200 related questions of WeBIC.

The Five Levels of WeBIC

Linear instructional design and development is not the answer to every performance problem. It is not even the answer to every instructional design problem. It is however, the best, most effective, most efficient procedure for designing instruction that is meant to teach specific things at most knowledge levels (Braden, 1996, 21). WeBIC functions on five levels: (I) three main processes, (II) 15 sub-processes, (III) 15 performance objectives, (IV) 84 strategies, and (V) 200 questions. The main processes and most of the sub-processes are applicable to a variety of instructional design activities, while the objectives and strategies are mainly directed towards online training and instruction. Each of the five levels of WeBIC is defined by criteria. This criteria is useful for determining and establishing a standard of consistency in each of the structural components of WeBIC and a standard for adding additional processes, strategies and questions that may arise out of future applications and refinements of WeBIC.

Level One: Three Phases

WeBIC is structured around the five major processes of analysis, design, development, implementation, and evaluation, which have been further simplified into three phases: (a) analysis phase, (b) design and development phase, and (c) implementation and evaluation phase. The three phases of WeBIC were selected based upon the following criteria:

1. *Popularity in the ID Field*. WeBIC's general structure is similar to the well-known ADDIE Model (Clark, 1995), the TIP Model (Training, 1990), and the Gerlach and Ely Model (Braxton et al., 1995), as shown in Figures 1 to 3. The terms 'analysis', 'design', 'development', 'implementation', and 'evaluation' are easily recognized as major processes in the field of instructional design.
2. *Each Phase is Distinct*. The processes in the three phases of WeBIC, (a) analysis, (b) design and development, and (c) implementation and evaluation are easy to distinguish from each other.
3. *Easy to Understand and Remember*. The terms 'analysis, 'design', 'development', 'implementation', and 'evaluation' have straightforward meanings and are popular in the ID field making them easy to remember, understand and apply.
4. *Wide Application*. The terms 'analysis', 'design', 'development', 'implementation', and 'evaluation' have applicability to many ID sub-processes and thus are suitable as general upper-level classification terms in a multi-level hierarchy.

Level Two: 15 Sub-processes

The second level of WeBIC outlines 15 sub-processes. These sub-processes, as outlined in Table 5, are structured around the WeBIC's three main phases. Each of the 15 sub-processes have been selected based on the following criteria:

1. *Process Centered*. Each sub-process component centers around a task, action, or activity common to ID development.
2. *Applicable to Online Instructional Design*. Each of the 15 sub-processes can be applied to the design of online instructional materials.

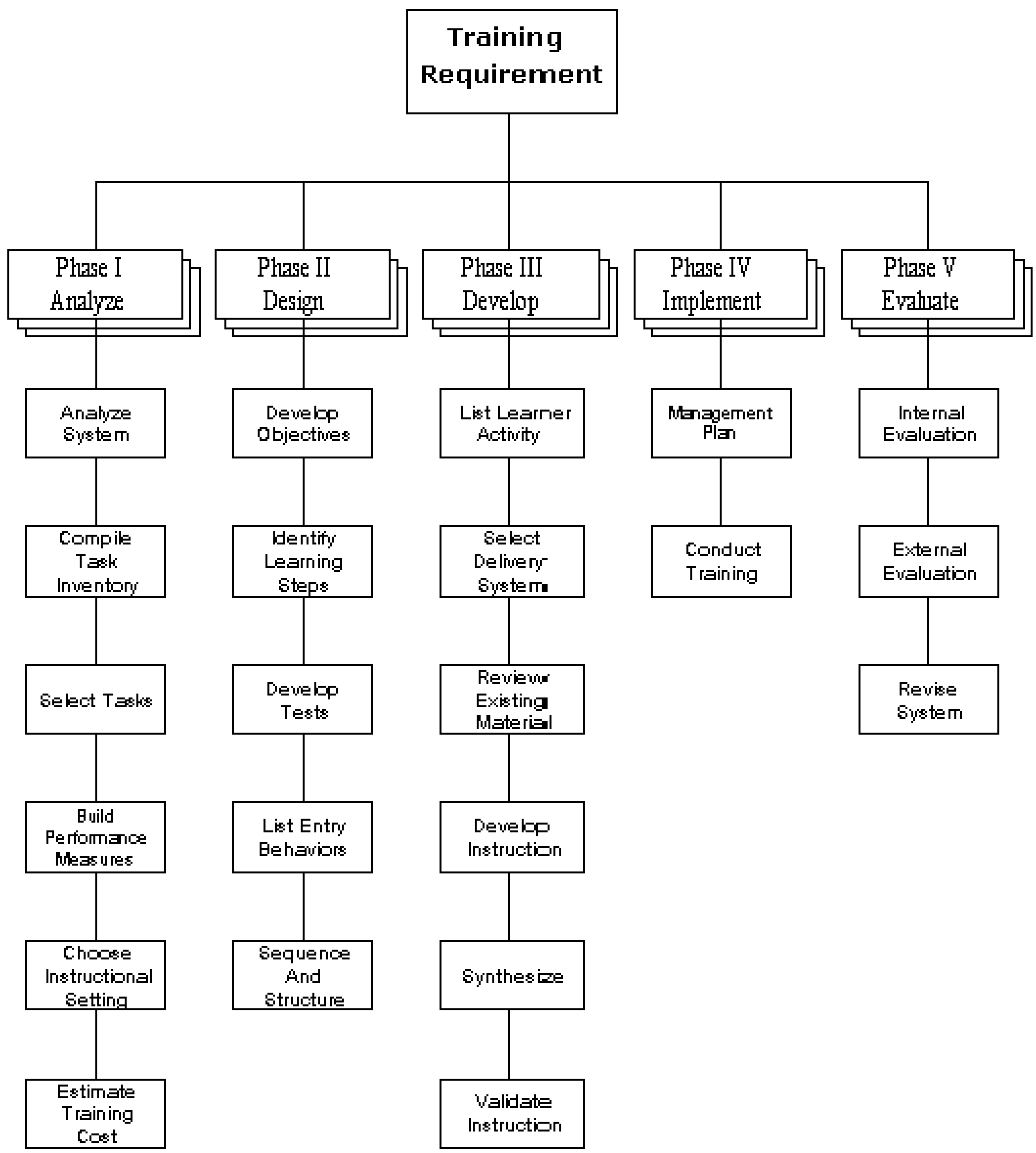


Figure 1. ADDIE model. Adapted from Clark, D. (1995). Introduction to instructional system design. [Online]. Retrieved August 1, 2000, from the World Wide Web: http://www.nwlink.com/~donclark/hrd/sat1.html#model

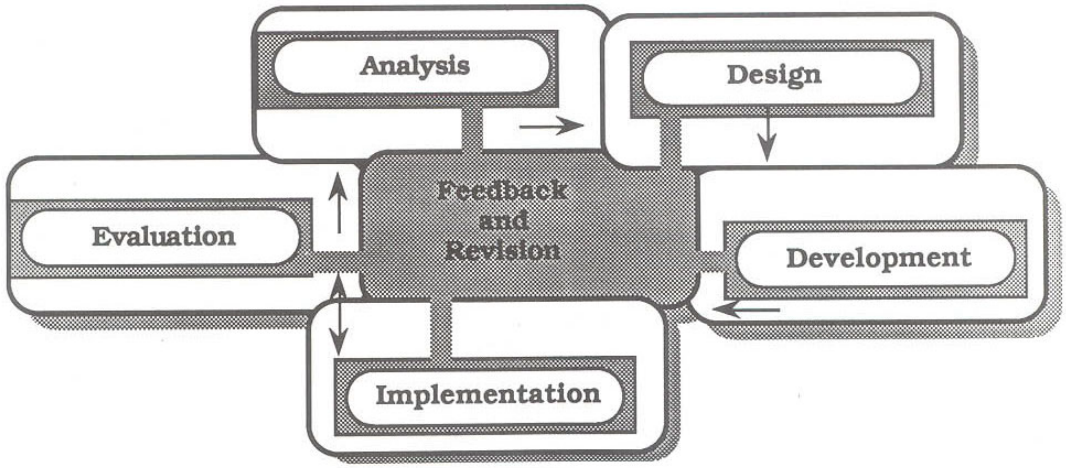


Figure 2. TIP model. Adapted from Training for improved performance series. (1995). Athabasca, AB: Athabasca University.

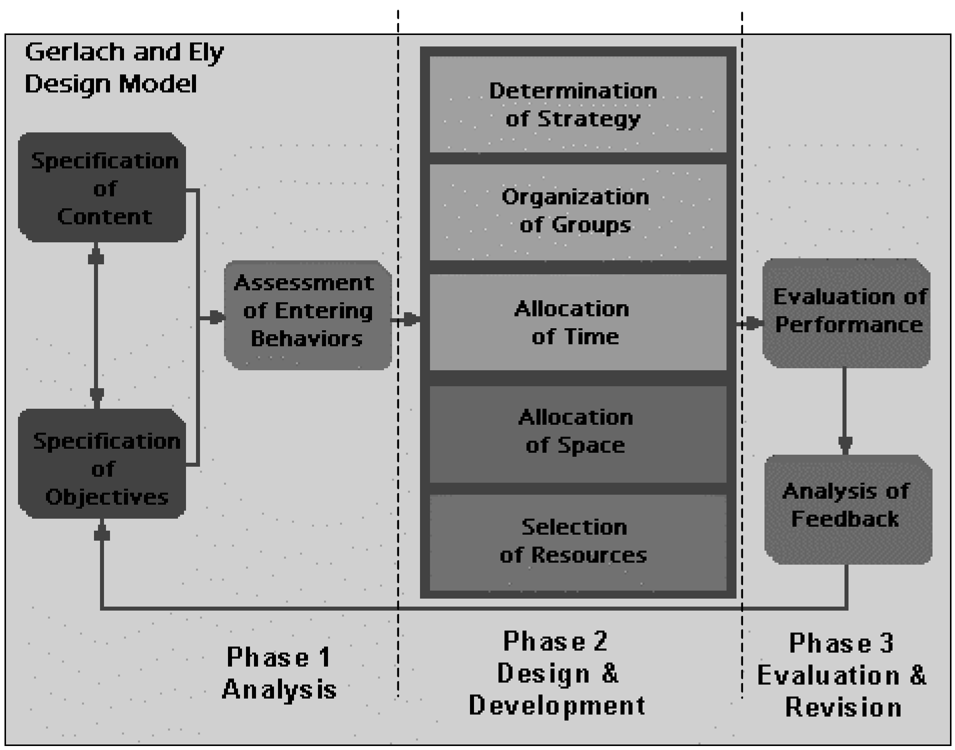


Figure 3. Gerlach and Ely model. Adapted from Braxton, S., Bronico, K., & Looms, T. (1995). Gerlach and Ely design model. [Online]. Retrieved August 1, 2000, from the World Wide Web: http://tangle.seas.gwu.edu/~sbraxton/ISD/ge_design.html

Table 5. *Sub-processes of WeBIC with Sources from Andrews & Goodson's "Fourteen Common Tasks to ID Models"*

Main Process		Sub-process and Andrews and Goodson's Source
Analysis	1.0	*Purpose Definition* -- 14 TASKS: Formulation of broad goals and detailed subgoals stated in observable terms (1). Assessment of need, problem identification, occupational analysis, competence or training requirements (11). Formulation of system and environmental descriptions and identification of constraints (13). Costing instructional programs (14).
	2.0	*Learner Analysis* -- 14 TASKS: Characterization of learner population (5).
	3.0	*Performance Analysis* -- 14 TASKS: Analysis of goals and subgoals for types of skills/learning required (3).
	4.0	*Media and Technology Analysis* -- 14 TASKS: Selection of media to implement strategies (7). Consideration of alternative solution to instruction (12).
Design & Development	5.0	*Format Design* -- 14 TASKS: Formulation of instructional strategy to match subject-matter and learner requirements (6).
	6.0.	*Instructional Objectives Design* -- 14 TASKS: Formulation of broad goals and detailed subgoals stated in observable terms (1).Sequencing of goals and subgoals to facilitate learning (4).
	7.0.	*Preparation Design* -- 14 TASKS: Formulation of instructional strategy to match subject-matter and learner requirements (6).
	8.0	*Presentation Design* -- 14 TASKS: Formulation of instructional strategy to match subject-matter and learner requirements (6).
	9.0	*Participation D*esign -- 14 TASKS: Formulation of instructional strategy to match subject-matter and learner requirements (6).
	10.0	*Practice and Feedback Design* --14 TASKS: Formulation of instructional strategy to match subject-matter and learner requirements (6).
	11.0	*Performance Assessment Design* -- 14 TASKS: Development of pretest and posttest matching goals and subgoals (2).
Implementation & Evaluation	12.0	*Usability Design* -- 14 TASKS: Formulation of instructional strategy to match subject-matter and learner requirements (6).
	13.0	*Support Services Develo*pment -- Formulation of instructional strategy to match subject-matter and learner requirements (6).
	14.0	*Website Development* -- 14 TASKS: Development of courseware based on strategies (8). Development of materials and procedures for installing, maintaining, and periodically repairing the instructional program (10).
	15.0	*Evaluation* -- 14 TASKS: Empirical tryout of courseware with learner population, diagnosis of learning and courseware failures, and revision of courseware based on diagnosis (9).

3. *Depth and Flexibility*. Careful attention has been directed towards selecting sub-processes that provide the depth and flexibility necessary to house a variety of appropriate strategies for online instructional design.
4. *Defined by its Objective*. Just as an ID project is defined by a purpose or goal statement, each sub-process is defined by its objective. This is important to keep each sub-process relevant to the unique needs of each agency.
5. *Recognizable as a Common Task in ID*. Each sub-process is supported by one or more of the "Fourteen Common Tasks to an ID Model" as outlined by Andrews and Goodson (1980). WeBIC attempts to address one or more of these tasks in each of its sub-processes (Table 5 shows how the sub-processes relate to Andrews and Goodson's 14 tasks).

<u>Fourteen common tasks in model development</u>. Andrews and Goodson (1980) examine 40 models of instructional design, identifying which of 14 common tasks in model development each includes, and categorizing them by origins, theoretical underpinnings, purposes and uses, and documentation. Tasks one to ten represent Gropper's (1977, as cited in Andrews and Goodson, 1980) list of 10 common tasks -- a synthesis of the best models as reviewed by Gropper. Tasks 11 to 14 represent additional tasks often cited in ID literature. The 14 tasks are listed on the following page (italicized headings by the author of this thesis).

1. *Goal Statement Development*. Formulation of broad goals and detailed subgoals stated in observable terms.
2. *Performance Assessment*. Development of pretest and posttest matching goals and subgoals.
3. *Performance Analysis*. Analysis of goals and subgoals for types of skills/learning required.
4. *Sequencing*. Sequencing of goals and subgoals to facilitate learning.
5. *Learner Analysis*. Characterization of learner population as to age, grade level, past learning history, special aptitudes or disabilities, and estimated attainment of current and prerequisite goals.

6. *Primary Instructional Components Development*. Formulation of instructional strategy to match subject-matter and learner requirements.
7. *Media Selection*. Selection of media to implement strategies.
8. *Lesson Development*. Development of courseware based on strategies.
9. *Prototyping*. Empirical tryout of courseware with learner population, diagnosis of learning and courseware failures, and revision of courseware based on diagnosis.
10. *Implementation*. Development of materials and procedures for installing, maintaining, and periodically repairing the instructional program.
11. *Needs Assessment*. Assessment of need, problem identification, occupational analysis, competence or training requirements.
12. *Alternatives to Instruction*. Consideration of alternative solution to instruction.
13. *Constraint Analysis*. Formulation of system and environmental descriptions and identification of constraints.
14. *Budgeting*. Costing instructional programs.

<u>Level Three: Fifteen Objectives</u>

The third level of WeBIC outlines 15 objectives. These objectives relate specifically to each of the 15 sub-processes. Each of the objectives have been developed based on the following criteria (the objectives of WeBIC are listed and explained in more detail under the heading ‘Objectives, Strategies and Questions of WeBIC’):

1. *Process Related*. Each objective must be related to its sub-process.
2. *Task Orientated*. Each objective must outline one or more tasks or activities of the ID process. A WeBIC objective is defined by its tasks, subtasks, strategies, and questions.
3. *Outcome Specified*. As much as possible, each objective must include an outcome i.e., the result, product or effect after completing the objective.
4. *Web Related*. Each objective must be applicable to the development of online instruction (although a number of the objectives may also be applicable to other types of ID projects as well).

5. *Purpose Related*. Each objective must be related to the project's purpose definition.
6. *Flexible*. Each objective functions as a purpose statement for each sub-process. These purposes statements, and hence the objectives, can change depending on the goals and needs of the organization. The objectives outlined in WeBIC provide a relevant starting point for most online training and instructional design organizations.
7. *One Objective to Each Sub-process*. To limit a long list of objectives from clouding the heart of each sub-process, each objective must be concise and touch upon all the important sub-tasks of the sub-process as determined by the organization.
8. 'W*hat' Related*. Each objective focuses on the 'what' of each sub-process.

Level Four: WeBIC Strategies

WeBIC provides 84 strategies and practical guidelines for the development of online instruction based on learning theories and practical web-design strategies advocated by the research literature. In particular, these strategies concentrate on providing guidelines and ideas for the development of the 5 Ps of instruction (preparation, presentation, participation, practice with feedback, and performance assessment) and web usability. The WeBIC strategies are used as a basis for developing evaluation and design questions (see Appendix A). Each of the strategies have been selected and developed based on the following criteria:

1. *Results Orientated*. Each strategy must produce a result. By following through on a strategy, the user must have evidence of an improvement in the design of an ID project.
2. *Supported and Popular*. Each strategy must be supported by a learning theory and/or research study, and/or be well recognized and used within the fields of ID and web design.

3. *Simple and Memorable*. Each strategy must be easy to explain and relate to others. No complicated terms or jargon should be used.
4. *Practical and Usable*. Each strategy must be easy to use and help clarify the objective.
5. *Purpose Related*. Each strategy must be related to the purpose definition of the project and the mission of WeBIC. More specifically, each strategy must help improve efficiency, effectiveness, quality, profitability, and/or usability.
6. *Objective Related*. Each strategy must be related to or develop the defining tasks of each sub-process objective.
7. *'How' Related*. Each strategy must focus on the 'how' of each objective.

Level Five: WeBIC Questions

WeBIC provides 200 questions that address specific problems of online instructional design. These questions have been developed to function as a checklist that can be used to assist in the evaluation of online training and instructional materials (see Appendix A). Each of the questions have been selected and developed based on the following criteria:

1. *Strategy Related*. Each question must relate to, summarize and define the main purpose and processes in the strategy, so that it helps capture the essence of the strategy and can be used as a guideline to design online instructional materials.
2. *Evaluation Orientated*. Each question must be able to function as an evaluation tool to assess online instructional materials, in which the effectiveness of each strategy can be judged along a scale of 0 to 3. The WeBIC rating scale can be interpreted as follows: 0 = strongly disagree (SD), 1 = disagree (D), 2 = agree (A), and 3 = strongly agree (SA). Depending on the nature of each question, the WeBIC rating scale can also be interpreted as: 0 = no evidence of application or development, 1 = some evidence of application and development, 2 = moderate evidence of application and development, and 3 = strong evidence of application and development. The WeBIC rating scale is kept as simple as possible to keep the evaluation of each question as objective as possible.

Objectives, Strategies and Questions of WeBIC

Outlined in this section are the objectives, strategies and questions of WeBIC with support from the research literature. Important terms and concepts as they relate to the objectives have been defined where necessary. Where applicable, references to authors and theorists of related web design strategies and learning theories previously discussed in earlier sections have also been listed to support the strategies and questions. WeBIC concentrates most of its strategies on the development of 'The Five Ps of Instruction' and 'Web Usability' with the understanding that these are the processes that can generate the most improvement in the effectiveness of online instructional materials.

The WeBIC objectives, strategies and questions can be summarized as follows:

1. *Objectives*. WeBIC objectives function as defining goal statements for each sub-process and focus on the 'what' that needs to be done for each sub-process.
2. *Strategies*. WeBIC strategies function as WBI development tools that focus on the 'how' it is to be done and 'why' the strategy is important,
3. *Questions*. WeBIC questions function as WBI development guidelines that focus on providing a means to evaluate whether a strategy has been successful implemented.

Objective 1.0 -- Purpose Definition Checklist

Objective: Develop a purpose definition for your organization and/or ID project by identifying stakeholders, writing a purpose statement, writing goal statements related to your purpose statement, writing a constraints, resources, needs and priorities summary, writing a working philosophy and values statement, and conducting a detailed needs analysis if necessary. Under WeBIC, there are five main criteria for developing a purpose definition:

1. *Stakeholder Identification*. An essential process to determine the relevancy and focus of the purpose definition.
2. *Purpose Statement*. The purpose definition must stem from a purpose statement or mission statement which outlines (a) *who* you are; (b) *where* you want to go i.e., who your target market is, what problem you wish to solve; (c) *how* you plan to get there i.e., what your solution is; and (d) *why* you need to do it (Patsula, 2000, 8).
3. *Goal Statements*. The purpose statement must be supported by a list of related goals.
4. *Constraints, Resources, Needs and Priorities Summary*. The goals and purpose statement must be 'qualified' and/or 'quantified' by an analysis of internal and external constraints and limitations which directly and indirectly impact the ID process within the parent organization.
5. *Philosophy and Values Statement*. This statement provides further direction and focus to an agency's purpose and goal statements.

Under WeBIC, *purpose definition* is an ongoing process. Initially, the purpose definition functions as a guide to provide direction and focus to the ID developmental process. However, it is expected that changes will be made to the purpose definition as the final ID product emerges and evolves. If necessary, a formal more detailed needs assessment can be conducted to better determine needs and the impact of internal and external factors on the development of the ID project. It is important that each ID project have its own separate purpose definition. This purpose definition can be based on or derived from the underlying mission statement and goals of the parent organization, but it should also be distinct enough so that factors relevant to the particular challenges of a unique ID problem are clearly stated.

Strategy 1.1 -- Stakeholder identification. *Write down all persons and groups of individuals whose needs may affect the design, development, and implementation of the instructional materials*. a--Have stakeholders been identified? *Stakeholders* are any individuals with potential interest in a project or plan or any individuals who might be affected by the implementation of a project or plan. Stakeholders can include: individuals, such as content experts, learners, and programmers; the parent organization; external agencies, such as a private or public sector organization, a professional or voluntary association, or a community; and society (Pearce, 1998).

Strategy 1.2 -- Purpose statement. *Develop an ID purpose statement by analyzing the mission and goals of your parent organization; describing 'who' you are, who your 'target market' is, what the 'problem' is, what your 'solution' is, and 'why' you need to solve the problem; identifying additional aims and purposes important to your organization; and synthesizing all essential elements into one or two sentences of no more than 100 words*. a--Has a purpose statement been developed for the ID project? b--Is the purpose statement concise and relevant (no more than 100 words)? c--Is the purpose statement expressed in the instructional materials? (supported by Great Sites 8.2a, Rogers 9.0 and Knowles 11.0).

Rothwell and Cookson (1997) define *purpose* as "the ultimate reason for designing, developing and delivering instruction" (p. 153). They go on to define a *purpose statement* as "a general expression of the need to be met or the problem to be solved by a program". Sork (1998) maintains that a clear and concise purpose statement is a good way "to suggest what [a] program is designed to accomplish and can give potential participants and instructors a reasonably clear idea of why [a] program is being offered" (p. 286). Under WeBIC, a *purpose statement* clarifies why training and instruction is necessary and what the most important goals are. A purpose statement is needed because it helps the ID team:

a. begin with a clear vision of where they want to go and what they want to accomplish;
b. ensure that there is a consistent rationale for all their activities;
c. build a strong sense of culture within their organization (Murgatroyd & Woudstra, 1999);
d. provide a measurement and benchmark to assist them in evaluating their efforts; and
e. recognize the competitive environment in which distance education operates (Murgatroyd & Woudstra, 1999).

To write a purpose statement, the following strategy can be used:

1. Write a short description of the educational agency.
2. Define the instructional problem that needs to be solved.
3. Summarize the instructional solution.
4. List who will benefit from the instruction.
5. Determine a reason 'why' the problem needs to be solved.

An example of a purpose statement that follows this strategy would be:

> ESLenglish.com is a profit-seeking online training agency dedicated to helping: ESL learners around the world develop their English reading, writing, listening and speaking skills by providing effective and efficient online instructional materials aimed at motivating learners to study English and prepare them to better compete in the global marketplace.

Strategy 1.3 -- Goal statements. *Develop goal statements for an ID project by writing general tasks and desired outcomes related to the purpose statement, quantifying and qualifying key tasks and outcomes with specific information that will be useful in measuring performance, and listing each general task and outcome under a system of classification that best reflects the structure of your organization*. a--Have goal statements been developed to expand upon the purpose statement? b--Are they expressed in the instructional materials? (supported by Berge, 4.1, Barron 11.2, and Ed's Oasis12.15).

Goals "flow from the purpose. They clarify in more detail than the purpose what program results are sought" (Rothwell & Cookson, 1997, 155). "Goals specify the general results to be achieved" (p. 11) and "are rarely measurable or timebound" (p. 155). Most importantly, goal statements provide a general direction for a detailed performance analysis and the development of instructional materials. However, under a WeBIC purpose definition, goal statements should also develop and elaborate upon broader agency goals related to quality, effectiveness, efficiency, profitability and usability. Instructional designers should work on a team or committee with stakeholders to draft goal statements. "This approach should produce more ownership among program participants and other stakeholders" (p. 155). Goal statements can be classified under departments, basic functions of an agency, important processes of an ID strategy, and key elements of a purpose statement.

Strategy 1.4 -- Constraints summary. *Develop a constraints, resources, needs and priorities summary by listing, describing and prioritizing political, social, financial, organizational and environmental constraints, resources, needs and priorities, and* *concluding with an explanation as to how each might aid or pose a threat to the successful implementation of the agency's mission and goals*. a--Have constraints, resources, and stakeholder needs and priorities been considered and factored into the purpose statement and goal statements? *Constraints* are elements within an organization's internal and external environment that can limit the success of a project. *Resources* are elements within an organization's internal and external environment that can contribute to the success of a project. *Needs*, as defined in a constraints, resources, needs and priorities summary under WeBIC, are those needs which are immediate and easily recognizable and do not demand a formal needs assessment to recognize. *Priorities* are needs that must be attended to as soon as possible.

A summary of constraints, resources, needs and priorities helps an organization to recognize the scope and limits of its goals statement, and if necessary can be applied to goal statements to help quantify and qualify expectations. It also helps an organization assess and design a more realistic and practical implementation of its purpose and goal statements. The following elements can be assessed as either constraints or resources depending on the unique circumstances of an organization's internal and external environment:

a. *Budgetary Considerations*. What financial resources are available? Can the Web help contain costs of education? Rumble (1993) notes that:

> Whether distance education is actually cheaper depends on a number of factors, including choice of media, the number of subject areas covered and courses offered, the extent to which the direct variable student cost is kept below the level found in traditional forms of education, and, of course, the number of students (p. 106).

Owston (1997) reports that: "there are three main areas of cost for a Web-based course: hardware and software, course development, and ongoing course support" (p.

31). He cautions that all three categories of expenses represent expenditures above what a traditional educational agency otherwise would incur and thus need to be carefully budgeted for.

b. *Delivery System*. Is the delivery system economically feasible? Does the necessary infrastructure exist?

c. *Size of Target Market*. Are there enough students to generate sufficient enrollment? Rumble (1993) states that "the most efficient distance-education system will be one with a relatively small range of courses and large numbers of students" (p. 103). He contends that:

> Whatever the social justification for distance education, the fact remains that the high costs of setting up a system and developing courses means that there can be little justification for the investment, in economic terms, unless there is a large enough market to bring average costs down below those found in traditional education systems (1989, p. 101).

Similarly, Owston reports that "perhaps the most effective strategy for minimizing the impact of [web-based training] costs is to concentrate Web development efforts and resources on the courses that generate the greatest enrollment" (p. 32). In other words, the costs of distance education can be contained if, like a manufacturing business, distance education institutions use economies of scale to create courses for mass consumption (Rumble, 1993).

d. *Organization Policies and Procedures*. What are the policies and practices related to hiring? Is the organizational culture conservative or risk-taking?

e. *Laws and Regulations*. Are they any laws and regulations which might increase operating costs or limit access? Are there any employment standards which might impact hiring practices and job descriptions?

f. *Equipment and Facilities*. What are the physical facilities?

g. *Materials and Supplies*. Can materials and supplies be purchased at a reasonable cost?

h. *Time*. How soon is the training solution required?

i. *Human Resources and Expertise*. What instructional expertise is available? Is staff technological literate? Are people able to design and develop materials? Can full-time staff work from their own home, thus saving enormously on plant and building costs?

j. *Available Information*. Is information easily available to develop the subject matter of the training?

k. *Organizational Structure*. Are communication channels flexible?

l. *Political Considerations*. Is the government willing to fund part of the online training project? Are tax breaks available for certain kinds of training development?

m. *Costs to Students*. How much will the training costs students over and above tuition fees? Rumble (1993) points out that "the issue of who pays (student, employer, or government) is an important one which has a bearing on both what is taught and access" (p. 106). He cautions that as new technologies develop "the technologization of distance education will put increasing costs on to students."

Strategy 1.5 -- Philosophy statement. *Clarify the values of your organization by articulating a working philosophy for your program*. a--Does the organization have a philosophy/values statement? b--Is this statement expressed in the instructional materials? "Program planning does not take place in a vacuum. It is driven by values: values of the organization, values of the adult education practioner, values of the clientele and values of society" (Brockett & Hiemstra, 1998). Apps (1973, as cited in Cookson & Rothwell, 1997) defines a 'working philosophy' as a system of beliefs about key issues in program planning and lifelong education (p.68). A working philosophy provides instructional designers with "a foundation of principles upon which they can establish goals, identify criteria for excellence, and make decisions." It enables an educational agency to answer important questions such as: "What is real? How do we Know? What is right?" It also brings up issues such as: What is the nature of humankind? How is knowledge acquired? What is education? What is the purpose of education? Should educational agencies focus on developing the intellectual powers of the mind? What is valued in society or in an organization? (Rothwell & Cookson, 1997, 69).

Brockett and Hiemstra (1998) believe that a philosophy statement can also do the following (p. 118):

a. promote an understanding of human relationships;
b. sensitize one to the various needs associated with positive human interactions;
c. provide a framework for distinguishing, separating, and understanding personal values; and
d. promote flexibility and consistency in working with adult learners.

Strategy 1.6 -- Detailed needs assessment. *Conduct a detailed needs assessment by listing all internal and external environmental factors effecting the development of an ID project; identifying and summarizing all stakeholders needs; analyzing and appraising the importance and size of these factors and needs to determine which are most critical to the success and development of the project; and recommending a course of action*. a--Has a detailed needs analysis been conducted? b--Have the results of this analysis been incorporated into the purpose definition? c--Was the needs assessment conducted in a scientific manner that can be verified by outside sources if necessary?

Pearce (1998) defines needs assessment as "the process of discovering program needs" (p. 251) and Sork (1998) defines it as a "process in which present states of affairs are determined and judgments are made about more desirable states of affairs" (p. 275). Under

WeBIC, *needs assessment* is defined as the process of identifying the needs of stakeholders, determining the size and importance of those needs, and then recommending a course of action. Furthermore, similar to the manner in which Rothwell and Cookson (1997) define the term *needs analysis*, needs assessment under WeBIC, resembles a research project that involves the "systematic application of principles of scientific inquiry, measurement, and data analysis" (p. 135).

To conduct a needs assessment:

1. *List all relevant factors which may effect the development of an instructional project by analyzing and appraising the 'external environment' of its parent organization*. Rothwell and Cookson, (1997) define the *external environment* as "the world outside the system" (p. 94). Outlined below are factors and questions an organization should look at to appraise its external environment:

   a. *Demographic Conditions*. What are the attributes of the population, its size, density, ethnicity, age profile, level of schooling? What are the geographical areas in which the organization operates and with which it relates? How many households have computers and access to the Internet?
   b. *Social and Cultural Conditions*. What are the characteristics of the society? What is the level of literacy and schooling of the population, availability of books and libraries, and educational programs via the Internet? What is the computer literacy rate?
   c. *Economic, Market, and Competitive Conditions*. What are the attributes of the economy, its level of production, average income per capita, rate of employment/unemployment and under-employment?
   d. *Legal and Regulatory Conditions*. What are the laws regarding use of the Internet and information access?
   e. *Technological Conditions*. Have people jumped on the Internet bandwagon without know where it is really going?

f. *Ideology, Historical and Political Conditions*. What are the dominant tendencies of the country, degree of official hegemony of the government and armed forces, values assigned to the functions of education and training, degree of class consciousness and consciousness of class conflicts?

2. *List all relevant factors which may effect the development of and instructional project by analyzing and appraising the 'internal environment' of the parent organization and ID team*. Rothwell and Cookson, (1997) define the *internal environment* as "the world inside the system" (p. 94). Outlined below are factors and questions an organization should look at to appraise its internal environment:

a. *Costs*. How much will the instructional solution cost? How much will it cost to maintain and update?
b. *Organizational Structure*. How do we organize? What is the chain of command in my organization? Who has power? How much and what kind of coordination exists among divisions, departments, work units, or teams, and how is that coordination handled by top management? How effective has it been? (Donaldson, 1998).
c. *Organizational Policies*. What are the goals and values of the organization? What is the organization's mission? What is the organization's philosophy of service to program participants? What is the organization attempting to accomplish? How is success measured? (Rothwell & Cookson, 1997, 109).
d. *Organizational Needs*. What are the needs of the organization? What are the unwritten values and norms of the organization?
e. *Program Planning*. How is program planning done now? How is the organization obtain information about customer, suppliers, and distributor needs? How are decision makers and prospective program participants using that information?
f. *Organizational Strengths and Weaknesses*. What does the organization do best and why? How does the organization compare to others in the same industry based on costs, profits, and customers satisfaction levels? How well is the

organization making use of state-of-the-art techniques, equipment, and facilities? How do the organization's techniques, equipment, and facilities compare to those of competitive organizations?

g. *Human Resources*. What is the experience level of people working in the organization, and how long have they been doing what they have been doing? How are workers trained on work methods, equipment, and facilities? How motivated are the workers? What incentives or rewards affect motivation? What attitudes prevail between workers and management in the organization?
h. *Learner Satisfaction*. Are learners satisfied with current learning activities? Will they be more satisfied with a new approach?

3. *Select an appropriate needs assessment activity to better determine and assess stakeholder needs, as well as other important factors brought out during the internal and external environment analysis*. Types of needs assessment activities include:

a. literature reviews;
b. research on private and public training organizations;
c. review of archives and internal documents;
d. human resource/personnel analysis;
e. individual interviews;
f. focus groups;
g. job analysis exercises;
h. efficiency and effectiveness studies;
i. online surveys; and
j. data and web mining.

It should be noted that "relatively little research has been conducted on needs assessment practices in U.S. organizations" (Rothwell & Cookson, 1997, 141). One of the results of this is that "program planners are unable to provide decision makers with convincing arguments about the value of needs assessment by pointing to the results of benchmarks elsewhere."

4. *Conduct as much or as little needs assessment as deemed appropriate*. According to a survey by Rothwell and Cookson (1997), continuing education professionals consider "informal needs assessment slightly more vital to effective program planning than formal needs assessment" (p. 141). Informal needs assessment involves "asking stakeholders and prospective learners about what they feel they need," while formal needs assessment "uses a more planned, rigorous and systematic approach." Pearce (1998) notes that "it is clear that the process of developing a [formal] needs assessment . . . is extremely time consuming, and also very costly" (p. 267). She adds that informal needs assessment can be more aptly described as 'Q & D': 'quick and dirty' assessments (p. 268), and lists the following Q & D assessment strategies (Strother & Klus, 1982, Boshier, 1986, as cited in Pearce, 1998, 268-269):

a. reviewing trade and professional journals;
b. talking with colleagues in the field;
c. checking out ideas with a network of key contacts;
d. looking over past trends;
e. informal environmental scanning; and
f. offering a program to see what happens.

Schon (1987, as cited in Pearce, 1998, 267) surmises that many highly successful program have in fact no needs assessment component at all.

5. *Focus on costs as well as performance requirements*. Needs assessment often focuses on determining the types of skill and performance requirements sought after by an educational agency, information that is necessary to prepare a proper performance analysis. However, when delving into the relatively unexplored area of online training and instruction with a sparse track record of cost and

developmental research, under WeBIC it is equally important to probe the financial, administrative and technological impact of a new program or course of instruction. Otherwise, an agency faces greater risk, not being able to as accurately project costs and revenues as is possible with more traditional forms of education.

6. *Summarize, report and apply the results of the needs assessment*. The results of the environment analysis, should be organized into a report that can be distributed among stakeholders. The results should then be incorporated into the purpose definition of the organization.

Objective 2.0 -- Learner Analysis Checklist

Objective: Conduct a learner analysis by summarizing characteristics of the learner population; listing behaviors and skills target learners must demonstrate prior to training; identifying specific entry behaviors, entry skills, and other learner characteristics that will affect the design of training materials; explaining how you plan to accommodate various learner characteristics; and summarizing this research in a learner characteristics summary statement and list of entry skills and other prerequisites. “The unique characteristics of the targeted program participants, can dramatically affect the success of planned learning experiences” (Rothwell & Cookson, 1997, 115). Being aware of the underlying tensions that learners may bring into a learning situation can also help instructional designers short-circuit any potential problems that may arise. A good program plan must thus determine “what participant characteristics are worthy of consideration” as programs are designed?

Strategy 2.1 -- Learner needs and characteristics. *Identify learner characteristics that need to be considered in the development of training and instructional materials and* *selection of delivery platforms*. a--Have learner characteristics been identified? b--Have the learner characteristics and needs been incorporated into the instructional goals and design of materials? c--Is there a learner summary statement? (supported by Daunt 5.1 and 5.3, Great Sites 8.3b, Barron 11.3, and Ed's Oasis12.16).

The following seven categories of participant characteristics, based on Rothwell and Cookson's 'Five Sets of Participant Characteristics' (1997, 116-117), should be considered as training and instructional materials are being designed and delivery media selected:

1. *Entry Behaviors, Attitudes, Values and Experiences*. What are the participant's levels of experience? How much responsibility are participants willing to accept for their own learning? What participant involvement is necessary or desirable? What attitude problems should be addressed in the planning? What do learners seek to gain from instruction, and why? How do the participants feel about the subject matter of the program, the organization, and the program planners?
2. *Entry Skills and Prerequisites*. Are there any prerequisites that learners must have in order to participate in the training? What is the baseline knowledge and experience for the targeted participants? What equipment do they have? What kinds of communication links do they have?
3. *Learner Motivations*. What is the participants present level of motivation to learn in the program? What are the most typical motivations for learning and are these motivations primarily intrinsic or extrinsic influences? Can the motivation to learn be increased?
4. *Interests*. Do the learners have any special interests? What accounts for that interest? What do learners hope to gain from participating in an online learning and training experience? How realistic are their learning expectations?
5. *Background*. In what education, training, and other experiences have participants already participated? How do their backgrounds, beliefs, and experiences affect what they believe about a program and how they may approach it?

6. *Learning Styles*. What learning styles are evident among a group of targeted participants?
7. *Physical Characteristics*. Are the students able to withstand the physical, mental, learning or emotional demands of online learning? Do they have any physical, mental, or learning disabilities that may affect their ability to learn online?

Strategy 2.2 -- Required entry skills and prerequisites. *Summarize the entry skills, behaviors, values, equipment, communication and other prerequisites learners should have to successfully complete the instructional materials*. a--Are entry skills, equipment and other prerequisites clearly stated? b--Do learners have access to the necessary equipment to properly access the online instructional materials? After actual learner characteristics have been assessed and a summary statement written, a list of minimum and desirable characteristics and requirements should be listed to help learners assess whether they can succeed in a course of instruction and to help instructional designers develop more effective materials. The California State University (Teaching and Learning Online, 2000) outlines the following characteristics students should have to be successful at learning online:

a. Discipline to complete projects by deadlines instead of waiting until the end of the semester.
b. Motivation to read, write, and participate fully in class activities.
c. Time to devote approximately 12 hours a week to a 3-credit course.
d. Ability to work independently and in teams.
e. Flexibility in dealing with technology problems.
f. Capacity to be self-starting and not procrastinate.
g. Ability to learn from the printed word.
h. Ability to set aside specific times on a routine basis to ‘participate’ in the course.
i. Capacity to ask questions when they do not understand.
j. Access to a current computer and the Internet.

k. Possession of good, basic computer skills.
l. Possession of time management skills.

The California State University notes that “not all students are successful in online courses. Some students have trouble with time management, need the structure of a classroom, or miss the face-to-face interaction with other students and the instructor.”

Objective 3.0 -- Performance Analysis Checklist

Objective: Conduct a performance analysis by developing and listing performance goals; conducting task analyses to identify sub-goals, tasks, and sub-tasks; conducting content analyses to identify important information, concepts, rules, and principles; assessing which performance problem(s) can be solved by instruction; and writing a performance gap analysis statement that summarizes the performance problem, the gap, and the solution. *Performance analysis*, also occasionally called *front-end an*alysis, “distinguishes learning needs from such other needs as management needs or work environment needs” (Rothwell & Cookson, 1997, 129). A performance analysis develops more specific performance objectives or goals that expand upon the general learning goal statements as outlined in the purpose definition.

Strategy 3.1 -- Performance goals. *List performance goals that outline the desired outcomes and results learners should achieve after completing the training and instruction materials*. a--Has the desired performance been determined? b--Have performance goals been written? c--Are these goals realistic? (supported by Berge 4.1, Barron 11.2, and Ed’s Oasis 12.15). In developing performance goals, members of the ID team should ask questions like:

1. What is the desired performance?
2. What is the present performance? Is the present performance acceptable or unacceptable? How does it compare to any standards that may or may not exist?
3. Is there a difference between what performers *do*, what they are *capable of* doing, and what they *should* do? In other words, is there a *performance gap*?
4. Why does this 'difference' or 'performance gap' exist? How important is this gap?
5. How can the performance gap be closed?
6. Is training or education the best solution to resolve the problem?

Strategy 3.2 -- Task and content analysis. *After developing instruction and performance related goals, conduct task analysis and content analysis, and if necessary, further needs analysis to better understand learner deficiencies*. a--Was a proper task and content analysis conducted? b--Did the task and content analysis include feedback from stakeholders?

> After completing performance analysis and deciding that instruction is an appropriate solution to a problem, program planners, conduct task analysis, by working alone or collaboratively with stakeholders (Rothwell & Cookson, 1997, 132).

A *task analysis* is "a detailed examination of ideal performance" (p. 132). The purpose of task analysis is to tear apart all performance goals into sub-goals, tasks and sub-tasks to better determine how instruction should be prepared. *Content analysis* is a detailed examination of all instruction related tasks to identify the information, concepts, rules, and principles contained within each. The results of task analysis and content analysis are used to prepare performance objectives, and if necessary to redefine performance goals.

Strategy 3.3 -- Performance gap statement. *Summarize the performance analysis by writing a statement that describes the problem, most important gaps, and the best possible* *solutions*. a--Has a performance gap statement or similar statement been developed to summarize the performance analysis? Outlined below is a sample performance gap statement for developing online instructional materials for ESL learners at Sookmyung Women's University in Seoul, Korea:

1. *The* Gap. Korean students have been studying English for years within the Korean educational system with marginal success. Most teachers of English focus on grammar and vocabulary and are usually unable to carry on a conversation in English. Students are tired of the 'old ways' of learning English. They want something new and motivational.
2. *The Importance*. The new Korean job market, influenced by the increasing globalization of world economies, demands that more and more students acquire basic English communication skills to get hired and promoted. ESL education agencies are also looking to build enrollment with new innovative courses designed to attract attention and increase revenues.
3. *Instructional Need*. It is difficult for students to meet native-English speakers within Korea. By tapping into the global community, they can greatly expand their opportunities to communicate in English and establish foreign contacts. By learning how to study English on their own, students can also increase their self-confidence and independence, qualities that are often underdeveloped in the traditional group-orientated Korean educational setting.

Objective 4.0 -- Media/Technologies Analysis Checklist

Objective: Based on CASCOIME criteria, especially cost and access, evaluate and select print, visual, audio and video media to be used to deliver the instructional package making sure to consider usability issues, as well as possible conflicts and difficulties and how you plan to solve these difficulties. In this thesis, *media* and *technology* are used interchangeably. A *medium* can be defined as "a channel of communication, information, or entertainment" (Mish, 1989, 455). Media that can be used to develop online instruction include print, radio, audio-cassettes, video-cassettes, broadcast TV, satellite TV, cable TV, multimedia CDs, computer-based learning, HTML materials, CGI scripts, JavaScript, Java applets, Shockwave components and other web-based materials and technologies.

Strategy 4.1 -- CASCOIME criteria. *Use CASCOIME criteria to evaluate and select media and technology*. a--Is the medium or technology cost efficient? b--Accessible and convenient? c--Socially and political suitable? d--Culturally friendly? e--Open and flexible? f--Interactive? g--Motivational? h--Effective? (supported by Guay 1.7; Winn 2.1f, Berge 4.7; Paquette-Frenette and Larocque 6.3; Bates 7.1, 7.2, 7.4 and 7.6; Great Sites 8.3f and 8.3h; Barron 11.1b and 11.4; and Ed's Oasis 12.1)

CASCOIME (pronounced *cas-coy-mi*) outlines eight practical criteria compiled in descending order of importance for evaluating and selecting new media or technology for distance education. These guidelines are targeted towards distance educators wishing to meets the needs of minority groups and developing regions. However, they are useful for the selection of media and technology is many distance education and online training situations. The eight criteria are summarized as follows:

1. *Cost*. Is the medium cost efficient? Can it reach a wide enough audience? What technology infrastructure and resources are currently available to produce and deliver the instructional product?

Two examples which clearly illustrate the importance of cost as a deciding factor in the success or demise of a medium are print and video. "Traditional print-based correspondence study endures in spite of more than sixty years of technological innovation in mass communications and continued declarations of its obsolescence" (Pittman, 1987, 33). As Pittman argues, "convenience and economy" are key factors contributing to its continued use. Video, on the other hand, has virtually replaced film overnight as an educational medium of choice for one very simple reason -- it is much cheaper:

> Film has become an expensive medium, both the software (films themselves) and the hardware (film projectors). The video version to a title is generally a fraction of the costs of the film version, and the combination of a video player and video monitor costs less than a film projector. There are major reasons why institutions are willing to write off their considerable capital investment in films and projectors and adopt videocassettes as the format of choice for moving images (Heinich, Molenda, Russell & Smaldino, 1996, 207).

Schwier (1994) advises that "generally speaking, interactive media are more expensive than many other formats to design and produce. They are most cost-effective when distributed in large quantities" (p. 214).

2. *Accessibility*. Is the medium accessible? Does it facilitate distribution? Is it convenient to use? Is it user-friendly? Is it suitable for the learners? According to Bates (as cited in Fahy 1999, 126), "cost and accessibility" are the two most important criteria in the selection of new media or technology. Threlkeld and Brzoska (1994) contend that "a delivery system which permits wide distribution of a course . . . can be shown to significantly reduce costs" (p. 60) and hence increase accessibility (i.e., more people can afford it). Pittman (1993), in supporting the remarkable staying power of print-based correspondence study, argues that "the more sophisticated the medium, the more constraints students must accept" (p. 34).

3. *Social-Political Suitability*. Is the medium socially and politically suitable? Does its use coincide with social and political agendas of governing bodies? Guy (1991) reports that "there are significant levels of physical, linguistic, cultural, political and economic diversity within developing nations. The developing world lacks the relative homogeneity which characterizes students, systems and

societies found in the developed world" (p. 162). Thus, more and more, distance educators are being asked to design distance learning systems to suit local environments in an effort to solve the social, political, and economic problems unique to each nation.

4. *Cultural Friendliness*. Is the medium culturally appropriate? Does it coincide with the culture's traditional way of learning? "It is widely recognized that perceptions of success and failure among people in non-Western cultures may be quite different from those reported by people in Western cultures" (Murphy, 1991, 27). Guy (1991) advises that "it may be more appropriate to identify the cultures of the learners prior to the development of an institutional response so that it is sensitive to those cultural forms" (p. 163).

5. *Openness/Flexibility*. Is the medium flexible? Does it foster collaboration? Does it foster different ways of teaching? "The integrative nature of technology and its use in distance education is pulling people around the globe into new and unexpected forms of collaboration" (Thach & Murphy, 1994, 17). Collaboration will "increasingly become a major tool of institutional development" (Moran & Mugridge, 1993, 163). What this suggests is that media that facilitates collaboration is preferable to media that does not, especially for developing nations where it is economically advantageous to adopt the distance education structures of more advanced nations.

6. *Interactivity*. Is the medium interactive? Does it promote learner-learner and learner-instructor interaction? Does it facilitate timely and quality feedback from instructors and tutors? *Interaction* is an important part of all forms of learning. "All the major learning theories specify that some form of meaningful interaction must take place between learners, instructors, and the environment" (Szabo, 1998, 44). Barker, Frisbie and Patrick (1996) go as far as to assert that interaction legitimizes distance education. They state:

> The use of new and emerging technologies in distance education that foster live, teacher-student and student-to-student interactivity will enable distance education to assume its rightful and respected role in the educational process (p. 46).

7. *Motivational Value*. Is the medium motivating? Does it encourage learners to study harder and longer? Clark (1983) reports that several studies have "fruitfully explored" the question of enjoyment and entertainment in the use of educational media. He states: "the fact that we learn (though education and experience) to prefer some media or to attribute varying levels of difficulty, entertainment value, or enjoyment to media might influence instructionally relevant outcomes" (p. 454). However, it should be cautioned that technologies can produce less learning if chosen for their entertainment value and ease of use. Fahy (1999) reports that "learners tend to like media which [are] easier to learn with, although it most often results in poorer learning (p. 49).

8. *Effectiveness*. Is the medium effective? It is suitable for the types of learning required? Does it facilitate and support the mastery of the performance goals? Does it help students learn content faster (i.e., more efficiently)?

It is rather discouraging as a distance educator to realize that "in distance teaching institutions, the deployment of different media for different topics and learning tasks is controlled more by logistic, economic and human factors than by pedagogical considerations" (Koumi, 1994, 41). In other words, when it comes down to making a decision, the effectiveness of a medium as an educational tool is a minor consideration in the selection process. Sometimes, certain kinds of technology are not even necessary. The research literature, for example, "doesn't confirm the need for live or synchronous interactivity in distance education. Its impact on learner outcome is elusive, at best" (Threlkeld & Brzoska, 1994, 49). Nevertheless, Clark (1994) expresses the importance of choosing media that are "capable of delivering the method at the least expensive rate and in the speediest fashion" (p. 26). Kulik and Kulik (1985, as cited in Carter, 1996, 34) have also conducted studies which highlight achievement efficiencies gained by using educational technologies. Assertions of increased effectiveness of certain media is also supported by Simpson's (1994) neurological findings. Simpson reports on the power of technological media to alter the biochemical structure of the brain and submits that it may be possible for new media to actually be responsible for new ways of thinking.

Strategy 4.2 -- Proven technologies. *Stick to technologies that have been tested and proved efficient and effective*. a--Do the media and technologies selected have a strong record of proven performance and web usability? In general, distance education institutions have:

1. high fixed costs;
2. low variable costs per student;
3. design and productions costs of materials which depend on the choice of media (Keegan, 1996, 178).

All these costs are dependent upon the type of media chosen to deliver course content, and thus are of great importance when establishing any distance education or online instructional agency. AVU (1999) similarly concludes: "The choice of technology is not only critical in determining how users access, interact with and learn content, it also has a major impact on the overall success of the project." The importance of sticking to proven technologies is further supported by UKOU's experience (Heap, 1999):

> Evaluation of the UKOU's new CD-ROM-based course, *IT and Society*, indicates that many students are concerned by the shift from printed materials to electronic delivery. They dislike the lack of freedom to study as and were they please, they found it inconvenient switching between multiple media and reading from the screen, and they were overwhelmed by the sheer volume of information accessible on CD-ROM and via the Internet (p. 77).

In selecting its choice of media, the ID team should carefully consider the following factors (Crawford, 1999, 31):

1. The infrastructure required to use some technologies is both expensive and complex.
2. The preparation of courses and programs for some technologies is especially complex and expensive.
3. The selection of delivery strategies and technologies is rarely a simple, rational issue. It is usually also a political and economic issue.
4. The speed with which shifts are being made, while seemingly slow in the eyes of some, may also be so rapid that institutions may make serious errors and incur fiscal losses if they select the 'wrong' technologies.

<u>Strategy 4.3 -- Technologies that impede interaction</u>. *Avoid technologies that impede interaction*. a--Are the media and technologies selected unlikely to produce conflicts, difficulties and behaviors in learners that will reduce interaction? (supported by Bates 7.1, Great Sites 8.3h, Flanders 10.3, and Barron 11.1b). The chief barrier technology imposes on its users is *cost* and *access*, which curiously enough can also be argued as one of its greatest strengths. Miller (1996) argues that "for the past century, almost every attempt to introduce new technologies has served only to limit student access without dramatically improving the learning environment" (p. 35). The fact is, not everyone has computer access, nor the funds purchase the latest hardware or software. In many developing nations, a majority of civilians do not even have access to telephone or postal services. Technology can also make people nervous, especially those who have limited experience with it. Furthermore, due to its frequently complex nature, technology can make students feel *stupid*, hence quiet and reluctant to participate. More specifically, technology can impede interaction by:

1. *Being Impersonal*. Dede (1996) argues that even "a sloppy, handwritten note delivered through surface mail at times will mean more to the recipient than an instantly transmitted, elegantly formatted electronic message" (p. 33). Students often prefer high-touch to high-tech.
2. *Increasing Frustration Due to Bandwidth Bottlenecks*. Szabo (1998) reports that "access speed and difficulties in conducting dialogues over the Internet currently inhibit interaction in a multimedia environment" (p. 43). Often on-line users become frustrated waiting for discussions to download and servers to submit their postings. This wasted time and hence low quality interaction is due to insufficient bandwidth. *Bandwidth* is a term used to describe the electronic pathway along which voice, video, and data travel (Noll, 1988, as cited in Oliver, 1994, 171). Hudson (1996) more simply defines bandwidth as "the speed with which information flows." The problem of insufficient bandwidth becomes even more critical when video is used. "One full-motion video signal requires the same bandwidth as 600 telephone calls" (Oliver, 1994, 171).
3. *Increasing the likelihood of 'Social Loafing.'* Technology increases the "tendency for individuals to minimize their efforts on collaborative tasks" (Fahy, 1999, 210). This is defined as *social loafing*.
4. *Increasing the Likelihood of Rude and Impulsive Behavior*. The cloak of the virtual world allows some users to lose their manners and civility resulting in increased instances of interaction which is "demeaning, untimely, embarrassing, [or] boring" (Fahy, 1999, 65). Collins (as cited in Fahy, 1999, 147) also points out that fast paced "high interactivity" may have negative potential for learning and problem-solving as it has a tendency to encourage a lack of thoughtfulness by the learners. Learners tend to *react* rather than *think*, as everything they do is in response to some situation.
5. *Promoting Addictive Behaviors*. Some users find cyberspace so compelling that they fall into unusual addictive behaviors (Bruckman, 1992, as cited in Dede, 1996, 27). Virtual addicts tend to hog conferencing discussion boards, close all open-ended questions, and with numerous contributions, add unnecessarily to the

maze of discussion threads making it more difficult for others to follow and participate.

6. *Promoting the Deterioration of Off-line Relationships*. A study by Carnegie Mellon University (Harmon, 1998, as cited by Fahy, 1999, 210) found that participant interactions with their families and off-line friends declined while they were involved online with chat and e-mail associates. The researchers commented: "Our hypothesis is, there are more cases where you're building shallow relationships [on the Internet], leading to an overall decline in feeling of connection to other people." The study also found that on average one hour per week of Internet use led to an increase of 1% on the depression scale.

Strategy 4.4 -- Media effectiveness supported. *Select media that is supported by research or usability studies, keeping in mind that there is very little evidence that supports the assertion that media influences learning*. a--Is the medium backed by research or usability studies that validate its suitability and effectiveness at solving the types of instructional problems that the ID team wishes to solve? In the research literature, there has been an ongoing debate about whether or not media does, might, or ever will influence learning. The main contributors to this debate have been Clark and Kozma, with Clark being the instigator and Kozma the antagonist.

Clark's (1994) position is that media will *never* influence learning. He cautions that there is "*no* compelling evidence in the past 70 years of published and unpublished research that media cause learning increases under any conditions" (p. 25). He states "that absolutely any necessary teaching method can be delivered to students by many media or a variety of mixtures of media attributes -- with similar learning results," and thus "it is method which is the 'active ingredient' that influences learning" (p. 27). He argues: "When a study demonstrates that media attributes are sufficient to cause learning, the study has failed to control for instructional method and is therefore confounded" (p. 25). Clark's claims are supported by Wilbur Schramm (1977, as cited in Clark, 1994) who maintains that learning is influenced more by the content and instructional method in a medium than by the type of medium (p. 21). Threlkeld and Brzoska (1994) agree reporting that, "literally hundreds of media comparison studies have been performed over the past forty years, and the results have been uniform: the instructional medium doesn't appear to make any important difference in student achievement, attitudes, and retention" (p. 42).

Eicher et al. (1982, as cited in Rumble, 1993) also provide supporting evidence that motivated students learn from any medium provided it is properly used and adapted to their needs. In other words, research and practical experience have shown that much of the effectiveness of media depends on how they are integrated into the teaching act. These findings along with Clark's have been researched in great detail by Tom Russell (1999) who provides 355 research reports from 1928 to 1999 to support the assertion that media do not influence learning.

In direct opposition to Clark is Kozma, who counter-argues (1994) that "medium and method have a more integral relationship" and that "both are part of the design" (p. 16). He maintains that within a particular design, the medium enables and constrains the method. Kozma (1994) surmises that:

> If we move from 'Do media influence learning?' to 'In what ways can we use the capabilities of media to influence learning for particular students, task and situation?' we with both advance the development of our field and contribute to the restructuring of schools and the improvement of education and training (p. 18).

"Although Clark has self-described his view point as unpopular, most citations in the distance education literature [indicate] his positioning [as] mainstream" (Carter, 1999, 37). Nevertheless, Moore (1996) warns that "the main weakness of many distance education programs is their commitment to only one type of medium . . . when there is only one medium it is probable that only one kind of interaction is permitted or done well" (p. 23). This caution is supported by Sauvé (1993) who contends that "research has demonstrated that no medium by itself possesses all the essential characteristics to accomplish one or all of the education functions. Each medium fulfills one or more function, more or less completely" (p. 309). Related to this, Bates (1981, as cited in Sauvé, 1993) asserts that learners differ in their preferences to learning formats as well as their competency to learn with different media.

It is thus advisable for the ID design team not to rely on one particular medium to deliver instruction. There is no such thing as a 'perfect medium.' It is usually more important to focus on issues of cost, accessibility, convenience and design methods, rather than whether a particular medium is more effective than another.

<u>Strategy 4.5 -- Print effectiveness</u>. *Do not underestimate the power of print*. a--Are printed media appropriate and feasible? b--Do they increase the usability and effectiveness of the instructional materials? Print media consists of materials such as, study guides, workbooks, textbooks, reports, graphs, charts, pamphlets and brochures. Printed materials can be used for any type of course and for almost any kind of student: they are flexible, portable, adaptable, user-friendly (if properly designed), and available in a variety of topics. They can also be mailed, faxed, and for numerous educational situations, photocopied

without infringing upon copyright laws. Furthermore, they can be “easily carried from place to place and do not require any equipment or electricity” (Heinich et al., 106).

Unless, paper costs soar, or trees vanish from the face of the earth due to deforestation or some rare bacteria unleashed by negligent bio-geneticists, print-based instruction will be prevalent in traditional and distance education contexts well into the next decade and perhaps century. As it is, print media is “relatively inexpensive to produce or purchase and can be reused . . . some [can] be obtained free” (Heinich et al., 1996, 106). In fact, “in spite of predictions to the contrary, the correspondence [print-based] format still dominates distance education. A recent worldwide survey of educational institutions offering distance education programs (Holmberg, 1987, as cited in Pittman, 1999) reports that 96 percent of respondents currently use printed course units, and 68 percent list printed units as the most important components of their courses.

<u>Strategy 4.6 -- Visuals effectiveness</u>. *Do not underestimate or overuse visuals*. a--Are visual media appropriate and feasible? b--Do they increase the usability and effectiveness of the instructional materials? Heinich et al. (1996) assert that “the overemphasis on words has contributed to the failure of formal education to reach its ideal of universal success” (p. 66). Visuals need to be used in instructional materials because, “most people remember visuals longer than they remember words and numbers” (Heinich et al., 1996, 53). As well, “visuals help to attract and hold learners’ interest.”

Like print media, visuals can be used for any type of course and for almost any kind of learner, except for those who are blind or severely visually impaired. From a pedagogical point of view, as long as the ID teams strives to: “[1] ensure legibility; [2] reduce the effort required to interpret the message; [3] increase the viewer’s active engagement with the message; and [4] focus attention on the most important parts of the message” (Heinich et al., 1996, 71), visuals can be used to teach students of art, drama, language arts, literature, music, mathematics, library skills, consumer science, geography, science, math, and poetry. The simplification of visuals can also lesson development costs significantly. Dwyer (1970, as cited in Szabo, 1998) argues that simple line drawing tend to be superior to photographs or more realistic drawings (p. 20).

Heinich et al. cautions however that “a major synthesis of research studies comparing visual-based lessons . . . with conventional instruction indicated [only] a small overall superiority in achievement for students who experienced the visual treatment” (p. 66). Furthermore, they stipulate that although visuals support ideas, and can help translate abstractions into more realistic formats, they “lose their effectiveness if overused” (p. 53), and “tend to become less useful in instruction as they approach the extremes of very abstract or very realistic” (p. 75).

<u>Strategy 4.7 -- Audio effectiveness</u>. *Use audio when it is beneficial to the learner*. a--Are visual media appropriate and feasible? b--Do they increase the usability and effectiveness of the instructional materials? In online training and instruction, the use of

audio centers mainly around audiocassettes and CD-ROMs, audio teleconferencing, streaming audio and WAV files:

1. *Audiocassettes and CD-ROMs*. Audiocassettes have become a media of choice. To their advantage, they are low cost, most learners already have the equipment to use them, academics find them easy to produce and simple to distribute, learners find them convenient to use, and, when designed properly, they encourage learner activity (Bates, 1988, p.3). Rumble (1993) advises that the cost-effectiveness of audiocassettes should not be underestimated, especially in lower enrollment situations. CD-ROMs are especially useful in the development of online instructional materials, as sound and software can be conveniently distributed on one inexpensive disk. Furthermore, with low developmental and production costs, CD-ROMs have fast become the online medium of choice for providing supplementary audio, visuals and software for online instructional materials.
2. *Audio Teleconferencing*. Audio teleconferencing has become an important component of many distance education courses and is proving to be a successful new media. Fowler and Wakerbarth (1980, as cited in Garrison, 1990) conclude that research findings do not support the notion that telephone communication is inferior to face-to-face communication. In many respects "audio communication is equal, if not superior, to face-to-face communication" (p. 17). Citing the results of a University of Calgary questionnaire on the strengths and weaknesses of audio teleconferencing, Garrison relates that "94% of the students said they would recommend this style of instruction to others" (p. 21). He surmises that "together with the previous results, this is an overwhelming endorsement of audio teleconferencing for undergraduate and graduate level university courses." In further support of this position, Garrison adds that "the completion rate for all of the teleconferencing courses over this period was 96.7 percent."
3. *Streaming Audio*. Internet audio can be added to training materials using RealAudio (.ra) and compressed .wav files. However, file sizes and resulting

bandwidth issues and site speed become a important consideration especially during peak usage periods.

4. *WAV Files*. Gaver (1989, as cited in Szabo, 1998, 23) reports that audio cues can reduce cognitive overload by using everyday sounds to convey messages. For example, when a file is being copied, the sound of a liquid being poured into a container can accompany the visual cue. The audio cue allows the user to focus on something else until the copying is completed.

Szabo (1998) maintains that "from an instructional designer's point of view, there must be a clear benefit to the learner if audio is to be integrated into instructional programs" (p. 26). He argues that for the most part learning gains attributable to audio are weak or nonexistent. Regarding the use of audio in distance education and computer assisted instruction (CAI), he summarizes the following research findings:

a. "Students with higher verbal skills do not profit significantly from the use of audio" (p. 22).
b. "There are no apparent significant immediate recall effects between users of text and text plus redundant audio," except that added audio requires more time to complete instruction (p. 22).
c. It is possible that "audio limits the ability of learners to learn at their own individual rate of learning and thus defeats self-pacing" (p. 22).
d. The possible benefits of audio must be weighed against the increased costs of integrating the audio into materials (p. 24-25).
e. Learners should be allowed to decide whether to use audio or not (p. 26).

<u>Strategy 4.8 -- Video effectiveness</u>. *Use video when it is beneficial to the learner*. a--Are video and animation media appropriate and feasible? b--Do they increase the usability and effectiveness of the instructional materials? In online training and instruction, the use of

video centers mainly around videocassettes, Internet-based video conferencing, and Internet-based streaming video.

1. *Videocassettes*. The most important motion-based media currently in use today in distance education is the videocassette. A VCR and TV set are easier to set up than a film projector. A video copy is much less expensive than its film counterpart and costs less to maintain. Production of video is also easier to handle and less costly than broadcast or satellite mediums. In addition these advantages, corporations have latched on to the videocassette as a training tool with unwavering certainty. "According to *Training* magazine, videotapes are used by 92% of U.S. organizations with 100 or more employees. The amount of videotape use is comparable to that of lectures (used in 87% of these organizations)" (as cited in, Heinich et al., 1996, 210). Companies use videocassettes for the orientation of new employees, training in job-related skills, management development, customer training, standardization of training among distributors, and the introduction of new products, polices or markets (Heinich et al., 1996, 210).

   Lectures from traditional style educational institutions can also be videotaped. Very quickly, a large range of course offerings can be compiled. Rumble (1993) states:

   > Once lecture theatres have been equipped with video cameras and recording equipment, the additional per capital costs of preparing video and lecture notes for use by off-campus tents can be very little . . . a vast library of video material can be built up rapidly for relatively little total cost. While the quality of these videos may not be very high, they are adequate for their purpose (p. 98).

   Like audiocassettes, the cost effectiveness of videocassettes can be considerable in lower enrollment situations. The UK Open University, found that (Rumble, 1993):

   > It was cheaper to give each student a 60-minute videocassette than transmit over the air provided that there were fewer than 133 students on the course. Between 134 and 233 students, it was cheaper to loan a cassette to each student, paying the

costs of postage each way. Over this level, it was cheaper to transmit once using the national television channels of the BBC (p. 101).

2. *Video Conferencing*. “It is acknowledged that in a few years time the video-conferencing window now available on some personal computers will become standard on the motherboard and the experience of compressed video face-to-face synchronous communication will become generally available” (Keegan, 1996, 10). However, to date, video-conferencing remains more of a nuisance than useful. Practical experiences have indicated that most conferences tend to offer low visual and audio quality, considerably reducing their effectiveness.

3. *Streaming Video*. One of the biggest drawbacks with broadcast TV, besides its expense and inconvenience, is its lack of *control*. It is this feature of *control* that allows learners to participate more fully in their learning experience and as a result experience more learning gains. Baggaley (1999, January 15) asserts that “during the 90s, television has been dropped by educators in favor of the Internet.” Baggaley goes on to suggest that this may not be the wisest of decisions, as it is not based on evaluative evidence. However, the Internet offers users more *control* over learning content. And although it must be admitted that the content on the Internet is of questionable quality, it is this *control* feature that makes it so appealing, and hence to a large extent its popularity. Learners can surf when they want, how long they want, and where they want. If this *control* feature is transferred to TV, and if technology and infrastructures can increase the speed at which audio and visual data can be exchanged on the Web (the same problem video-conferencing has, only to a much larger degree), education will never be the same.

Objective 5.0 -- Format Design Checklist

Objective: Develop format design specifications for the finished online instructional product that support the instructional approach and detail the web-based format and screen-option used. A *method* is “a procedure used in offering a program” that reflects the relationship between learners and on organizational sponsor or institutional provided (Rothwell & Cookson, 1997, 207). Verner (1964, as cited in Rothwell & Cookson, 1997, 207-208) outlines three classifications for methods:

a. *Individual Method*. Fosters individualized learning between a learner and the sponsoring organization e.g., correspondence course, coaching and mentoring.
b. *Group Method*. Fosters individual learning through group arrangements e.g., course, discussion group, workshop, forum, and broadcasted online lecture or demonstration.
c. *Community Method*. Learning is based within a community and stems from the daily problems people experience (difficult to implement on the Web).

Techniques are “the forms in which program planners establish relationship between learners and learning tasks” (Rothwell & Cookson, 1997, 208). Verner (1964, as cited in Rothwell & Cookson) classifies techniques according to the purposes of the learning tasks:

a. *Information Acquisition*: Techniques to acquire information include lectures, or talks, and panels (a series of short lectures by members of a well-informed group to communicate more diverse viewpoints).
b. *Skills Acquisition*: Techniques to acquire a skill, require learners to assume active roles (demonstrations, role plays).
c. *Knowledge Application*: Techniques to apply knowledge are necessary when problem solving is emphasized (a group discussion, buzz group).

Formats for learning refer to the manner in which programs are organized. Fellenz (1998) comments that “in the literature of adult education they often have been referred to as ‘methods’ and primarily relate to the way adults are organized for learning” (p. 347). Under

WeBIC, the term 'learning format' and 'web-based format' are used interchangeably with the combined terms 'methods' and 'techniques', as well as the term 'instructional approach.'

Strategy 5.1 -- Web-based format. *Choose an appropriate web-based format*. a--Is the web-based format selected feasible considering the resources of the instructional agency? b--Are there valid reasons for the selection of the web-based format in terms of learner needs, effectiveness, usability features, and ease of design and maintenance? Barron (1998) reports that "there are many methods and techniques for delivering instruction through the Web." In general, "academic and industrial courses can be enhanced with Web-based links, or the courses can be delivered completely via the Web": More specifically, Barron describes the following four Web-based instructional formats:

1. *E-mail Correspondence Instruction*. "With e-mail correspondence courses instructions and/or assignments are e-mailed back and forth between students and instructors." Courses offered in this manner often include an textbook and other instructional materials.
2. *Web-enhanced Instruction*. "With Web-enhanced instruction, the instructor creates a Web page (or pages) with relevant links for the class." Web-enhanced instruction is generally designed as a supplement to on-campus/on-site instruction or can be used to supplement e-mail correspondence instruction.
3. *Web-managed Instruction (Course-in-a-Box).* With Web-managed instruction, tools, such as *ActiveX*, *TopClass*, *Learning Space*, *WebCT*, *Blackboard*, or *Web Course in a Box* are used to provide an architecture for course information and materials. Barron notes that "these Web-management tools are not generally designed to create instruction; instead they provide an easy, effective means of managing (with password access and student tracking) course information and materials." Web-managed instruction often provides tools and features such as chat rooms, discussion groups, and e-mail.

4. *Web-delivered Instruction*. "Web-delivered instruction (commonly referred to as Web-based Training or WBT) includes courseware in which the instruction, interactions, and feedback are delivered via the Web." This type of instruction can be created with many tools, such as HTML, JavaScript, Java, Shockwave, Flash, Neuron, ActiveX, DHTML and Authorware.

<u>Strategy 5.2 -- Screen option</u>. *Choose an appropriate screen option for WBT*. a--Is the page-based, frame-based, or screen-based option selected the most effective delivery format for the targeted learners in terms of usability, ease of design, and ease of maintenance? Barron (1998) comments that "Web pages are no longer confined to scrolling pages." She adds that "with the availability of new *HTML* tags (such as framesets), authoring system plug-ins (such as *Shockwave*) and programming languages (such as *Java*), there are several options for the design and development of WBT":

1. *Page-based WBT*. "Page-based WBT consists of scrollable *HTML* pages." A page-based program course will not use frames. A single scroll bar will appear if the document is long or the window is decreased. Barron notes that the "advantages of page-based WBT is that it is generally more accessible to a worldwide audience (because it can be created in basic *HTML*). In addition . . . most users are comfortable using the browser and embedded links to navigate through the pages." One of the disadvantages of page-based WBT is the need to scroll through the pages if they are long and the lack of 'static' menu options, i.e., menu items that do not move when you scroll.
2. *Frame-based WBT*. "With frames, one or more parts of the screen can remain static while the other part or parts change and/or scroll." Barron notes that "the advantages of frame-based WBT is that a menu or other options can remain on the screen, in the same place at all times." Some of the disadvantages of frame-based material is the difficulty in printing information (only the active frame will print), and the increased access time in loading multiple pages. With frame-based

WBT is it often advisable to incorporate a user-friendly printable version of the course materials.

3. *Screen-based WBT*. With the advent of plug-ins, such as *Shockwave* for *Authorware* and *Neuron* for *ToolBook*, courseware can be used to produce materials the appear exactly the same as 'traditional' CBT. Barron notes that the "advantages of screen-based programs include the fact that each screen can fill the display window; scroll bars are not included; existing courseware can be converted for Web delivery; and management systems are available (such as *Librarian* for *ToolBook* and *Pathware* for *Authorware*)." A major disadvantage however is the necessity for students to install plug-ins and slower access due to larger files sizes.

<u>Strategy 5.3 -- Learning format support</u>. *Support the learning with the necessary technology*. a--Do the media and technologies selected support the desired learning format? b--Does the learning format take advantage of the Web medium? c--Does the learning format support and facilitate interaction and collaboration? (supported by Berge 4.2, Bates 7.3 and Ed's Oasis 12.7)

<u>Objective 6.0 -- Instructional Objectives Design Checklist</u>

Objective: Write performance objectives for instructional goals identified in the performance analysis and purpose definition in a variety of cognitive domains by clearly specifying the desired learning outcomes and how those outcomes will be measured. An *instructional objective* is "a detailed description of what learners should know or be able to do as a result of their participation in and educational event" (Sork, 1998, 274). They are "derived from goals . . . lend themselves to measurement and provide a basis for measuring program achievement (Rothwell & Cookson, 1997, 11). Sork (1998) contends that "objectives [can be] useful planning tools because they clarify the intentions of those who are involved in planning and can then be used to communicate those intentions to potential participants, sponsors, instructors, and so on" (p. 290). Rothwell and Cookson (1997) maintain that "goals and objectives derived from learning needs and stakeholders' interests are assumed to have greater practical value than goals and objectives derived in other ways" (p. 11-12).

Three types of instructional objectives important to the development of WeBIC are results objectives, behavioral objectives, and performance objectives.

1. *Results Objectives*. These "focus on the ultimate on-the-job applications or results to be achieved" (Rothwell & Cookson, 1997, 155). Two types of results objectives are general objectives and program objectives:
   a. *General Objectives*. These outline "broad social and institutional goals" (p. 155). Under WeBIC, general objectives of the parent organization are defined by the purpose and goal statements of the purpose definition.
   b. *Program Objectives*. These refer to "the desired results tied to one program and are oriented to the learning of knowledge, skills, or attitudes" (p. 156). Under WeBIC, program objectives are defined by the performance goals derived in the performance analysis.

2. *Behavioral Objectives*. These describe "the behaviors that participants should be capable of demonstrating upon program completion" (p. 157). Behavioral objectives center around three essential components: behaviors, conditions, and criteria. They describe the *what*, *how* and *why* of behavioral objectives (Rothwell & Cookson, 1997, 158).

3. *Performance Objectives*. As defined in the TIP Model (Training, 1990), performance objectives are "precise [statements that describe] the performance or attribute the trainee should have learned or acquired as a result of the instruction"

(Design & Development, p. 13). Both the TIP Model and WeBIC performance objectives are essentially Mager behavioral objectives, with the substitution of 'performance' for 'behaviors.' Based on principles outlined in the TIP Model, WeBIC, recommends developing performance objectives to:

a. guide the design and development process;
b. validate the instructional contents;
c. develop performance assessment measures;
d. indicate the level of ability learners need to complete a task;
e. help learners recall existing skills and knowledge or prerequisites;
f. specify the standard of performance and criteria for evaluation; and
g. familiarize learning with the upcoming instructional materials.

Strategy 6.1 -- Performance objectives. *Use the TIP Model and the Mager approach to writing instructional objectives*. a--Have instructional objectives been developed? b--Are they appropriate? c--Do they describe what the learners need to learn and how this will be measured? d--In greater detail, do they describe what the learners will be able to do upon completion of the objective, under what special conditions (if any) must the learners demonstrate the performance, and what the minimum acceptable level of performance is as measured by a specified performance measure?

The TIP Model (Training, 1990, Design & Development) recommends that each component of the task or content analysis, derived from the performance analysis, be written in the form of a performance objective. A performance objective may also include the sub-objectives required to complete it (p. 11). According to the TIP Model, and Mager's (1975) ideas on criterion referenced instruction, each instructional objective should include the following components:

1. *Performance*. State what the learner is expected to do.
2. *Conditions*. Describe the important conditions under which the performance is to occur.
3. *Criterion*. Describe the criterion of acceptable performance by describing how well the learner must perform in order to be considered acceptable.

The TIP Model and Mager approach to writing objectives makes it easier for instructors to evaluate student learning because the objectives contain not only a description of what students are expected to do, but also the conditions under which they should do it and expectations about how well they should do it. It is important when developing objectives to make sure that the criterion component of each objective includes a 'performance measure.' The TIP Model (Training, 1990) defines a *performance measure* as "a method of assessing whether or not trainees have achieved a required type and level of performance" (Design & Development, 29). Types of performance measures include: actual on-the-job performance evaluations after training, simulations in controlled settings, demonstrations of the required skill, oral responses, written responses, norm referenced tests that compare the learner's performance with that of other learners, criterion-referenced tests that require learners to demonstrate the presence of a learned capability based on the performance objectives, and essay questions that specify the criteria that will be used to evaluate answers.

<u>Strategy 6.2 -- Bloom's taxonomy</u>. *Use Bloom's Taxonomy of the Cognitive Domain to develop objectives in a variety of cognitive domains*. a--Have a variety of instructional objectives been written to help learners develop related knowledge, comprehension, application, analysis, synthesis, and evaluation skills? Bloom (1956) outlines a taxonomy of six cognitive activities organized from least to greater complexity: knowledge,

comprehension, application, analysis, synthesis, and evaluation (making judgments). Huitt (2000) provides the following explanation and illustration of how Bloom's taxonomy can be applied to developing objectives:

1. *Knowledge*. The student recalls, recognizes, writes, lists, labels, names, states and/or defines information, ideas, and principles in the approximate form in which they were learned e.g., "The student will define the 6 levels of Bloom's taxonomy of the cognitive domain."
2. *Comprehension*. The student translates, comprehends, summarizes, paraphrases, describes, illustrates and/or interprets information based on prior learning e.g., "The student will explain the purpose of Bloom's taxonomy of the cognitive domain."
3. *Application*. The student selects, transfers, computes, solves, demonstrates, applies, constructs and/or uses data and principles to complete a problem or task with a minimum of direction e.g., "The student will write an instructional objective for each level of Bloom's taxonomy."
4. *Analysis*. The student distinguishes, classifies, analyzes, categorizes, compares, contrasts, separates and/or relates the assumptions, hypotheses, evidence, or structure of a statement or question e.g., "The student will compare and contrast the cognitive and affective domains."
5. *Synthesis*. The student originates, integrates, creates, designs, hypothesizes, invents, develops and/or combines ideas into a product, plan or proposal that is new to him or her e.g., "The student will design a classification scheme for writing educational objectives that combines the cognitive, affective, and psychomotor domains."
6. *Evaluation*. The student appraises, assesses, or critiques on a basis of specific standards and criteria e.g., "The student will judge the effectiveness of writing objectives using Bloom's taxonomy."

Strategy 6.3 -- Overuse of objectives. *Do not overuse objectives*. a--Are there enough instructional objectives to properly carry out the performance goals without overloading students with too many learning demands? “Objectives have been under fire for years but have outlasted all detractors” (Braden, 1989, as cited in Braden, 1996, 17). Braden advises that without them “ID would be a farce.” However, Brookfield (1986, as cited in Sork, 1998) suggests an overemphasis on using specific objectives in adult education. He comments: “As both professor and student, nothing has proved more irksome to me that the insistence that for educational encounters to be valuable there must always be clearly specified learning objectives that are being assiduously pursued” (p. 289). The overzealous promotion of behavioral and performance objectives could lead to a backlash and rejection of the use of objectives. Sork (1998) comments:

> This backlash has been so strong that some authors have rejected outright the use of objectives in adult education because they are seen as instruments for undemocratic, institutionally based control of educational experiences that serve only the interests of dominant groups (p. 289).

Objective 7.0 -- Preparation Design Checklist

Objective: Develop the preparation component of the instruction by: offering configuration help and ensuring that learners have all the resources they need to complete the instruction; providing guidance elements; including an index and site map; gaining attention with an effective introduction page; creating an effective navigation menu; identifying explicit outcomes that the trainees are expected to achieve as a result of the instruction; establishing a meaningful context for new learning; including search capabilities and study guidelines; and using proper titles and headings to clearly identify content. Preparation elements include title page, learning materials list, statement of objectives, statement of prerequisites, overview, and advance organizers.

Strategy 7.1 -- Configuration help. *Offer help in configuring the learner's browsers and computer system.* a--Are links and help pages provided for required plug-ins and special software? b--If the instructional materials are best viewed in a specific browser or at a certain screen size (e.g., 800 x 600 pixels), is this information provided? c--Is information provided regarding the desired connection speed and computer setup? d--Are students provided with a list of any additional materials required to complete the instruction? (supported by Winn 2.1a, Jones and Farquhar 3.2, Great Sites 8.3i, Barron 11.3 and Ed's Oasis 12.13). Learners should be provided with information on all materials required during the course. Specifically for WBI, learners need to know which 'plug-ins' and 'helper applications' are required to take full advantage of the materials being presented e.g., RealAudio, Shockwave, Java, Acrobat Reader, etc. Links to the sites where the plug-ins can be downloaded should also be included.

Browsers also differ and translate the HTML markup language with varying degrees of fidelity to the original: sometimes fonts, colors and graphics are not reproduced faithfully, and occasionally the results are dramatically different. Thus, it may also be necessary to list which browser the instructional materials are best designed for e.g., Netscape 3.0 + or I.E. 4.0 +). Other technical control design considerations include (Jones & Farquhar, 1997, 240-241):

1. *Display Hardware (monitors).* Is a minimum screen resolution e.g., 800 x 600 pixels needed to best view the material?
2. *Connection Speed.* How fast does the connection need to be to access the new material easily?

3. *Software*. Is any special software required.
4. *User Settings*. Are any special browser controlled font sizes, colors or background required to view the materials?

Strategy 7.2 -- Guidance elements. *Use guidance elements and site features to attract hold, and focus attention*. a--Are guidance elements and site features designed to attract, hold, and focus attention? b--Are clear and easy-to-follow directions provided? (supported by Winn 2.1c and 2.1e, Great Sites 8.3j and Barron 11.5). To attract, hold and focus attention so students can learn principles, Fahy (1999, 59) lists the following ways to attract attention:

1. To *draw* attention, use novelty, differences, motion, changes in intensity or brightness, the presence of moderate complexity, and lean and focused displays. Merrill (1989, as cited in Fahy 1999) however cautions against the overuse of attention-getting strategies, especially on the computer. "Screen motion and animated movement are very powerful in attracting and holding attention. The program should therefore not require the user to read while watching an animated display" (p. 60).
2. To *increase* attention and maintain learner focus, create moderate uncertainty about what is about to happen next or what the eventual outcome of a presentation will be.
3. To *sustain* attention, maintain change and variety in the learning environment.
4. To *focus* attention, teach learners to interpret certain cues such as specific colors, sounds, symbols, fonts, screen or display arrangement, underlining, etc.
5. To *focus* attention, use captions in pictures, graphics and illustrations.

Strategy 7.3 -- Index and site map. *Include an index or site map*. a--Does the site have a detailed index or site map? b--Is the index or site map easy to find and access? (supported by Nielsen 9.7 and Ed's Oasis 12.11). Ross (1998) believes that an index, akin to a table of contents, can provide learners with a brief overview of the major topics of discussion.

JAVA™ or *Dynamic HTML* programming languages can also be used to create lists that are automatically expandable or contractible. "If a *tracking* function is available, 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."

Strategy 7.4 -- Introduction page. *Include an introduction page*. a-- Is there an introduction page? b--Does the introduction page have all the necessary components including time required to complete the instructional materials? Horton (2000, 151-153) advises that an introduction page should have the following:

a. *Complete Title*. The lesson should be clearly identified.
b. *Context*. An explanation should be provided as to where the lesson fits in with the course as a whole.
c. *Goals*. Learners should be told what they will gain by completing the lesson.
d. *Requirements*. All prerequisites should be listed, as well as how much time the lesson will take to complete from the slowest to the quickest.
e. *Preparation*. Learners should be provided with a suggest path through the lesson, a list of special features, rules that apply in the lesson and prerequisite knowledge.
f. *Contents of the Lesson*. You may wish to include an outline of the lesson.
h. *Links to Related Topics*. A link to a summary page or related resources should also be provided.
i. *Invitation to Continue*. At the end of the introduction, "nudge the learner to continue into the lesson."

Strategy 7.5 -- Navigation menu. *Make navigation easier with well-designed menus that give the learner control of sequence and help them develop an accurate mental model of* *the structure being searched*. a--Does the navigation menu accurately reflect the structure of the site? b--Is the navigation structure shallow, but broad? (supported by Guay 1.5, Winn.2.1d, Great Sites 8.2a and 8.2d, Nielsen 9.4 and 9.5, Flanders 10.14, Barron 11.6d and Ed's Oasis 12.10). Winn (1993, 112) advises that "broad, shallow menu structures" facilitate navigation. Well-designed menus also help learners develop an accurate mental model of the structure being searched. To design more effective menus, Szabo (1996, 55) advises to:

a. avoid using conflicting or confusing orienting devices, as disorientation interferes with the learning task;
b. develop organizational systems that are highly visual, interactive, and intuitive;
c. use embedded menus as a search aid, but make sure these menus actually meet learning needs and do not create disorientation;
d. keep menus shallow but meaningful; and
e. and use icons supplemented by text.

Gray (1987, 1988, as cited in Szabo, 1998) studied sequence control and its effect on navigation. She found that compared with students who were constrained to a linear sequence, students who could move freely within the program performed better on a comprehension-level test (p. 36). Gray also found that student performance was higher if the menus were organized in ways that were meaningful to the students.

Strategy 7.6 -- Objectives clearly stated. *Clearly state objectives at the beginning of each instructional unit*. a--Have objectives been clearly stated in the instructional materials, either as an introduction or review of the content? (supported by Berge 4.1, Barron 11.2, and Ed's Oasis12.15). Ritchie and Hoffman (1997) contend that "it is important to let learners know early in a lesson what they will be responsible for knowing or doing by the end of the instruction" (p. 136). They add that "Web-based instruction can too easily spend valuable time in unpurposeful browsing or simply becoming distracted by following links to external sources which have been incorporated to contextualize the material." The use of objectives is also well supported under behaviorist theory and research. "Behaviorist theory is rooted in the assumption that the proper manipulation of environmental stimuli is the key to learning" (Fahy, 1999, 31). According to the behaviorist view, "the teacher's role is one of designing an environment that will elicit desired behavior and extinguish undesirable behavior." Under this view, it is important to clearly state learning objectives as well as make the navigation of online materials conducive to meeting those objectives.

Strategy 7.7 -- Past knowledge. *Remind learners of past knowledge by using advance organizers, chunking and concept maps*. a--Do the instructional materials have activities or content that remind learners of past knowledge? (supported by Bruner 2.0, Carroll 4.0, Knowles 10.0 and Scandura 11.0). Ritchie and Hoffman (1997, 136, citing Gagné, 1985) report that "cognitive psychologists generally agree that for information to be retained in long-term memory, learners must associate or link the new information with some related information already stored in long-term memory" (p. 136). Ross-Gordon (1998) similarly stresses Ausubel's ideas of "building on the learners' existing experience and prior knowledge as new material is introduced" (p. 236). The University of Texas System (1998) recommends using advance organizers, chunking and concept maps as ways to present information so it will be remembered and to help learners organize materials based on previous learning experiences:

1. *Advance Organizers*. "The advance organizer is a brief, abstract prose passage based on the learner's prior knowledge which serves as a transitional statement

for new learning." It is a bridging strategy that allows students to build on what they already know and transfer the knowledge to new situations.

2. *Chunking*. Is a strategy used to organize or classify large amounts of information which has no structure, into a structure more familiar to the learner.
3. *Concept Mapping*. "Concept mapping is a way of displaying concepts and interrelationships among concepts in a graphic form." If the material lends itself to mapping, an 'Image Map' with links is a convenient way to help learners organize and remember content.

<u>Strategy 7.8 -- Search capabilities</u>. *Include search capabilities*. a--Does the course website provide search capabilities for its content? b--Can the search criteria be defined? c--Is the search feature available on every single page of the course site for easy access? (supported by Great Sites 8.4d, Nielsen 9.7 and Nielson Ed's Oasis 12.11). Ross (1998) advises that search capabilities are "especially important in courses with vast amounts of information and resources" as they "help learners find specific information quickly and efficiently." Learners should also be given flexibility and power with the option of using Boolean operators (and, or, not), and the option of searching specific parts of the course site.

Jakob Nielson, founder of Useit.com, advises that the search button is one of the most important user interface elements in any Website. His usability studies show that "slightly more than half of all users are search-dominant, about a fifth of the users are link-dominant, and the rest exhibit mixed behavior" (Nielsen, 2000, 224). This means that half of all users go straight for the search button when they enter a website. Nielsen advises that a search button should be available on every singe page. Nielsen also advises against websites that provide the entire Internet search option as users no where to find these engines and the information just clutters up the site's content.

Strategy 7.9 -- Study guidelines. *Provide a study guide with guidelines, tips and directions to help learners succeed in completing the instructional materials*. a--Is a study guide provided? b--Are guidelines and strategies provided to help learners meet the performance objectives? (supported by Winn 2.1a).

Strategy 7.10 -- Titles and headings. *Clearly identify content with headings and titles*. a--Do titles and headings clearly reflect the content of the instructional materials? (supported by Great Sites 8.4a). Jones and Farquhar (1997, 241) advise that "the consistent placement and style of section titles is [an] important cue to the structure of information." Kilian (1999) advises that the front page "should essentially be a table of contents" (p. 17) in which hypertext is organized alphabetically, numerically, chronologically, or graphically.

Objective 8.0 -- Presentation Design Checklist

Objective: Develop the presentation component of the instruction by: using captions; choosing an appropriate color scheme; developing content that is non-biased, practical, meaningful, and up-to-date; properly citing all sources and references; establishing credibility; maximizing the effectiveness of graphics and animations; organizing and labeling links properly, providing multiple versions of the content; simplifying navigation; limiting the quantity of materials; developing reusable modules, sequencing objectives; including examples; and developing a variety of instructional activities. Preparation elements include introductions, topics and subtopics, graphics and illustrations, definitions, examples, procedure lists, summaries, discussions, statements of facts, statements of principles, elaborative or background information, and case studies.

Strategy 8.1 -- Captions. *Provide captions for images, tables and charts*. a--Are captions provided for all images, tables and charts? Winn (1990, as cited in Szabo, 1998) cautions that diagrams, charts, and graphs may not be self-explanatory. The learner must be able to quickly understand and process the information, understand the convention used, and know what is expected of them when they view it. (p. 21).

Strategy 8.2 -- Color use. *Use color to create visual appeal and increase the speed at which learners search through lists, bearing in mind that color is not really necessary unless required as part of the performance objective*. a--Are colors used in the instructional materials necessary and appealing and do they add to the instructional effectiveness? Extensive research on using color shows that learning is not generally enhanced by color (Dwyer, 1967, 1968, 1970; Wise, 1982, as cited in Szabo, 1998). Szabo (1998) reports that:

> Most instructors would agree that using color in instruction increasing learning, makes the instructional environment more appealing and therefore increases attention and motivation to learn, and does not distract from the learning tasks at hand. Unfortunately, they are not completely correct (p. 27).

Szabo adds that “the exception to this finding occurs when the instructional objectives require the learning of color element’s (Dwyer, 1987, as cited in Szabo, 1998, 27). As applied to web design the following strategies for using colors should be considered:

a. *Use of Color in Lists*. “There is evidence that color-cueing can increase the speed at which people search through lists, learning does not seem to be affected. (Dwyer, 1981, as cited in Szabo, 1998, 27)

b. *Four to Six Color Maximum*. Yang and Moore (1996, as cited in Szabo, 1998, 27) suggest that a maximum of four colors be used in screen displays. England (1984, as cited in Szabo, 1998, 27) and Reilly and Roach (1986,) conclude that the use of too many colors reduce the legibility of a presentation. Misanchuk and Schwier (1995, as cited in Szabo, 1998, 53) suggest limiting screen colors to what the eye can actually keep track of at one glance, which is usually about six colors.

c. *Best Color Combinations*. From research involving 70 different display combinations, Dolsky (1993, as cited in Szabo, 1998, 27) found that combinations of red, purple, black, blue, and magenta were preferred to green, yellow, and orange. The least preferred color combinations were green and yellow and green and orange.

Other notable recommendations provided by Misanchuk and Schwier (1995, as cited in Szabo, 1998, 53) include:

d. *Avoid Complementary Colors*. Make sure color combinations are compatible be avoiding saturated complementary colors such as blue/orange, red/green, violet/yellow.

e. *Use Gray for Backgrounds*. Gray is versatile and should be used in inactive screen areas and backgrounds to enhance other colors.

<u>Strategy 8.3 -- Content non-biased</u>. *Avoid content that is cultural, gender or racial biased, as well as content that demeans or stereotypes the elderly, disabled or minority groups*. a--Is the content non-discriminatory to minority groups? b--Is the content non-gender biased? (supported by Great Sites 8.2c and Ed’s Oasis 12.19).

Strategy 8.4 -- Content practical and meaningful. *Develop content that is relevant, practical and meaningful to the learners*. a--Is the content practical, relevant and meaningful to the learners? (supported by Bruner 2.0, Carroll 4.0 and Knowles 10.0).

Strategy 8.5 -- Content sources cited. *Site the sources of all important content and provide links if the sources are online*. a--Are all sources referenced? b--Are links provided for all Web-based sources and references? (supported by Great Sites 8.1b and 8.1d and Ed's Oasis 12.4).

Strategy 8.6 -- Content up-to-date. *Develop content that is up-to-date and clearly identify pages with a 'last updated' notice*. a--Are the instructional materials up-to-date? (supported by Great Sites 8.4c and 8.4f, Nielsen 9.9, Barron 11.1a and Ed's Oasis 12.5).

Strategy 8.7 -- Credibility and authorship. *Establish credibility by stating authorship credentials and by making the course site and instructional materials attractive to the target audience*. a--Is authorship of the instructional materials clearly stated? b--Is the author credible? c--Is the agency sponsoring the instructional materials credible? d--Do the instructional materials look credible? e--Do the instructional materials compare well with the offerings of competitive educational organizations? f--Is there a 'last updated' notice? (supported by Great Sites 8.1a). Rothwell and Cookson (1997) assert that "successful program planners establish credibility for their efforts" (p. 12). Bednar and Levie (1993) advise that "sources perceived by the receiver as attractive are more influential" (p. 288). Keller and Burkman (1993) also point out that "learner confidence and efforts to succeed are increased in proportion to the perceived credibility of the source" (p. 22). To increase the perceived credibility of the site, a variety of meaningful images to the target learners should be used and careful attention paid to the beauty and unity of design. To maintain credibility, information should also be kept current and accurate and a 'last updated' notice given.

Strategy 8.8 -- Graphics and animations. *Use graphics and animations to grab and hold attention*. a--Are graphics and illustrations used effectively? b--Are animations used appropriately so that they are not distracting and properly focus attention where important? c--Are the animations files sizes small enough to avoid bandwidth problems? It is important to bear in mind that online instructional designers can waste a great deal of time on the production of multimedia, especially if they are not trained or experienced at it. Nevertheless, features such as animations, graphics, sound, video, introductory and transition pages can add to the effectiveness of online instructional content. Baek and Layne (1988, as cited in Szabo, 1998) in a study that compared learning using text only, text plus graphics, and text plus animation, found that the adults scored highest when the animation mode was used (p. 30). It was also found that learning with animation required less study time. In another study with adult learners, Mayton (1991, as cited in Szabo, 1998) found that the scores of learners whose lessons included animation were higher than those of other learners. The increased learning effects persisted and were measurable one week later (p. 30).

Gillani and Relan (1998, 237-237) provide the following guidelines for multimedia:

a. Use multimedia components to cue the learner to important concepts and grab the learner's attention. Do not distract the attention of the learner by providing unnecessary elements.

b. Multimedia should convey information rather than be an art piece. Combine colors attractively to appeal to students.
c. Always keep the size of animation files as small as possible.

Strategy 8.9 -- Linking. *For effective linking, organize and group related links, label links appropriately, and limit the number of links to keep learners on task*. a--Are internal links well-positioned and easily accessible to users? b--Are related links grouped together? c--Are links properly labeled to facilitate comprehension and help users make quick decisions about whether they need to click the link? d--Have the number of links been limited to keep students from drifting off task? (supported by Winn 2.1b; Jones and Farquhar 3.4, 3.5, 3.6 and 3.8; Great Sites 8.3e; Nielsen 9.4 and 9.8; and Barron 11.6a and 11.6b). *Hypermedia* is the linking of multimedia documents. *Hypertext* is the linking of words or phrases to other words or phrases in the same or another document. Bourne (1990, as cited in Cooper, 1993) notes that although hypertext and hypermedia have been shown to be effective, there is a danger that learners will become overwhelmed if the linkage between frames becomes too complex (p. 16). Very quickly that learner can lose site of the purpose.

Strategy 8.10 -- Multiple versions provided. *Provide multiple versions of the instructional material*. a--Are different versions of the instructional materials provided to make the content more accessible to learners with different computer systems and learning styles? (supported by Jones and Farquhar 3.1, Barron 11.7 and Ed's Oasis 12.20). Jones and Farquhar (1997) recommend providing a short page before Web-based instructional materials that offers a text only version, a version with smaller graphics, and a version that contains larger graphics and multimedia.

Strategy 8.11 -- Navigation ease. *Simplify navigation*. a--Is navigation simple, fast and intuitive? b--Do learners always know where they are? c--Do learners always know where they have been? d--Do learners always know where they can go next? e--Do learners know right away where to start a lesson and right away when they have finished? (supported by Guay 1.5, Winn.2.1d, Great Sites 8.2a and 8.2d, Nielsen 9.4 and 9.5, Flanders 10.14, Barron 11.6d and Ed's Oasis 12.10). Szabo (1998) defines *navigation* as "the process of acquiring information from a rich multimedia data base that has no obvious organizational pattern" (p. 6). As Guay (1995) advises, "navigation should be intuitive, clear, flowing." Otherwise, "poorly thought out hypertext [becomes] a navigational nightmare of tangled mazes, infinite loops, cul-de-sacs, and dead links." Guay concludes: "So don't start linking without thinking." Similarly Dede (1996) argues that "without skilled facilitation, many learners who access current knowledge webs will flounder in a morass of unstructured data" (p. 13). Nielsen (2000) asserts that essentially, "the Web is a navigational system" (p. 188). He advises that navigation interfaces need to answer the following three fundamental questions:

1. Where am I?
2. Where have I been?
3. Where can I go?

Strategy 8.12 -- Quantity of materials. *Strive for quality not quantity*. a--Is the right amount of text used? b--Is enough material provided to keep learners occupied and motivated, but not so much as to make them feel overwhelmed? (supported by Berge 4.3 and Flanders 10.9). Lefrere (1997) states that one of the main advantages of the Web over other media is 'content.' The Internet is "arguably, the largest and most diverse information resource in the world" and offers "immediate access to information and resources that cannot be found in any other medium.” Due to this fact, it is important that online instructional designers do not get carried away and over tax the learner with too much information.

Strategy 8.13 -- Reusable design. *Design reusable modules that can be resequenced and reused easily if necessary.* a--Have standards been established to help make instructional materials reusable? b--Are tutorials and sequenced lessons easy to change, rearrange, expand upon, and subtract from to develop new or updated instructional materials? Butler (1997) advises to structure materials as “topical modules, even within single lectures, [to simplify] selective reuse of course materials” (p. 422). Horton (2000) comments that “modularity is the password of WBT. Designers praise it, vendors promise it, and standards committees are working on recipes to serve it up (p. 172). However, developing reusable modules, although a beautiful goal with great benefits, is easier said then done, with real-world challenges such as technical, knowledge, and interface incompatibilities between modules. To help design reusable modules, Horton recommends to: (a) develop and follow standards; (b) design courses so they work with as many versions of as many browsers and operating systems as possible; (c) design independent, self contained modules at all levels that can be dropped on a page without a complex integration procedure; (d) limit links to other modules to reduce the potential of broken links; and (e) summarize rather than link to small bits of information (pp. 174-175). Horton states that “the classic tutorial, and its many variants, serves as the model for most current WBT lessons” (p. 136). It reflects the way teachers have taught for 50,000 years. Horton suggests the following architecture for the classic tutorial: (a) intro; (b) basic skill or concept with examples and practice; (c) intermediate skill or concept with examples and practice; (d) advanced skill or concept with examples and practice; (e) summary; and (f) test.

Strategy 8.14 -- Sequencing of objectives. *Sequence the performance objectives, learning tasks, content, and activities for instruction using an appropriate sequencing strategy*. a--Are the performance objectives and learning tasks sequenced using a proven sequencing strategy? b--Is the sequencing strategy appropriate for the targeted learners? (supported by Gagné 1.0, Bruner 2.0, Rogers 8.0 and Scandura 11.0). Horton (2000) cautions that poorly structured learning materials and courses often creates confused, disoriented, and frustrated learners. Such feelings of disorientation can seriously reduce their ability of the learners to master the content. Sequencing attempts to help learners organize materials. Sequencing strategies can be hierarchical (e.g., most important to least important), procedural, or spiral. Two basic ways to select a sequencing include: (a) according to the content to be learned; or (b) based on the amount of learner control the trainer wished to incorporate in the instruction. Horton (2000, 175-176) recommends the following sequencing strategies for online materials: (a) teach simple skills before complex ones; (2) introduce concepts necessary for understanding other ideas; and (3) teach skills the learner can immediately apply and appreciate.

Other strategies for sequencing materials include:

1. *Improve retention by sequencing screens and presenting related materials together*. Similar objects or ideas are often remembered together. Fahy (1999, 60) advises that "objects or events displayed together in space and time are often stored together in memory, and grouped together in recall (this is the Law of proximity in perception and contiguity in memory)." Fahy adds that "events ideas, words, concepts and stimuli in general which are not organized in some meaningful way are harder to understand and remember than those which are embedded in some organizational context."

2. *Pay special attention to the first and last displays of any sequence*. Fahy (1999) advises that when sequencing, consider that the first and last displays in any sequences are especially important. "Introductions and summaries are key learning opportunities" (p. 61).
3. *Use Gagné's nine instructional events to sequence materials*. Gagné's nine instructional events and corresponding cognitive processes can serve as the basis for designing instruction and selecting appropriate media (Gagné, Briggs and Wager, 1992, as cited in Kearsley 1994a). In applying these instructional events, Kearsley (1994a) suggests keeping the following three principles in mind: (a) learning hierarchies define a sequence of instruction; (b) learning hierarchies define what intellectual skills are to be learned; and (c) different instruction is required for different learning outcomes. To illustrate how Gagné's nine instructional events can be used to help students learn, the following example provided by Kearsley (1994a) outlines a sequence for helping learners recognize an equilateral triangle (this exercise can be found online at http://www.webbasedlearning.com):

   Instructional Objective: Recognize an equilateral triangle.
   Methodology:

   a. Gain attention. Show a variety of computer generated triangles.
   b. Identify objective. Pose the question: "What is an equilateral triangle?"
   c. Recall prior learning. Review definitions of triangles.
   d. Present stimulus. Give definition of equilateral triangle.
   e. Guide learning. Show example of how to create equilateral.
   f. Elicit performance. Ask students to create 5 different examples.
   g. Provide feedback. Check all examples as correct/incorrect.
   h. Assess performance. Provide scores and remediation.
   i. Enhance retention/transfer. Show pictures of objects and ask students to identify equilateral triangles.

4. *Use Sternberg's four types of learners to sequence events*. Sternberg (1994, as cited in Ross-Gordon, 1998) believes that teachers must accommodate an array of thinking and learning styles by systematically varying teaching and assessment methods so as to reach every student. Sternberg outlines four learner types and their preferences for information input and processing (Ross-Gordon, 1998, 227-228):

   a. *Convergers*. Main learning abilities are abstract conceptualization and active experimentation. "Especially good at the practical applications of ideas using hypothetical deductive reasoning to focus knowledge on the solution of specific problems."
   b. *Divergers*. Are best at concrete experience and reflective observation. "Their strength lies in their imaginative ability, as they see things from many perspectives."
   c. *Assimilators*. Main learning abilities are abstract conceptualization and reflective observation. "They are apt at creating theoretical models and excel in inductive reasoning."
   d. *Accommodators*. Are best at concrete experience and active experimentation. "They are risk-takers, preferring active involvement to a greater extent than the other three learning styles."

Ross-Gordon advises that "an instructional sequence that moves through each of the four modes of learning provides an opportunity for each learner to operate within a preferred learning mode" Svinicike and Dixon (1987, as cited in Ross-Gordon, 228) suggest the following activities associated with each of Sternberg's four types of learners:

a. *Concrete Experience*: laboratories, field work, readings, problems, examples.
b. *Reflective Observation*: journals, discussion, brainstorming.
c. *Abstract Conceptualization*: lecture, papers, projects.
d. *Active Experimentation*: case study, laboratory, simulations.

Strategy 8.15 -- Simulations and examples. *Provide a variety of examples, simulations, role playing activities and models*. a--Are enough examples presented? b--Do the examples adequately illustrate the range of material being presented? c--Are simple as well as complex examples included? (supported by Winn 2.3a and 2.3b, Bruner 2.0, Bandura 3.0 and Carroll 4.0).

Strategy 8.16 -- Variety of instructional activities. *Develop a variety of instructional activities*. a--Are a variety of instructional activities provided to accommodate different learning styles and multiple intelligences? (supported by Gagné 1.0, Bruner 2.0, Rogers 8.0 and Bloom 9.0). "The computer's storage and processing power provides the potential for more individualized learning" and a wider variety of paths through learning materials (Koumi, 1994, 53). Online instructional designers are thus able to accommodate alternate learning styles, by varying teaching and assessment methods (Sternberg, 1994, as cited in Ross-Gordon 1998, 227). They should also provide alternate offline materials and activities, as well as, present "alternate points of view and interpretations" (Fahy, 1999, 237) so that the learner is free to "[crisscross] the intellectual landscape of the content domain by looking at it from multiple perspectives or through multiple themes" (Jonassen et al., 1997, 122). Feden (1994, as cited in Ross-Gordon, 1998, 217) similarly emphasizes active learning by teaching students a variety of strategies for learning, using cooperative learning strategies, and offering instruction that adapts to differing learning styles.

The need for variety in instruction is also supported by Gardner's Theory of Multiple Intelligences (Kearsley, 1994k) which proposes seven primary types of intelligence: (1) linguistic, or word smart; (2) musical, or music smart; (3) logical-mathematical, or number smart; (4) spatial, or picture smart; (5) kinesthetic/athletic, body smart; (6) interpersonal, people smart; and (7) interpersonal/social; self-smart. The teaching principles implicit in this theory include:

a. Individuals should use their preferred intelligence whenever possible.
b. Different types of intelligence should be addressed and evoked in teaching.
c. Assessment should involve all intelligences.

Objective 9.0 -- Participation Design Checklist

Objective: Develop the participation component of the instruction by: creating a friendly, supportive and motivational environment; developing materials and learning formats that encourage and facilitate interactivity; installing online interactive components such as CMC, chatting, email, and surveys; innovating existing interactive technologies; and designing materials to reproduce interpersonal communication, facilitate collaboration, and create a sense of community. Participation elements include application exercises, observation exercises, reflective questions, rhetorical questions, application questions, simulations, case studies, group work, collaboration, questionnaires, discussion forums, online chat, email and online surveys.

Strategy 9.1 -- Friendly and motivational environment. *Create a friendly and positive instructional environment*. a--Is the online environment friendly and motivational? b--Does the site motivate students to interact? (supported by Berge 4.4, Bates 7.6 and Rogers 8.0). It is important to design an online environment that creates a friendly, social environment, which also promotes learning. Keller and Burkman (1993) advise that "the design of an instructional message is not complete without considering its motivational appeal" (p. 3).

How instructional stimulus is perceived, affects a student's willingness to learn. "Individual study by distance education methods [also] requires self-discipline, and this is difficult for some learners to develop, especially in the tradition of teacher-centered learning" predominant in many countries" (Chaya-ngam, 1998). Success of an ID strategy thus depends to a large extent, on the ability of the ID team "to promote a culture of self-learning and independence among students. Strong mechanisms need to be developed to ensure that students follow their courses of instruction and do not drop out due to lack of motivation or frustration" (AVU, 1999). Interestingly enough, Quigley (1998), citing a variety of studies, reports that resisters and reluctant learners neither oppose education nor learning. The primary concern was "the construct of schooling" (p. 418), i.e., its environment. Graphics, color, animation, and sound have long been used to motivate learners. Ritchie and Hoffman (1997) advise that each of these techniques can be applied to accomplish similar purposes on the Web (p. 135). They also add that "attention, and thereby motivation can also be stimulated through inquiry arousal, in which learners encounter a problem, contradictory information, or mystery to be resolved" (p. 136).

<u>Strategy 9.2 -- Interactivity</u>. *Design materials to support interaction*. a--Do the instructional materials encourage learners to participate actively in the instruction? b--Are opportunities provided for the learners to apply the instructional materials to their own experiences? c--Are group activities and/or projects provided? (supported by Guay 1.7, Winn 2.1f, Paquette-Frenette and Larocque 6.1, Bates 7.4, Great Sites 8.3f, Barron 11.4, Ed's Oasis 12.1, Vygotsky 5.0 and Knowles 10.0). For the past two decades, the field of instructional design has attempted to adjust to the "paradigm shift from behavioral to cognitive

psychology” (Jonassen et al., 1998, 8). The constructivist environment engages learners in knowledge construction “through collaborative activities that embed learning in a meaningful context and through reflection on what has been learned through conversation with other learners (p. 7).” Constructivism demands and encourages interaction. It is yet another impetus for the increasing importance of interaction in distance education. As Ritchie and Hoffman (1997) maintain when developing Web-based instruction, “a more active learner will integrate knowledge more readily than a passive learner” (pp. 136-137). Dede (1996, 21) argues that “learning is social as well as intellectual” and that “individual, isolated attempts to make sense of complex data can easily fail unless the learner is encouraged by some larger group.” Lefrere (1997) likewise agrees stating that one of the main advantages of the Web over other media is most notably interactivity. “It conveys video and sound better than a book, is more interactive than a videotape, and . . . can link people around the world cheaply.”

Keegan (1996) also underpins the importance of learner-learner and learner-instructor interaction as pertaining to the problem of dropouts. He warns that distance education students are often only weakly integrated into the social system of the teaching institution and thus feel low involvement with it. He adds:

> The separation of the teaching acts and the learning acts that is characteristic of distance education brings about a weak integration of the student into the life of the institution and this has been linked to dropout. It is hypothesized, therefore, that distance students have a tendency to drop out in those institutions in which structures for the reintegration of the teaching acts are not satisfactorily achieved (p. 119-120).

There is also a belief in North America that “face-to-face instruction is preferable to distance learning (Szabo, 1998, 42). Technology increases instructor-learner and learner-learner interaction and as far as the majority of academics are concerned, this reflects the values of traditional education. But the movement towards increasing interaction runs deeper than this. The old Plato and Socratic dialogue argument that "true knowledge can come only through questioning and discussion" is but the tip of the iceberg. The importance of interactivity in online education is supported by the following ideas and concepts:

1. *Allows Self-paced Interaction*. "Multimedia systems have the potential to combine the advantages of self-paced, learner-managed study with built-in opportunities for two-way communication" (Oliver, 1994, 169). Students can interact when they want. They are not bound by time constraints.
2. *Creates a Lower Threat Environment*. Schwier (1994) suggests that "interactive media used for independent study can provide a low-threat environment" (p. 214). Timid students who normally would not interact in a group situation often feel less inhibited in CMC situations.
3. *Effectively Recreates Face-to-Face Interaction*. Stone (1990, as cited in Fahy 1999) asserts that although teachers and learners often claim that virtual interactivity is not as good as face-to-face interaction, effectiveness measures prove that it actually is (p. 157).
4. *Has Become a Favored Medium of Communication*. Dede (1996) reports that "some people favor technology-mediated communication as the most authentic way of sharing ideas and enjoying fellowship" (p. 17).
5. *Has Been Proven Pedagogically Useful*. Interview results from the Annenberg/CPR-funded distance education project in higher education at the Rochester Institute of Technology and the Northern Virginia Community College found that learners who participated in asynchronous interaction from computer conferencing and voice mails found it very useful and effective (as cited in Threlkeld & Brzoska, 1994, 49).
6. *Provides Multiple Paths to Learning/Interaction*. Schwier (1994) argues that through interactive media, different paths can be taken "thereby satisfying individual learner needs and preferences" (p. 214).
7. *Provides Timely Student Feedback*. "Interactive media can be designed to provide immediate and relevant feedback to learners" (Schwier, 1994, 214).

Technology has allowed the rapid transfer of information. No longer must students wait weeks for mailed assignment comments.

8. *Simplifies Courseware Development*. Butler (1997) contends that new Internet technologies offer powerful tools for creating interactive courseware. However they avoid “many of the difficulties associated with software development” (p. 420). JavaScript, a less powerful but simpler version of Java, for example, “can be used to create mathematical units [embedded in HTML documents] that monitor and interact with students’ input” (Gillani & Relan, 1997, 236).

Strategy 9.3 -- Interactive technologies. *Use technologies that support interaction*. a--Are design and delivery technologies being used to support interaction? A broad range of technologies can be used to “enhance the interaction between instructor and learner and between learners” (Koble, 1996, 41). Outlined below are various *design* and *delivery* technologies that have been used to support interaction:

1. *Design Technologies*:
   a. Online Fonts. Specially designed fonts can make online document easier to read.
   b. Hyperlinks and Hover Buttons. “Objects on the pages (such as buttons, texts, and windows) can respond to user action directly” (Gillani & Relan, 1997, 235).
   c. WWW Plug-ins. Navigator and Explorer support a host of plug-ins that include “such powerful interactive multimedia applications as Java, java Scripting, Shockwave, and QuickTime Streaming” (Gillani & Relan, 1997, 235).
   d. Interactive Content Methodologies. The following design strategies can be used to increase learner-content interaction in technology and paper based mediums: easily readable writing style; careful structuring of content; self-testing questions; instructional objectives; inserted questions; model answers; anticipation of students problems; typographical considerations; design, diagrams, and drawings; and comments on assignments (Keegan, 1996).

2. *Delivery Technologies*:

a. Postal Systems. e.g., correspondence communication.
b. Telephones. e.g., telephone tutorials, teleconferences (Keegan, 1996).
c. Cassettes. e.g., lectures; self-help tutorials; foreign language practice; repetition drilling; listening exercises; recorded Q & A.
d. Computer Networks. e.g., email, voice mail, online computer communications, CMC, videoconferences (Keegan, 1996).
e. One-way Synchronous Video. e.g., broadcast television, videocassette, videodisc, interactive video (Oliver, 1994).
f. Two-way Synchronous Video. e.g., cable television, instructional television fixed service, satellite point-to-multipoint delivery, compressed video, teleconference, videoconference, Business TV (Oliver, 1994).
g. Interactive Multimedia. e.g., interactive CD's, interactive video (Oliver, 1994), Web docs (Gillani & Relan, 1997).

<u>Strategy 9.4 -- Interactivity innovation</u>. *Improve online interaction components*. a--Have steps been taken to innovate and improve existing interactive components and technologies? When developing interactive components in online training and instruction ideally, "the highest level of interactivity is a series of exchanges that result in the student learning or processing information at a cognitive level that is higher than rote memorization" (Szabo, 1998, 7). To be truly effective, online interaction must not only give students the opportunity to *react*, but also give them the opportunity to *think*. With this in mind, four recommendations for improving online interaction as follows:

1. *Refine and improve CMC*. "The research literature doesn't confirm the need for live or synchronous interactivity in distance education. Its impact on learner outcome is elusive, at best" (Threlkeld & Brzoska, 1994, 49). Russell similarly argues that "learners do not suffer from the inability to talk back to faculty in real time. Indeed the current research speaks to the contention that distance learners perform better where they control not only *where* but *when*

learning occurs (as cited in Fahy 1999, p. 56). Berge (1998) further argues that the “relatively low cost and easy access” (p. 23) of correspondence materials -- qualities that have made it so resilient over the years -- are qualities also shared with CC (Computer Conferencing). This suggests that asynchronous CC has what it takes to become a time-honored instructional tool. It is simple, cost effective and convenient. To actively push along its evolution, would be a wise investment in time, expertise and developmental funds.

2. *Incorporate more PBL into interactive multimedia*. “Too much multimedia interaction aims simply to assure knowledge and comprehension, and too little attempts to engage the learner in application, analysis, synthesis and evaluation” (Fahy, 1999, 152). Problem Based Learning (PBL) is “an instructional activity that uses a problem as the starting point for learning” (Bridges, 1992, 17). The need for PBL is supported by the research findings of Benjamin Bloom (1984). Bloom found that by using methodologies that foster HMP (Higher Mental Process) achievement and ML (Mastery Learning), group instruction methods can be as effective as highly interactive one-to-one tutoring. HMP emphasizes problem-solving, application of principles, analytical skills, and creativity while ML is a linear feed back corrective approach where students do not proceed until a concept is mastered.

3. *Incorporate more interactive JavaScript and Shockwave components*. JavaScript is a full-feature object based scripting language. Although less powerful than Java programming language, it is much more simple to learn. “While Java may take months to master, JavaScript can be learned within a few weeks” (Gillani & Relan, 1997, p. 235). Gillani & Relan advise that “what is important about JavaScript is that it can create its own objects or interact with objects that are included in the browser.” JavaScript codes can be embedded into HTML files and interpreted on the fly. This means that on-line content downloads faster and is easier to interact with. Shockwave, on the other hand, is an example of compression technology. “It was developed by Macromedia as a new way to compress large multimedia files” (p. 236). Like JavaScript, it can be embedded in HTML documents. Using *Director*, “an authoring tool with extensive features

that [can be] used to create interactive multimedia units" and *Afterburner*, which can be used to greatly reduce the size of *Director* multimedia files, outstanding interactive media can be created.

4. *Use 'show me' buttons*. When learners need help, provide them with a 'Show Me' or a 'How Do I Do This?' button (Jonassen, 1998, 12). Attach to this button a visual or animated example of the desired performance.

<u>Strategy 9.5 -- Social learning and collaboration support</u>. *Design materials to achieve as many of the characteristics of face-to-face interpersonal communication*. a--Do the instructional materials have characteristics of interpersonal face-to-face communication? b--Is the instruction supported by online discussion forums (CMC), chat and email components that are easy to use? c--Is there a sense of community and collaboration? (supported by Winn 2.3a and 2.3b, Berge 4.8, Barron 11.9 and Ed's Oasis 12.18). Social learning stresses the importance of modeling and observation. On the Web, it can be creating by developing activities and components to encourage collaboration and help reintegrate the face-to-face teaching act common in traditional schooling. In this way, learners can learn from each other. Keegan (1996) states that the reintegration of the teaching can be attempted in two basic ways: (a) by using various media; and (b) by designing materials "to achieve as many of the characteristics of interpersonal communication as possible" (p. 118).

Horton (2000) cautions however that although social learning and collaboration can "energize learners, promote deeper learning, and make learners more self-reliant" (p. 334), it comes at a price. Quite often, the process is "brutalizing, inefficient, and demoralizing" and marked by exchanges that are "peppered with flames, slurs, and slams" (p. 335). Some of the problems of collaboration include: (1) poorly designed group learning activities that frequently penalize low achievers and others anxious about interacting; (2) busy go-getters who want and need training the most find it more difficult to participate; (3) instructors must work harder often answering the same question over and over again by email; and (4) conversation are awkward due to the absence of visual gestures, tone of voice, and other important feedback common in face-to-face interaction.

Objective 10.0 -- Practice and Feedback Design Checklist

Objective: Develop the practice and feedback component of the instruction by: providing immediate and positive feedback; providing feedback tools, such as exploration links, right and wrong answer links, and CGI scripts; providing a variety of examples and problems with feedback; providing easy access to expert advice; installing survey CGI scripts; displaying student work; and installing user feedback and input forms. Practice with feedback elements include skill checklists, forms, CGI quizzes and surveys, JavaScript quizzes, DHTML exercises, simulated tests, practice exercises and problems with feedback, online publishing capabilities, simulated tests, sample tests, assignments and projects.

Strategy 10.1 -- Instant feedback. *Provide immediate feedback and reinforcement using behaviorist theory*. a--Is the feedback immediate? b--Is the feedback positive? c--Is the feedback provided in gradual steps? (supported by Carroll 4.0 and Skinner 6.0). Kearsley (1994l) says that "feedback and reinforcement are two of the most pivotal concepts in learning." *Feedback* involves "providing learners with information about their responses." Feedback can be positive, negative or neutral. On the other hand, *reinforcement* "affects the tendency to make a specific response again." Reinforcement can be either positive to increase the response or negative to decrease the response, and while feedback is almost always considered external, reinforcement can be either external or internal. "One of the critical variables in both cases is the length of time between the response and the feedback or reinforcement." It is believed that "the more immediate the feedback or reinforcement, the more learning is facilitated." The use of 'prompting' (i.e., providing hints) is frequently recommended to 'shape' (i.e., selectively reinforce) the correct responses.

The key figure in the development of behaviorism, as well as the concepts of feedback and reinforcement, is B.F. Skinner. Skinner developed the theory of operant conditioning which can be used to develop instructional materials by reinforcing the desired responses. In operant conditioning the following strategies are used:

a. The steps in the development of a stimulus-response chain should be small and gradual.
b. Feedback should be immediate to reinforce a response.
c. Stimuli must be perceived and understood by the learner to be effective.
d. The reinforcement must be positive and can take the form of verbal praise, grades, rewards, and privileges.

Strategy 10.2 -- Feedback methods. *Use Ritchie and Hoffman's three methods for providing guidance and feedback.* a--Is exploration feedback provided in the form of links to definitions, concepts principles and facts? b--Are feedback links provided for right and wrong answers? c--Are CGI scripts or JavaScripts used to provide feedback? (supported by Gagné 1.0, Bruner 2.0, Rogers 8.0 and Scandura 11.0). Ritchie and Hoffman (1997) offer three methods for providing guidance and feedback:

1. *Exploration Feedback*. “Guidance and feedback can be provided either during [a student’s] exploration of Web materials or afterward, by critiquing the artifacts or representation of a users exploration” (p. 137). Links to definitions, concepts, principles and facts can provide learners with feedback as they explore content.
2. *Making Informed Choices*. “A second method to provide both guidance and feedback can occur when users are required to make an informed choice among alternatives after engaging a segment of instruction.” Pages linked to right and wrong answers can provide additional information and guide users to a more appropriate answer or other remediation.
3. *CGI Codes*. CGI (Common Gateway Interface) codes can be used to provide learners with detailed information and alternative choices. “With CGI scripts, information that students place into online text fields, buttons, or check boxes can be compared to present answers in a database or text file.” CGI scripts can also track student progress and store variables which can be accessed later.

<u>Strategy 10.3 -- Feedback variety</u>. *Use repetition with variety when providing feedback in the form of examples and problems*. a--Are a variety of worked examples and problems repeated throughout the materials to provide users with a more complete understanding of the instructional materials? Fahy advises that (1999, 62) “repeating a variety of examples or problems with solutions is more effective for long-term retention than rote or verbatim reproduction.” He also adds that “paraphrasing, rephrasing, and reworking is more useful than the repetition or regurgitation of information.”

<u>Strategy 10.4 -- Online access to experts and instructors</u>. *Provide easy access to experts and instructors*. a--Are email links provided to instructors and other experts so that learners can easily ask questions and seek help from their browsers? b--Is there a Q & A discussion board? b--Is there a Q & A discussion board? (supported by Winn 2.2c and Barron 11.1d).

Strategy 10.5 -- Survey tool. *Use CGI scripts like QuickPoll to take polls, survey problem areas and provide immediate feedback*. a--Can online surveys be easily designed and implemented to collect user opinions and feedback? b--Is the feedback provided immediately after the user has entered their opinion? *QuickPoll* is a free CGI script authored by Japanese freelance programmer Taro Sato (2000). It provides automatic feedback and an easy-to-use administration interface, as well as, cookies to restrict poll tampering. QuickPoll can be used take polls and survey problems via multiple-choice type questions and provide feedback in real-time. This script is available at: http://ethereal.virtualave.net/soft/qpoll/home.html.

Strategy 10.6 -- Student work displayed. *Display student work on the course website to provide positive feedback and examples of excellent work to other learners*. a--Does the course site have a page where student work can be displayed? b--Are contributions screened before being posted to the course site? (supported by Ed's Oasis 12.2 and 12.6)

Strategy 10.7 -- User feedback and input forms. *Provide feedback forms for users to make suggestions or ask questions*. a--Are online forms provided for users to make suggestions or ask questions? b--Are suggestions and feedback regularly posted and responded to? (supported by Great Sites 8.1c and Ed's Oasis 12.8).

Objective 11.0 -- Performance Assessment Design Checklist

Objective: Develop the performance assessment component of the instruction by develop testing and evaluation products that are consistent with the performance objective. Performance assessment elements include written tests, entry tests, pretests, embedded tests, post-tests, observation checklists, written assignments, online projects, weekly CGI script-based review quizzes, and portfolios that assess information skills, application skills, problem solving skills, and attitudes skills.

Strategy 11.1 -- Objective consistency. *Use performance objectives to orient the development of training materials and help maintain consistency among objectives, content, and testing*. a--Is their consistency between the objectives, content and testing i.e., do the tests actually measure what is being taught? The most important factor to consider in the development of performance assessment components is that they match the performance objectives. In other words, testing should actually evaluate what is being taught. “The objectives, instructional content, and testing must all relate to the same type and level of learned capability” (Training, 1990, Design & Develop, 13). Following this ‘consistency principle,’ helps keep materials and development strategies relevant to learning outcomes.

Strategy 11.2 -- CGI quizzes. *Use CGI scripts to develop tests, reviews and quizzes*. a--Are online quizzes provided with immediate feedback to learners? b--Are the results automatically tabulated and sent to the site instructor in a reliable and secure manner? Ritchie and Hoffman (1998) suggest that “online testing can be constructed using CGI scripts” (p. 137). Multiple choice exams can be graded automatically and results stored in a database and/or emailed to the instructor. QuizTest (Pfaff-Harris, 1999) is a free CGI script that can be used to evaluate multiple-choice and true or false questions. Quizzes are automatically graded and scores sent to the instructor.

Objective 12.0 -- Usability Design Checklist

Objective: Develop design specifications that make the content and activities more usable on the Web and incorporate them into the development and implementation of the instructional materials. *Design specifications* refer to the actual layout of the course materials on screen, as well as the various design variables that affect their implementation, especially speed and access. Barron (1998) reports the following design specifications from a case study of an online program on the Holocaust produced at the University of South Florida (available at http://fcit.coedu.usf.edu/holocaust). The target audience for this program were teachers throughout the world, many of which only had access to older computer with memory and hardware constraints and thus were limited to the use of older versions of browsers. Consequently, the program was designed to operate in Netscape 2.0, without plug-ins, Java, or JavaScript. Design specifications that were developed include:

a. The width of the all images is 472 pixels or less.
b. The links are on the Main Menu are on the left side of the page (in case a user re-sizes the browser window, the links will still be accessible).
c. The links on the other pages are centered at both the top and the bottom of the page (the text links will wrap if the browser is re-sized).
d. The size of the Main Menu is less than 30 KB (only eight colors were used).
e. Text links are provided on all pages (in case a learner is using a text browser).
f. The code works with either client-side or server-side image maps.
g. The height and width attributes for all images are included in the HTML code so that the page displays more quickly.
h. A Site Map is included to enable users to easily navigate the program.
i. Visual clues are included for hyperlinks to photographs, glossary, documents, and external links.
j. The music is stored in MIDI format (which is much smaller than WAV or AIFF).

k. Feedback from users is solicited via a form to submit Holocaust Activities and MAILTO links to the project manager.
l. The 8.3 standard DOS filename conventions were used, which greatly simplified the production of the CD-ROM version of the program.

Strategy 12.1 -- Clutter-free (low cognitive bandwidth). *Screen excess information and keep pages uncluttered by extracting unnecessary elements*. a--Has excessive information and unessential design elements been removed from the interface? b--Does every element on the interface have a distinct purpose that facilitates the mastery of the instructional objectives? c--Does the interface look and feel clutter free? (supported by Guay 1.4, Great Sites 8.2b and 8.2c, Nielsen 9.3, Flanders 10.1, Carroll4.0, and Broadbent 7.0). Good design, as Carroll recommends (Kearsley, 1994h), must reduce excess information and allow learners to fill in the gaps. In support of this, Dede (1996) maintains that the curriculum is "overcrowded with low-level information" and as a result, "teachers [must] frantically race through required material, helping students memorize factual data to be regurgitated on mandated, standardized tests" (p. 13). Dede also advises that "the core skill for today's workplace is not foraging for data, but filtering a plethora of incoming information." He adds that as learners must increasingly dive into a sea of information, they must learn to master the ability to immerse themselves in data "to harvest patterns of knowledge just as fish extract oxygen from water via their gills" (p. 6). It should thus be the goal of instructional design to discard all that is unimportant so that the learner can focus on mastery of the content.

Strategy 12.2 -- Content usability. *Use Tate and Alexander's Checklist for an Informational Web Page to help write better content*. a--Is the content authoritative? b--

Accurate? c--Objective? d--Current? e--Complete? (supported by Guay 1.1, Great Sites 8.4, Flanders 10.2 and Ed's Oasis 12.9) (supported by Guay 1.1, Great Sites 8.4, Flanders 10.2 and Ed's Oasis 12.9). Tate and Alexander (1996) provides the following writing criterion that can help make content more usable to learners:

1. *Authority*. Is it clear who sponsors the instructional content? Is there a link to a page that describes the purpose of the sponsoring organization? Is there a way of verifying the legitimacy of the sponsor i.e., is there a phone number or postal address to contact for more information (an email address is not enough)? Is it clear who wrote the material and what the author's qualifications are for writing the material? If materials are protected by copyright, are the names of the copyright holder given?
2. *Accuracy*. Are the sources for factual information clearly listed so they can be verified? Is the information free of grammatical, spelling, and other typographical errors that could lead to misleading information? Is it clear who has responsibility for the accuracy of the instructional materials? If there are charts and/or graphs containing statistical data, are the charts and/or graphs clearly labeled and easy to read?
3. *Objectivity*. Is the information free of advertising? Is the information provided as a public service? If there is any advertising on the page, is it clearly differentiated from the informational and instructional content?
4. *Currency*. Are there dates on the page to indicate when the page was written, when the page was first placed on the Web, and when the page was last revised? If material is presented in graphs and/or charts, is it clearly stated when the data were gathered? If the information is published in different editions, is it clearly labeled what edition the page is from?
5. *Coverage*. Is there an indication that the page has been completed and is not under construction? If there is a printed equivalent to the web page, is there a clear indication of whether the entire work is available on the Web or only parts of it? If the material is from a work which is out of copyright (as is often the case with a dictionary or thesaurus) has there been an effort to keep the material current?

Strategy 12.3 -- Frames. *Use Vygotsky's theory of social cognitive development to create a frames page with tools*. a--If frame pages are used, do they follow the basic principles of Gillani and Relan's instructional design model to provide some semblance of an advance organizer phase, a modeling phase, an exploring phase, and a generating phase? b--Are each of the frame viewing areas easily understandable and clearly related to the learning objectives? c--Do the frames encourage overall usability of the instructional materials? (supported by Vygotsky 5.0) Gillani and Relan (1997) contend that "the interactive nature of frames in interdisciplinary instructional design has the potential of implementing cognitive theories as its theoretical foundation" (p. 232). Based on Ausubel's idea of advance organizers "as a cognitive strategy that links prior knowledge structure with new information" (1968, as cited in Gillani & Relan 1997, 232), as well as, Vygotsky's idea of instructional tools and the four learning stages as defined by his 'zone of proximal development', Gillani and Relan proposed an instructional design model having four phases: advance organizer phase, modeling phase, exploring phase, and generating phase.

Gillani & Relan argue that it was not until the introduction of frame technology introduced with Netscape Navigator 2.0 that these four phases could realistically be applied to instructional design. They say:

> Basically, frames enable the Web designer to create multiple, distinct, and independent viewing areas within the browser's window . . . each frame then becomes a window that can have its own URL (Uniform Resource Locator), scrollbar, and links to frames in the same document or other documents. Such internal connections among the frames of a browser enable the designer to create interactive links that can update and control the content of other frames (p. 232).

Gillani and Relan proposed an instructional design model, as shown in

Figure 4, made up of four distinct frames. The Instructional Model Frame includes links to four distinct phases:

1. *Vibrant Frame*. The small top left area frame above the navigation frame determines the underlying theme for content. Each time the user clicks on it, a new theme will appear which changes the thematic nature of instruction. For example, this frame could be used to provide multiple versions of content (e.g., frames, no frames, modules, no modules). This frame could also be used to show QuickTime movies.
2. *Instructional Model Frame*. The top right frame, includes four buttons representing the four stages of learning as proposed by Vygotsky's zone of proximal development: Advance Organizer, Modeling, Exploring, and Generating. Each button in this frame updates and controls the content of the navigation frame.
3. *Navigation Frame*. The left frame just below the Vibrant Frame is the Navigation Frame. Depending upon which button is clicked in the Navigation Frame, determines the content of the Presentation Frame.
4. *The Presentation Frame*. The main central frame displays dynamic instructional content as selected from the navigation frame.

Screen shots of the SM-CEC (2000) interface and ESLenglish.com exemplify design features of Gillani and Relan's instructional model (see Figure 5 and Figure 6).

Although not as important for Web-based instruction and training, the use of frames can present serious problems to websites. Adrian Roselli's (1999) lists the following caveats:

1. *Bookmarks*. If a user bookmarks a page, most browsers bookmark only the parent frameset. When that user later calls up that bookmark, he/she will get the home page or equivalent.

Vibrant Frame	**Instructional Model Frame** [Advance Organizer] [Model] [Explore] [Generate]
Navigation Frame [button] [button] [button] [button]	**Presentation Frame**

Figure 4. Use of frames following Gillani & Relan's (1997) instructional design model.

Figure 5. Sookmyung Cyber Education Center screen capture of instructional interface.

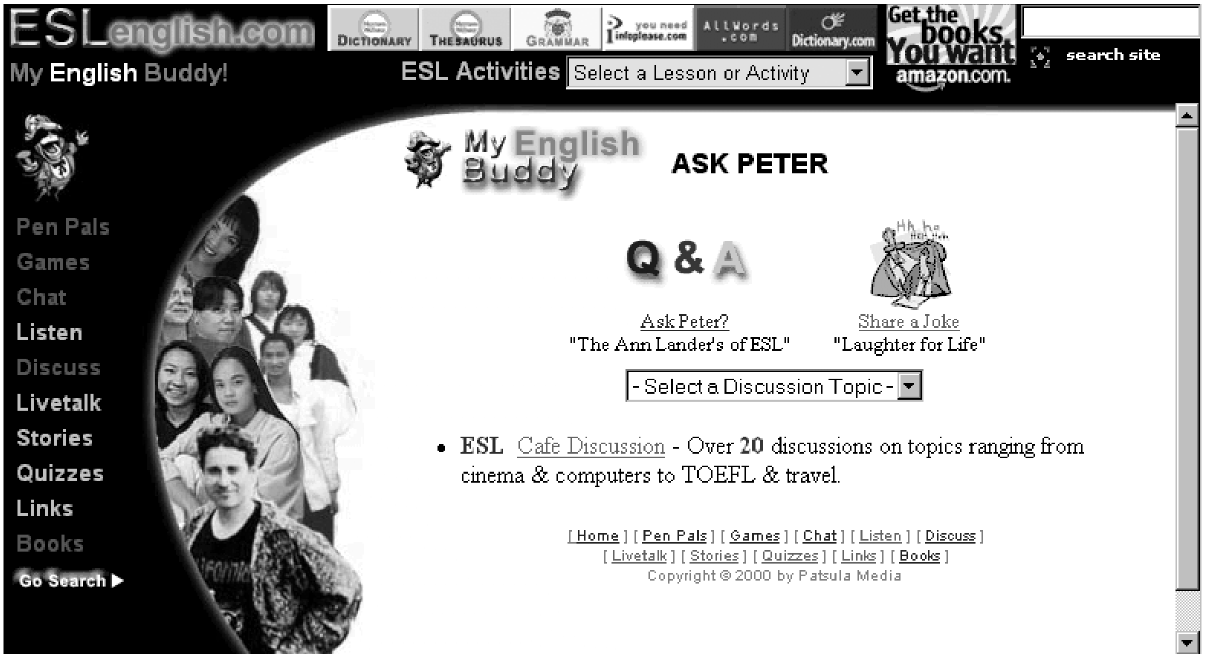


Figure 6. ESLenglish.com screen capture of instructional interface.

2. *Links*. Linking to other sites within a frameset can create legal problems. By placing another site within one of your frames, so it appears to be your own, the original site may order you to stop, claiming "brand dilution and lost revenue."
3. *Search Engines*. Many search engine spiders only index the parent frameset. As a result, your page may get poor ranking in search engines.
4. *Interface/Navigation Design*. If a site is designed with all of its navigation aids in one frame, what happens if a users enters from a search engine at another frame with no navigation?
5. *Accessibility*. Older browsers do not support frames, as well as many newer designed for PDAs and cellular phones. Roselli reports that "the U.S. government has signed a law requiring all government websites (as well as vendors of the government) to be completely accessible to all users by Aug. 7, 2000, including the blind...frames are now a prime target for such regulation."

6. *Design*. If precise frame alignment is important, web designers must design around the fact that Netscape Communicator and Microsoft IE do not handle frames exactly the same. It is very difficult to line images up across frames.

Strategy 12.4 -- Layout usability (screen design). *Design a user-friendly screen by keeping the layout simple and appealing, being consistent in design of text and graphics to limit cognitive overload, and properly directing attention to important areas*. a--Is the layout simple in design, balanced and easy to understand? b--Has attention been directed to what is important and away from what is not important? c--Has important information been highlighted with visual cues? d--Does the layout help the learner form an accurate picture of the site structure and contents? e--Is the layout visually appealing? f--Is important information at the top of the page? g--Does the overall layout improve comprehension of the content? (supported by Guay 1.2, Winn 2.1c and 2.1e, Jones and Farquhar 3.7, Great Sites 8.3b, Nielsen 9.1, and Flanders 10.6 and 10.7). To create a user-friendly screen and aesthetically appealing screen and layout to support comprehension and usability of the content, the following strategies can be used:

1. *Create balance and unity*. Kanuka (1997, as cited in Szabo, 1998) studied the effects of screen design on achievement, instructional time and rate of completion. Using accepted screen design principles, she created one CAI lesson on the topic of writing a term paper that used the design principles well, and another that violated them. She found that students who received the poorly designed lessons achieved the same results on a paper and pencil test, but took longer to complete the lesson. She concluded that well designed lessons and interfaces encourage automatic processing, while poor interface design slows down the learning rate and can also decrease motivation to continue. She advises to design screens that follow the basic rules of balance and unity of design (Kanuka, 1997, as cited in Szabo, 1998, 53).

2. *Ensure legibility*. A PC screen is not nearly as sharp as a piece of paper. "A PC screen is about 1/3 of a piece of paper in display area, and most monitors are less than 1/20 as sharp as the best laser printer." Rockley (1997, as cited in Fahy, 1999, 145). To foster legibility use neutral backgrounds. Jones and Farquhar (1997) advise that backgrounds should not compete with or obscure the text.
3. *Direct attention*. Guay (1995) advises that graphics and other enhancements should "never obscure the central message of the page" (p. 191). Gillani and Relan (1997) recommend that multimedia components should be used "to reinforce rather than distract from learning."
4. *Create simplicity and consistency*. Gillani and Relan (1997) maintain that "simplicity and consistency eliminates cognitive overload" (p. 236). Cooper (1993) advices that "interface consistency allows a greater degree of concentration on the content, if well designed" (p. 64).
5. *Keep important information at the top of the page*. When learners come to a page, they are looking for interesting and important information. Give them the information they need and want in a hurry. Large static graphics at the top of a page may look nice, but if they take up the majority of the window's immediate viewable space, they are likely wasting space (Jones & Farquhar, 1997). Rockley (1997, as cited in Fahy, 1999, 145) advises important information should go to the top-left. The lower-left is the least noticed area of the page/screen.

<u>Strategy 12.5 -- Page length usability</u>. *Keep pages short*. a--Are introductory and navigational pages short enough so that there is a minimum of scrolling? (supported by Jones and Farquhar 3.3, Nielsen 9.6 and Barron 11.7). Research suggests that "users do not like to scroll" (Nielsen, 1996). Guay (1995) agrees with this and advises that "each page should fit on the screen without scrolling." West (1998, as cited in Fahy 1999, 192) similarly advises that requiring users to scroll down a Web-based document should be kept to a minimum. West reports that many users will not scroll more than 3 times before abandoning a site and

has estimated that readers give only between 7 and 15 seconds to assess the probable usefulness of a site before leaving it. It should be noted that one of the problems with making pages short is that people may choose to print out certain pieces of information, or download the entire contents. “This [problem can be solved] by combining all of the pages into a single document that is labeled as such” (Jones & Farquhar, 1997, 243). A print button can also be provided so that users can easily print longer material for off-screen reading.

Strategy 12.6 -- Readability. *Make contents readable for the target audience*. a--Is content easy to read and understand for the target market i.e., has the content been presented at a level appropriate to the target audience? b--Is the content well formatted? c--Have proper fonts been used? d--Have writing guidelines been established to make future content additions readable and suitable for the target audience? (supported by Great Sites 8.4b, Flanders 10.10 and Barron 11.5a). To increase readability, the following strategies can be used:

1. *Write in international English*. Horton (2000) defines *international English* as a “direct style that minimizes reading problems for those who read English as a second language” (p. 469). The advantage of using international English include easier translations, better readability on computer screens, and increased comprehension from second-language readers, readers who skim, and people with reading difficulties. Kilian (1999) advises to avoid using unfamiliar words and phrases, or words that can be easily confused such as ‘mate’ which in Australia is a man’s friend and not his wife (p. 61). The TIP Model (Training, 1990) recommends “writing at or below the trainees reading level” (Design & Develop, p. 207).
2. *Use the active voice rather than the passive voice*. Kilian (1999) advises that “most readers are very comfortable with the active voice” (p. 40) as it focuses attention on the author. However, in technical, academic, and bureaucratic writing, the passive voice is often used to draw attention away from the author.

Kilian recommends on the Internet to use "I tested 33 subjects for Ebola fever" rather than "Thirty-three subjects were tested for Ebola fever." He also advises not to confuse the passive voice with past tense (p. 41). For example, if you write "I enjoyed dinner," you are using the active voice and past tense. However, if you write "Dinner was enjoyed by me," you are using the past tense and the passive voice (i.e., dinner happened in the past).

3. *Choose concrete Anglo-Saxon words, avoid jargon, and avoid clichés*. Kilian (1999, 43-44) advises that (a) proverbial clichés e.g., "an ounce of prevention will save you a pound of cure"; (b) slangy clichés e.g., 'kewl' for 'cool'; and (c) trendy clichés e.g., should be avoided like the plague. He also recommends that plain everyday English should be used in preference to Latin and French based text which tends to be too technical, scientific, bureaucratic and scholarly.
4. *Write simple sentences*. Kilian (1999) advises that "the longer a sentence becomes, the harder to read it becomes" (p. 43). He also suggests to vary sentences, "but most should be short and simple."
5. *Have a specific reader in mind*. Guay (1995) advises that content must be directed towards a specific audience and have a specific communications goals.
6. *Cut verbiage*. Kilian (1999) recommends that "no chunk of text [should] run over 75 words" (p. 58). He suggests to deliberately write long chunks of text from 150 to 200 words and then cut it down to 55 or 60 words to pack "the maximum meaning into the minimum [of] text" (p. 59).
7. *Address the reader (use the term you)*. Keller and Burkman {1993, 13) advise to use personal language to stimulate human interest. Personal pronouns such as 'my,' 'you,' 'your' and 'we' will be used to create a "readable writing style [so as] to maintain learner attention and increase confidence" (p. 36).
8. *Use correct spelling, grammar, and punctuation*. Instructional materials should be properly edited and re-edited, and if necessary printed out and proofread. Kilian (1999) asserts that "computer spell checkers are rubber crutches" (p. 57), but adds that if used along with a grammar and style checker, problems like the overuse of the passive voice and too many prepositional phrases can be more easily spotted.

9. *Use proper fonts*. “Reading from a monitor is 25 percent slower than reading from printed paper” (Nielsen, as cited in Kilian, 1999, 3). To help speed up reading, san serif fonts, with mixed upper-lower case are best for legibility and reading ease on the computer screen. Nielsen (2000) recommends that small text nine points and below is more readable in sans-serif typefaces such as Verdana (p. 126). Serif fonts can be used for large 12-point fonts. In a 10-point serif typeface, “there are simply not enough pixels available to resolve the fine detail needed for the serifs.” All caps should be avoided as users read this kind of text about 10 percent slower. For emphasis, use font changes (size and type), caps, underline, or especially, bold, but avoid color alone as some of the target learners may be color blind. As well, different computer systems handle color differently.
10. *Use the FLESCH readability scale*. Mouli and Ramakrishna (1991) applied the Flesch Reading Ease score method to survey the readability of 48 books used in distance education courses at Andhra Prasesh Open University (APOU). In the second part of their study, they examined the relationship between Reading-Ease and student performance on term-end examinations and reported a positive correlation. Mouli and Ramakrishna conclude with the recommendation that the calculation of Reading Ease scores prior to the production of course materials is “beneficial to students and institutions” (p. 14). Huff (1993) on the other hand questions whether readability can truly be measured “by such simple and objective items as length of words and sentences” (p. 137). He maintains that the assumption in the Flesch formula that a word’s length determines its readability does not make sense to him and remains to be proved. In support of his assertion, he reports research by Robert A. Dufour (as cited in Huff, 1993, 137-138) who put the Flesch formula to trial and found that *The Legend of Sleepy Hollow* to be half again as hard to read as Plato’s *Republic*, and the Sinclair Lewis novel *Cass Timberlande* more difficult than an essay by Jacques Maritain, “The Spiritual Value of Art.” To readers of these texts, these results do not ring true.
11. *Design your pages to be scanned.* “People rarely read Web pages word by word; instead they scan the page” (Nielsen, 1997). Nielsen in a recent study with John Morkes found that 79 percent of test users scanned new pages; and only 16

percent read word-by-word. What this means is that to design for readability, web designers must create scannable text by using: (a) highlighted keywords with hypertext links, typeface variations and color; (b) meaningful sub-headings not clever ones; (c) bulleted lists; (d) one idea per paragraph -- otherwise users will skip over additional ideas if they are not summarized in the first few words in a paragraph; (e) inverted pyramid style of writing i.e., starting with the conclusion; and (f) half the word count or less than conventional writing.

Strategy 12.7 -- Speed of access. *Pages should download quickly: the faster the better*. a--Is each page size, including text, HTML code, images, and other components, under 47.8 KB, and preferably under 30 KB? b--Have all graphics been shrunk as small as possible? c--Has page access speed been tested on the platform of the typical user and is this speed acceptable? d--Are logo, banner, PDF, audio, and video file access speeds reasonable? (supported by Guay 1.3, Berge 4.4, Bates 7.7, Great Sites 8.3g, Nielsen 9.10, Flanders 10.11, Barron 11.1c and Ed's Oasis 12.12).

Nielsen (1998) maintains that "Web design needs to cater to the masses. Only rarely can a site be successful if it is aimed at the most advanced 10% of users." He adds that "even though high-end users may have ISDN these days, Web design *must* aim at optimal usability over a 28.8 kbps modem." Nielsen predicts that, for the next three years, the Web will be dominated by users with so slow connections that any reasonable web page will take much longer to download than they are willing to wait based on human factors research. He advises that since most users have access speeds on the order of 28.8 kbps, web pages should be no more than two to three KB if there are to download in one second, which is the required response time for users to feel that they are freely moving through the hypertext information space (Nielsen, 2000, 48). Users also do not keep their attention on a page if downloading exceeds 10 seconds, which is equivalent to about 30 KB at modem speed. Nielsen concludes that for the next three years, "the dominant design criterion must be download speed in all Web projects until about the Year 2003." Until bandwidth increases, "Minimalist design rules."

Based on research of the world's most popular sites, including Yahoo, Microsoft and AOL, Flanders (1999) also advises that page sizes, including text, HTML code, images, and other components, should ideally be around 50 KB, preferably closer to Yahoo's 17 KB size and at most 64 KB. Flanders refers to this guideline as the "47.8 KB rule." Another good rule of thumb is that pages download in 30 seconds or less with a 14.4 modem. To limit download times and increase access speed, the following strategies should be factored into the design of online materials:

1. *Limit number of images and keep image file sizes small*. James J. Cramer, cofounder of and columnist at TheStreet.com (as quoted in Inc., 2000, February 01) advises that: "The look and feel of a site is meaningless. What matters is speed. People want to get in and get out. Until they get technology so that pictures and graphics don't delay load time, all pictures should be banned."
2. *Use software such as Adobe's ImageReady 2.0 to shrink .gif and .jpg files by removing colors from the color pallet and reducing file size.* Guay (1995) suggests that tagging graphics (in HTML) with vertical and horizontal size can also speed download.
3. *Give special consideration to logos, banners, .pdf files, audio, and video to make sure that these files do not slow down the site too much*. These files can quickly ruin the download speed of an otherwise usable page.
4. *Carefully consider new fancy technology that hogs bandwidth*. Chip Hazard, general partner and E-commerce specialist at Greylock (as quoted in Inc., 2000, February 01), advises the following: "Fancy front-end technology slows down

the user experience. Ultimately, that will turn people off. I was shopping on toy sites from home the other night. One loaded in one second, and one loaded in 15. Guess which one I bought from?"

Strategy 12.8 -- Technological minimalism. *Minimize the use of bleeding-edge technologies that do not add significantly to the effectiveness of the instructional materials*. a--Do all bleeding-edge technologies incorporated into the instructional materials have a definable purpose that supports learning? b--Are no silly technologies used that merely 'showcase' the talents of the ID team? c--Do all bleeding-edge technologies such as Java, JavaScript, RealAudio and other plug-ins function smoothly without any glitches on a variety of browsers and operating systems, and under realistic access speeds? (supported by Berge 4.5, Great Sites 8.4k, Nielsen 9.2, Flanders 10.5 and 10.12, Barron 11.8, Carroll 4.0 and Broadbent 7.0). The following advice from two experts sheds ample light on the importance of not letting technology get out of hand:

1. *Know what people want*. "There's a tremendous focus on the cool things you can do. Technology has gotten ahead of the concept in many cases. The more important thing is to know what people want" (Kelly Mooney, director of intelligence at Resource Marketing Inc., as quoted in Inc., 2000, February 01).
2. *Be functional rather than pretty*. "There are sites out there that are just functional. Look at Yahoo. It's not fancy; it's just gray and blue. Look at us at AOL. We're pretty much a flat site . . . no videos, no bells and whistles. Just get to the point" (Ted Leonsis, president of AOL Interactive Properties Group, as quoted in Inc., 2000, February 01).

Strategy 12.9 -- User friendliness. *Design instructional materials to be user friendly?* a--Are simple text and graphics used to avoid bandwidth problems? b--Do the learners and teachers feel comfortable using new technologies incorporated into the instructional materials? c--Is the software required to use the instructional materials easy to learn? (supported by Berge 4.4, Daunt 5.2 and 5.4, Paquette-Frenette and Larocque 6.1, Bates 7.4, and Flanders 10.11)

Objective 13.0 -- Support Services Development Checklist

Objective: Identify, list and develop support services, materials and tools that can be used by the learners to master the performance objectives.

Strategy 13.1 -- Support services and materials. *Develop a support services strategy*. a--Is there an online library? b--Is support provided for technology related problems? c--Is the assignment turn-around-time within one week or less? d--Are additional support services and materials offered to help learners master the instructional objectives, such as downloadable PDF manuals, a web-based email account, a 24 hour email answering desk, an online tutor, virtual study groups, and resource study centers in disadvantaged areas? (supported by Winn 2.4, Berge 4.6 and Ed's Oasis 12.26). A student support services plan is essential to effective online training and instruction. Brindley (1995) reports that the United Kingdom Open University spends roughly the same amount on preparation of course materials as on learner support. Student support services can be developed to include:

a. *24 Hour Email Answering Desk*. Open seven days a week.
b. *Email Account*. Students can be provided with a Internet based email account accessible via the Internet.
c. *Free Extensive Online Library Support Services*. Threlkeld and Brzoska (1994) advise that "students want and need . . . access to library resources and other supporting materials" (p. 62). Dillon, Gunawardena, and Parker (1992, as cited in

Threlkeld & Brzoska, 1994, 57) report in a study that library resources are very important to distance students as 57.3% indicated that success in a course required access to library materials. They added that libraries can be a significant barrier to distance students who are required to use them if the services provided are not as effective as they should be.

d. *Rapid Feedback on Assignments*. Threlkeld and Brzoska (1994) advise that "students want and need rapid feedback from instructors" (p. 62). They cite research from Delbecq and Scates (1989, as cited in Threlkeld & Brzoska, 1994) that students who receive rapid feedback on their assignments react more positively towards the class than those who must wait for feedback (p. 55).

e. *Introductory Messages*. To establish a feeling of connectedness, organizations should send out introductory messages from tutors and instructors with a photograph, and /or audio- or videocassettes (Brindley, 1995).

f. *Software and Reference Material*. Each student can be provided with a CD (included in the enrolment fee for all courses and programs) that contains a collection of current freeware and shareware including NetMeeting, ICQ and RealPlayer G2. This CD could also contain useful readings and references such as a Dictionary, Thesaurus, Quotations, and Facts Almanac. Reference material can also be stored in PDF format and downloaded from the site as needed.

g. *Study groups*. Online educational agencies can coordinate virtual informal and formal study groups, assign selected students with study partners; and publish an online student directory (Brindley ,1995).

h. *Study Centers*. Study centers can be set-up in disadvantaged areas. Satyanarayana and Koul (1998) outline the following facilities and services for a model study center: cassettes of radio and TV programs for use by the students and tutors and other supplementary tapes; a small library with relevant printed material, including reference works, magazines etc.; study rooms for conducting tutorials; and facilities of information. A study center should also have a number of computers with printers and Internet access.

i. *Tutors*. Tutors can be used in WBI to guide members through new experiences, challenges assumptions, encourage new behaviors, and individualize learning

(Fellenz, 1998, 358). Crawford (1999) advises however that although some distance educators and students believe that tutors are critical to success, there is little empirical evidence to support this. “Most tutor support goes to a small proportion of the students . . . many students use very little tutor support” (p. 61).

Strategy 13.2 -- Support tools. *Develop online support tools.* a--Is there an online glossary of important terms? b--Is there a related links page? c--Is there an online help button or FAQ link on every page? d--Are additional support tools provided such as online dictionaries and encyclopedias that are usable and functional on a variety of user platforms? (supported by Great Sites 8.4g, Ed’s Oasis 12.3 and Vygotsky 5.0). When creating on-line course environments, Ross (1998) believes it is imperative that students are provided with tools to help with managing course information. Ross details the following tools which can be used to add support components to an ID strategy:

1. *Glossary*. “This tool can be useful when a large amount of textual content is placed on-line.” Instructors are encouraged to hyperlink glossary terms and concepts to their original location in the text, as well as to make glossaries searchable. Glossaries are especially important in courses with complex vocabulary, or where the population is comprised of English as a Second Language (ESL) students. Pronunciation buttons located by complicated words may also be useful.
2. *Bookmarking*. “This feature allows learners to return to the area of the course last visited before log-off.” Bookmarking can quickly orientate the learner and save time. A message upon log-in, for instance, could ask the learner to choose whether to resume the session or go to the main course home page.
3. *Related Links Page and Submit Links Button*. “Links should be constructed to help ensure that learners receive relevant, specific information matched to their knowledge or skill” (Ritchie & Hoffman, 1997, 135). “When including detailed resource lists, the course facilitator should [also] categorize links according to

course subject areas" (Ross, 1998). It is important that links are checked frequently to ensure accuracy. "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."

4. *Notebook*. "An electronic notebook with a print and edit feature is particularly helpful for the learner who prefers to summarize and paraphrase course material." Learners should not be expected to open an external word process to create course notes. "A floating, pop-up window can allow the learner to move through course pages, while having constant access to the notebook."
5. *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." To be useful, help features must be extensive and cover the areas which most often cause problems to learners, preferably in a frequently asked questions (FAQ) page. "It is recommended that a help button be included in the main navigation toolbar located on *every* course page." The FAQ page can also provide links to the online glossary for additional information and clarification.

Objective 14.0 -- Website Development Checklist

Objective: Develop a website implementation plan by selecting a web server or web host that is fast and reliable, making sure that sufficient staff and infrastructure is available to support website development and maintenance, and by incorporating Rockley's advice for planning and managing Web-based resources.

Strategy 14.1 -- Implementation ease. *Develop the necessary infrastructure to support the delivery of the instructional materials over the Web*. a--Are sufficient resources, staff and infrastructures available to support the design and development of the website? b--Is a web server or web host easily available to upload the instructional materials to? c--Is the web server reliable? d--Is enough bandwidth available to support the number of users during peak periods and to keep the response times fast enough? e--Will students and staff be able to use the website easily without training? f--Is the course website easily accessible with an easy-to-remember URL address and proper search engine placement? (supported by Paquette-Frenette and Larocque 6.4 and 6.5, Bates 7.5 and Flanders 10.4).

Fast response times are the single most important element for the proper implementation of Web-based instructional materials. In 1999, Nielsen (2000) measured the down load times for the home pages of twenty major sites finding out that corporate home pages downloaded at a snail's pace of 19 seconds, while the Web's most popular home pages took an average of only eight seconds (p. 46). Nielsen advises that approximately: (a) one tenth of a second is the limit for users to feel that the system is reacting instantaneously; (b) one second is the limit for the user's flow of thought to remain uninterrupted even though the delay is noticeable; and (c) ten seconds is the limit for keeping the user's attention focused on navigating the site. Nielsen recommends "investing in a fast server and [to] get a performance expert to review [the] system architecture and code quality to optimize response times" (p. 45). He adds that users "don't care why response times are slow. All they know is that the site doesn't offer good service."

Response times are influenced by: (a) the throughput of the server; (b) the server's connection to the Internet; (c) bottlenecks on the Internet during peak hours; (d) the user's connection to the Internet (which is usually low for the majority of users; and (e) the rendering speed of the user's browser especially for large complex tables (p. 45). Owston

(1997) cautions that online educational programs run the risk of disaster if the computing infrastructure is not adequate for the anticipated load. The capacity of servers and the bandwidth of internal networks must be considered.

Having simple URLs and proper search engine placements are also important implementation and delivery concerns. A simple URL helps users remember how to return to a site and recommend a site to others. Proper search engine placements in the most popular search engines and directories on the other hand can help users find a site. Although, easier said the done, search engine placements can be improved by placing popular keywords and descriptions in META tags, obtaining URLs with popular keywords in them (e.g., ESLgames.net), and designing special 'doorway' pages designed to rank higher in specific search engines. However, with the constant redevelopment and configuration of engine search algorithms, it may be wiser to expend marketing efforts on building a network with as many other sites as possible.

Strategy 14.2 -- Maintenance and tinkering. *Avoid tinkering*. a--Once the instructional materials have been installed, do they literally 'run themselves' requiring only minor maintenance, modifications and updates? The desire to tinker endlessly and mindlessly can have disastrous results for productivity (Fahy, 1998, as cited in Fahy, 1999, 152). This effect is called "the futz factor" by Fernandez (1997, as cited in Fahy) and "fiddling around" by Laudon, Traver and Laudon (1996, as cited in Fahy).

Strategy 14.3 -- Web-based resources management. *Use Rockley's advice for planning and managing Web-based resources*. a--Are the materials compact and easily added to? b--Is there room for growth? c--Are links tested regularly? d--Does only one person have edit privileges? e--Are there no 'under construction' notices? f--Has a webmaster been appointed? Rockley (1997, as cited in Fahy, 1999) gives the following advice for the planning and management of Web-based resources (pp. 196-197):

a. *Design small*. Make what you have effective, then add to it. Do not attempt to do everything at once.
b. *Keep effects simple*. Assure effects add to the message/content.
c. *Map out the whole site*. Both for development and maintenance.
d. *Plan for growth*. Anticipate and direct it.
e. *Get feedback from users*. And pay attention to it.
f. *Test any outside links regularly*. Do not link to sites which do not appear to be well maintained or stable.
g. *Give only one person edit privileges*. Only one person should have site maintenance responsibilities.
h. *Do not post any part of a site while it is still 'under construction.'* Everything on your site should work now. Instead of 'under construction,' put up announcements of the expected availability of 'coming' or 'new' features.
i. *Appoint a Webmaster*. Give him or her responsibility and authority for planning, implementing, maintaining the site.

Other issues important to the development of an implementation plan, but beyond the scope of this thesis include: (a) formulating and costing delivery and maintenance strategies that take into consideration all the unique implementation variables of an organization and its learners; (b) establishing support structures for the delivery method; and (c) developing strategies to help learners overcome potential problems with new media and technology.

Objective 15.0 -- Evaluation Checklist

Objective: Develop an evaluation plan detailing formative and summative evaluation strategies that stress the importance of organizational learning and the assessment of the effectiveness and efficiency of the instructional solution; establishing performance indicators and/or performance measures to evaluate the success of an ID project; and establishing a standard for accountability that outlines a minimum level of participation in the evaluation process. Rothwell and Cookson (1997) define *evaluation* as "the process of estimated value" and *program evaluation* as "the process of estimating the value of a planned learning experience" (p. 166). They add that "the essence of evaluation, like the essence of needs assessment, is comparing what is, and what should be and interpreting the results of that comparison."

Deshler (1998) defines *program evaluation* in adult and continuing education, as addressing concerns about: "accountability, program goals and philosophy, resources, planning and networking, program operation, recruitment of staff and training of volunteers, nature of educational events, and program impact, including changes to organization, services, and public policies" (p. 305). Deshler also comments that by avoiding evaluation, the ID team denies itself and its learners "the experience of appreciating accomplishments and achievements" (p. 303).

The two most important kinds of evaluation are summative and formative. *Summative evaluation* usually focuses on results, while *formative evaluation* focuses on ways results can be improved. Rothwell and Cookson (1997) report that continuing education respondents see "summative (after-instruction) evaluation as slightly more vital to effective program planning than formative (before-instruction) evaluation" (p. 185). They add that "summative evaluation is implemented more in practice than formative evaluations." Types of evaluation activities include: interviews, observation, feedback committees, end-of-class analysis, and rating scales.

Strategy 15.1 -- Organizational learning. *Develop an evaluation plan for your instructional approach that stresses the importance of organizational learning and double-loop learning*. a--Does the design of the instructional materials facilitate the gathering of data which can be used to evaluate and improve its effectiveness and efficiency, as well as provide a deeper understanding of its impact on the learners? b--Are server access logs being analyzed regularly to spot usage trends? c--Has special web mining software been installed to monitor critical design areas? Lewis and Romiszowski (1996) maintain, that "the concept of the learning organization which continually updates the skills of its members and in the process, has become an important idea in recent management theory, [and is] accepted in many business environments and also as a general planning concept." Sengé (1990, as cited in Malhotra, 1996) concurs stating that "the rate at which organizations learn may become the only sustainable source of competitive advantage."

Single Loop Learning, also referred to as Adaptive Learning, focuses on solving problems in the present without examining the appropriateness of current learning behaviors. In contrast, *double loop learning*, also referred to as Generative Learning "emphasizes continuous experimentation and feedback in an ongoing examination of the very way organizations go about defining and solving problems" (Malhotra, 1996). Argyris (1977, as cited in Malhotra, 1996) argues "that the overwhelming amount of learning done in an organization is single loop because the 'underlying program is not questioned'" He warns that "most organizations, often without realizing, create systems of learning that suppress double-loop inquiry and make it very difficult for even well designed information systems to be effective."

Strategy 15.2 -- OPEQ criteria. *Use OPEQ's eleven questions derived from Calder's Three Stages of Evaluation to develop a program evaluation system*. a--Does the evaluation plan address each of the questions outlined in OPEQ? The following eleven *Online Program Evaluation Questions* (OPEQ) form the basis of an evaluation system derived from Calder's (1994) 'Three Stage's of Evaluation.' Calder outlines the development of an evaluation system as a three-phase process which asks the development team to: (1) clarify what it is they want the system to do, i.e., clarify the nature of the system, its purposes, policies and priorities; (2) work out how the system is to be operated, i.e., how will the agreed purposes of the system be achieved; and (3) establish how it will be known whether the system has achieved its purposes, or whether the system needs to be modified in some way (p. 116). The primary goal and function of OPEQ is to improve *quality* and *effectiveness* by providing useful feedback to clients, increase *efficiency* and *profitability* of programs and courses by tracking key performance measures, and help develop an agency into a learning organization. More specifically, as shown in Table 6, in the design of a program evaluation system, OPEQ asks the ID team to address aspects of eleven evaluation areas and related questions.

Strategy 15.3 -- Performance indicators. *Develop 'performance indicators' or 'performance measures' to evaluate the success of an ID project*. a--Have performance

Table 6. *Online Program Evaluation Questions (OPEQ) based on Calder's Three Stages of Evaluation*

OPEQ Evaluation Area	Questions that Need to be Addressed
1.0 Purpose/Clients	What is the purpose of the evaluation? Who are the major clients of the system?
2.0 Focus	What is the focus of the evaluation?
3.0 Designated Responsibilities	Who will be designing and carrying out the work of the evaluation?
4.0 Approach	What approach or combination of approaches will be used?
5.0 Policies	What policies and related issues will be established and addressed in the program evaluation plan?
6.0 Priorities	What model will be followed to determine the priorities of the evaluation system?
7.0 Routine Data Collection	What type of data will be collected on a routine basis?
8.0 Monitoring Studies	What type of monitoring studies will be carried out on a regular basis?
9.0 Ad Hoc Studies	What type of ad hoc studies will be conducted to evaluate 'new' programs?
10.0 Management Issues	What management, staffing, and resource issues need to be addressed before implementing the system?
11.0 Self-improvement Strategies	What issues and questions need to be addressed to set up a "self-evaluation" of the evaluation system?

indicators been developed that provide useful information and benchmarks to help improve the effectiveness and efficiency of the instructional materials? Morris (1990, as cited in Calder, 1994) defines *performance indicators* as "statistics, ratios, costs and other forms of information which illuminate or measure progress in achieving the mission and the corresponding aims and objectives" (p. 39). Under WeBIC, *activity measures* are defined as data that can be used to track the performance of a program over the long term. Together, both terms can be defined as *performance measures* (PM's). Calder (1994) points out that "the spread of the ideas of quality assurance and performance indicators into education is now leading providers to review just what data they do have which can be used for evaluation purposes" (p. 45). She adds that the challenge is to recognize how existing administrative records can be used for institutional research and evaluation.

Crawford (1999) advises that when selecting which performance measures should be used to evaluate an ID project, the following criteria should be considered (p. 94):

1. *Is the performance measure related to the purpose statement?* Performance measures should flow from the mission or purpose statement of the organization.
2. *Is it relevant to clients?* Performance measures should be relevant and of use to clients and important stakeholders. If the response to the results of a performance measure is 'so what?' then it is not useful.
3. *Is it verifiable?* The measurement and results of any given performance measure should be replicable by clients, stakeholders or external investigators wishing to audit the performance of the agency.
4. *Is it economically feasible?* Performance measures should be cost-efficient. An educational agency should spend more time and resources attracting students and improving program quality rather than measuring how it is performing.
5. *Is it fair?* Performance measures should make sense to those who are accountable for its performance. Setting unrealizable targets for those who are unable to influence its performances is pointless.
6. *Does it measure 'performance' or 'activity'?* PI's help an agency document how much it *accomplishes* not how much it is *doing*. PM's such as budgets and enrollment which measure activity are equally important in being able to fully understand and evaluate a program and track performance over the long term.

Powers (1992, as cited in Rothwell & Cookson, 1997, 243) lists 29 performance indicators as shown in Table 7, as used by businesses, many of which can be applied to online education agencies. Rothwell and Cookson (1997) note that:

Table 7. *Power's Performance Indicators*

- Units of work per hour	- Rejects
- Units of work per worker	- Back order filed
- Number of sales	- Monetary value for back orders filled
- Monetary value per sale	- Tasks completed
- Ratio of sales to calls	- Percentage of tasks complete properly
- Total monetary value of sales	- Budgets submitted
- Number of grievances	- Budgets achieved within X percent of forecast
- Number of grievances decided	- Employee turnover
- Percentage of counseling problems solved	- Inventory turnover
- Total minutes of tardiness	- Machine downtime
- Total days of absenteeism	- Costs of accidents
- Number of absenteeism incidents	- Letters and reports completed
- Scrap Rates	- Percentage of letters and reports that get the desired results

> While indicators of success of business may include specific measures of improved performance linked to reduced costs, increased production or quality, and higher profit margins, such indicators for education may include a growing number and variety of education programs that attract large numbers of participants with high retention rates and generate surplus income that can be transferred to the parent institution (p. 185).

Performance measures that apply more specifically to online education include:

1. *Program Related PM's*: total revenues, fixed costs, variable costs, profit margin, number of enrolled students, number of course completions, dropout rate, cost per course completion, number of instructors, number of inquiries, number of complaints, number of repeat students, and program popularity.
2. *Course Related PM's*: number of courses, course production time, cost per course, and profit per course.
3. *Student Related PM's*: final grade average, pre-test average, final exam average, assignment submission rate, average online time, course satisfaction, instructor satisfaction, male / female ratio, and ratio of international students.
4. *Staff Related PM's*: assignment turnaround time, email turnaround time, and instructor turnover.

5. *Web-site Related PM's*: number of page hits, number of unique visitors, number of repeat visitors, most frequently accessed pages, and number of visitors who purchase information or sign-up for courses.

Strategy 15.4 -- Accountability. *Develop a standard for accountability by establishing a minimum level of participation in the evaluation process*. a--Have policies and standards of accountability been established to outline the roles and responsibilities of all participants in the evaluation process? *Accountability* has been defined as a means of "making public what you are doing, or what you have done, for judgment by others" (Calder, 1994, 35). The main thrust of this definition is that "organizations take responsibility for their actions so that those who depend on them can be assured that there are some safeguards in place to encourage good practices and to prevent bad practices or abuses" (Darling-Hammond, 1999). Under WeBIC, the main thrust of *accountability* is to foster change and self-improvement and to monitor that evaluation activities are actually taking place. Under WeBIC, those involved in the evaluation process are accountable to 'participate' in evaluation and attempt to improve after receiving feedback. It is not the intent of WeBIC to make those involved accountable for the results, as it is believed that this creates fear and is counter-productive to organizational learning.

Strategy 15.5 -- End-of-course questionnaire. *Create an end-of-course questionnaire using Deshler's list of questions that educators ask themselves when making judgments about the effectiveness of a program*. a--Is there a properly designed end-of-course online questionnaire that can be used to survey learners to help assess the effectiveness of instructional materials and make improvements? Deshler (1998) provides a list of questions that educators can ask themselves when making judgments about the effectiveness of their program. These questions can be used as a basis to generate questions for online forms and surveys to be distributed to students and instructional staff. Have educators:

a. Shared up-to-date knowledge and methods?
b. Related theory to practice?
c. Showed concern about learners as human beings?
d. Challenged learners to move beyond where they are now?
e. Encouraged independent learning and responsibility?
f. Pointed out what was important to learn?
g. Given step-by-step instructions?
h. Clarified goals and objectives?
i. Promoted discussion and learner interaction?
j. encouraged silent learners to participate?
k. Spoken with expressiveness and variety in tone of voice?
l. Introduced a variety of useful teaching techniques and materials?
m. Used understandable vocabulary?
n. Encouraged the use of examples to illustrate concepts or practice?
o. Summarized material presented?
p. Respected racial, ethnic, and gender differences?
q. Appreciated learning handicaps and disabilities?
r. Praised learners during the learning activities?
s. Helped learners critically reflect on how they learn? (p. 313).

CHAPTER IV

CONNECTION OF THE LITERATURE REVIEW TO THE STUDY OF ESLENGLISH.COM

WeBIC provides guidelines for the design of Web-based instruction and information and content websites based on learning theories and practical web-design strategies researched in the literature. It fills the growing need to provide ID strategies more specific to the design and development of online materials. To assess whether WeBIC is useful as a design and evaluation tool, three studies have been conducted using WeBIC.

Study #1: Comparison Study (A1/B1 and A2/B2)

In the first study, WeBIC is used to design two sets of online instructional materials to help ESL learners at Sookmyung Women's University learn English phrases (A1 and B1). As much as possible, the WeBIC strategies have been applied to create usable web learning materials based on the 'Five Ps of Instruction.' A summary of the strategies implemented to develop these materials is provided below under the 15 sub-processes of WeBIC:

1. *Purpose Definition*. A purpose statement has been developed to summarize the goal of the online instructional materials:

> The purpose of the online phrase exercises are to help SMU ESL learners in GEP II master common English phrases that can be used in everyday conversation and email correspondence and to motivate them to study English using the Internet so that they can become more independent learners.

2. *Learner Analysis*. The impact of the computer lab equipment, SMU network and ESL difficulties of the learners have been factored into the design of the learning materials. It is expected that the SMU network will be slow. Page size and use of graphics has been limited.
3. *Performance Analysis*. Performance goals have been determined. A performance gap statement has been written (see Strategy 3.3).
4. *Media/Technologies Analysis*. Media has been chosen to create motivation, generate interaction and conserve bandwidth. Graphics and audio have been optimized for the Web to reduce response times.
5. *Format Design*. To evaluate interface design and assess cognitive overload, three versions of the instructional materials were developed: (a) four-frames version; (b) two-frames version; and (c) one-frame or page-based version.
6. *Instructional Objectives Design*. An instructional objective has been developed and is listed at the beginning of the lesson:

> The purpose of this lesson is to help you learn 20 commonly used English phrases from our text. By the end of this lesson, you should be able to correctly answer 20 multiple-choice questions by picking the missing word or words from these phrases.

7. *Preparation Design*. An introductory page, site map, and navigation menu have been provided. Appropriate headings and titles have also been used to help learners know where they are in the lesson. Study guidelines were provided in the four-frames version of the English phrases instructional materials.
8. *Presentation Design*. The phrase exercises have been designed as a tutorial that moves from one screen to the next. In the four-frames version of the instructional materials, four learning formats have been provided to give learners a choice of how to learn and where to start: (a) text-based with interactive links; (b) Flash text with sound; (c) interactive feedback exercises and puzzles; and (d) practice quiz. In the two-frame version and the page-based version, the learning formats have

been combined into a 14-page tutorial starting with the Flash text and sound first, followed by the interactive text, interactive puzzle exercises, and the online quiz.

9. *Participation Design*. Interactivity has been designed to encourage users to think, interact with and apply the phrases rather than just memorize them.
10. *Practice and Feedback Design*. Hot Potatoes (Half-baked Software, 2000) has been used to develop numerous interactive feedback exercises and puzzles integrated into the latter part of the tutorial. An online suggestion box was also incorporated into the four-frames version of the instructional materials.
11. *Performance Assessment Design*. QuizTest (Pfaff-Harris, 1999) has been used to develop an online multiple-choice test. Answers are calculated automatically and sent to the instructor. A five-question practice quiz was also incorporated into the four-frames version of the instructional materials.
12. *Usability Design*. The instructional materials have been designed primarily for speed and navigation ease.
13. *Support Services Development*. Support tools in the form of links to online dictionaries and information sources have been provided in the four-frames version of the instructional materials.
14. *Website Development*. The phrase exercises have been stored on 26 floppy disks in case the SMU server goes down or is too slow.
15. *Evaluation*. A five-question survey handout has been designed to collect feedback at the end of the lesson.

Study #2: Analysis Study (AS-1 and AS-2)

In the second study, website activity over a period of 30 days (AS-1) and during the first study (AS-2) has been analyzed using a variety of web-tracking tools. Results of this study have been assessed in relation to the design principles outlined in WeBIC.

Study #3: Evaluation Study (ES-1, ES-2 and ES-3)

In the third study, WeBIC has been used to evaluate the instructional design of the web-based learning materials (ES-1), the text-based learning materials (ES-2) and ESLenglish.com (ES-3). The purpose of this study is to establish a standard in which to: (1) further interpret the results of the second study; (2) make suggestions on how the instructional effectiveness of ESLenglish.com can be improved; and (3) establish a benchmark for further study of online instructional materials using WeBIC.

CHAPTER V

METHODOLOGY

Purpose of Studies

The purpose of the study of ESLenglish.com and online instructional materials in two formats is to determine whether instructional effectiveness can be improved by following the guidelines outlined by WeBIC. The purpose of this study is to also explore to what extent server data analysis can support the conclusions of WeBIC, as well as to what extent server data analysis can be used to improve the effectiveness of the online instructional materials.

Three Studies to Evaluate WeBIC

Three studies have been conducted to evaluate WeBIC: (1) a *comparison* study of online instructional materials using two formats of online design; (2) an *analysis* study of server data related to website access and instructional activity at ESLenglish.com and during the comparison study; and (3) an *evaluation* study of the instructional materials used in the comparison study and the instructional materials available at ESLenglish.com using WeBIC.

All three studies have been designed using the research methodology of *disciplined inquiry*. As defined by Cronbach and Suppes (1969, as cited in Shulman, 1997), "disciplined inquiry is conducted and reported in such a way that arguments can be painstakingly examined" (p. 8). Under disciplined inquiry, the investigator:

a. anticipates traditional questions that are pertinent;
b. institutes control at each step of information collection and reasoning to avoid the sources of error to which these questions refer;

c. takes errors into account by discussing the margin for error.

The concept of operational definitions also applies to disciplined inquiry. Simon and Burstein maintain that "the language of empirical scientific research is made up of instructions that are descriptions of sets of actions or operations that someone can follow accurately" (Simon & Burstein, 1985, 11-12). Such instructions for specific terms or procedures are called *operational definitions*. Thus, under disciplined inquiry, it is also *imperative* to:

d. clearly define all terms, procedures and variables to foster consistency of application.

The above criteria can be simplified into the following statement: *Disciplined inquiry* is a research methodology that painstakingly defines, outlines and reports all procedures taken to arrive at conclusions in order that the arguments can be further scrutinized, assessed and generalized by others. In applying this definition of disciplined inquiry to each of the three studies, the following methodologies have been used:

1. To prevent confusion, all important terms have been defined.
2. The population samples for each study have been clearly identified.
3. All manipulated variables are clarified.
4. Data collection procedures are explained in detail so that other researchers can validate the results if necessary.
5. Confounding variables and potential sources of errors are discussed along with the potential impacts to the results of each study.

I. Comparison Study

An experimental comparison study was developed to test two online instructional exercise sets targeted towards ESL learners: *exercise set A* and *exercise set B*. Each exercise consists of 20 English question and answer phrases from *Springboard English II* (Gilman, Johnson, Kuzmitski, Reith, Seibel & Sheridan, 1998) used in GEP II and published by the Sookmyung Women's University Press. For each exercise set, two versions were created: (1) a *treatment group* exercise and a (2) *control group* exercise (these exercises are referred to as A1, A2, B1 and B2). The two treatment group exercises were developed using strategies from WeBIC, and in particular strategies that focus on the five P's of instruction and web usability. The two control group exercises were developed using text only and a modified thesis-writing standard.

Hypothesis

The application of WeBIC strategies to plain text-based learning materials will yield learning gains. More specifically, it is hypothesized that the quiz scores achieved by the participants using the treatment group exercises will be higher than the quiz scores they achieve using the control group exercises.

Participants

All students who participated in this experimental comparison study were from Sookmyung Women's University (SMU) located in Seoul, Korea. All participants were registered in the General English Program (GEP II), which focuses on the development of listening and conversation skills. The participants were students of the author of this thesis and were required to participate in this study as part of their GEP II course. Outlined below are other important characteristics of the participants:

a. *Number of Participants (Sample Size)*. For the comparison study, 121 GEP II students participated of which 110 answered the survey questions.

b. *Population*. Participants were selected from 1,793 students registered in GEP II.

c. *Gender*. All participants were female.

d. *Age*. The participants were between the ages of 19 to 23.

e. *Nationality*. All participants were Korean.

f. *Majors*. There were a wide variety of student majors ranging from Business Administration to Vocal Performance. The highest concentrations were in Business Administration (17.4%) and Design (11.6%) as shown in Table 8. *Frequencies of Majors*.

g. *English Fluency*. Fluency levels ranged from 'unable to communicate' to 'near native-like speaking fluency.'

h. *Number of Classes and Class Sizes*. Six GEP II classes participated in this study (classes B, C, D, E, F and G). The class sizes were 22, 26, 11, 24, 22 and 16 students.

Instruments Used

To prepare the online materials and record results, the following software and materials were used:

a. *Type of Computer Used*. The computers used for class B, C, D, E, and F, had Pentium 133 MHz chips with 32 MB of RAM and a screen resolution of 800 x 600. The computers used for class G had Pentium II 333 MHz Celeron Chips with 64 MB of RAM and a screen resolution of 1024 by 768.

b. *Software*. Ninety-eight percent of the students used IE 5.0 (Korean version). Only 2% used Netscape Communicator 4.7 (English version). Eighty percent used Win95, and 20% use Win98.

c. *Internet Connection*. The computers had Internet access through 10 MBps LAN cards. The SMU network is connected to the Internet with a 1 GBps connection distributed among 3,000 computers. The SMU LAN was very unpredictable and irregular and for the most part frequently congested. Average data throughput was frequently less than 14 Kbps with bursts of connectivity. Downloads frequently froze, necessitating the use of the floppy disks for 31% of the students.

Table 8. *Frequencies of Majors*

Major	#	%	Major	#	%
Arts and Crafts	8	6.6	Fine Arts (painting)	3	2.5
Business Administration	21	17.4	Foreign Language and Lit.	3	2.5
Composition	3	2.5	Home Economics	4	3.3
Communication and Media	3	2.5	Mathematics and Statistics	4	3.3
Computer Science	7	5.8	Natural Science	8	6.6
Design	14	11.6	Pharmacy	2	1.6
Division of Humanities	3	2.5	Piano (Musical Instruments)	2	1.6
Economics	8	6.6	Politics and Law	3	2.5
Education	2	1.6	Tourism and Culture	3	2.5
English Literature	11	9.1	Vocal Performance	9	7.4
Sub-total	81	66.2	Total	121	100.00

d. *Graded Online Quizzes*. *QuizTest v2.0 beta*, a free multiple-choice CGI script developed by Kristina Pfaff-Harris (1999), was used to develop the online quizzes.

e. *Interactive Feedback Quizzes and Exercises*. Interactive online exercises were developed using Half-baked Software's (2000) *Hot Potatoes 4.0*. Hot Potatoes is an authoring program that enables users to make web-based interactive teaching materials. Created by the Humanities Computing and Media Center (2000) at the University of Victoria, it includes six applications for generating exercises which provide feedback in the form of interactive multiple-choice, short-answer, jumbled-sentence, crossword, matching/ordering and gap-fill exercises.

f. *Web Design Software*. ESLenglish.com was designed using Microsoft's *FrontPage 2000* and *Word 2000*, Adobe's *ImageReady 2.0*, Loureiro's *Lview Pro 1.B*, Alchemy Mindworks *Gif Construction Set 1.0P*, and Macromedia's *Flash 4.0*.

g. *English Phrases Handout*. This handout includes a student information section, a description of procedures, and a questionnaire on the back (see Appendix B).

Design Variables

In the context of *comparative experiments* in education, an independent variable is defined as something that is believed to predict or bring about differences (Porter, 1997). In this study, the WeBIC design strategies used to develop the *treatment group* exercises (A1 and B1) function as the *independent variable*. It is hypothesized that this independent variable will improve the online quiz scores when compared with the *control group* exercises (A2 and B2). The *dependent variable*, i.e., “that quantity or aspect of nature whose change or different states the researcher wants to understand or explain or predict” (p. 26), is the quiz score results.

Another independent variable that arose while the experiment was being conducted was a redesign of the original four-frames web-based (treatment group) materials into a two-frames and one-frame version. These additional design formats were not intended to be tested as independent variables. However, they were implemented due to problems many students experienced in navigating the instructional materials using the four-frames design.

<u>Assignment of subjects to groups</u>. The participants were assigned into four groups in random order (A1/B2, B1/A2, A2/B1 and B2/A1) as explained in procedure statement four.

<u>Format of treatment group and control group exercises</u>. Shown in <u>Figure 7 to 14</u> are screen shots of the three different formats used for the treatment group exercises and the format used for the control group exercises, as well as screen shots of various activities.

1. *Treatment group Exercises (A1 and B1)*. The treatment group web-based exercises were designed using strategies from WeBIC. Three versions were created and tested on various classes: a four-frame version, a two-frame version, and a page-based version. Each exercise was given the following code: A1 (exercise A, treatment group), A2 (exercise A, control group), B1 (exercise B, treatment group), or B2 (exercise B, control group). Shown in Figure 7 to 12 are screen shots for selected exercises from the web-based exercises A1 and B1.

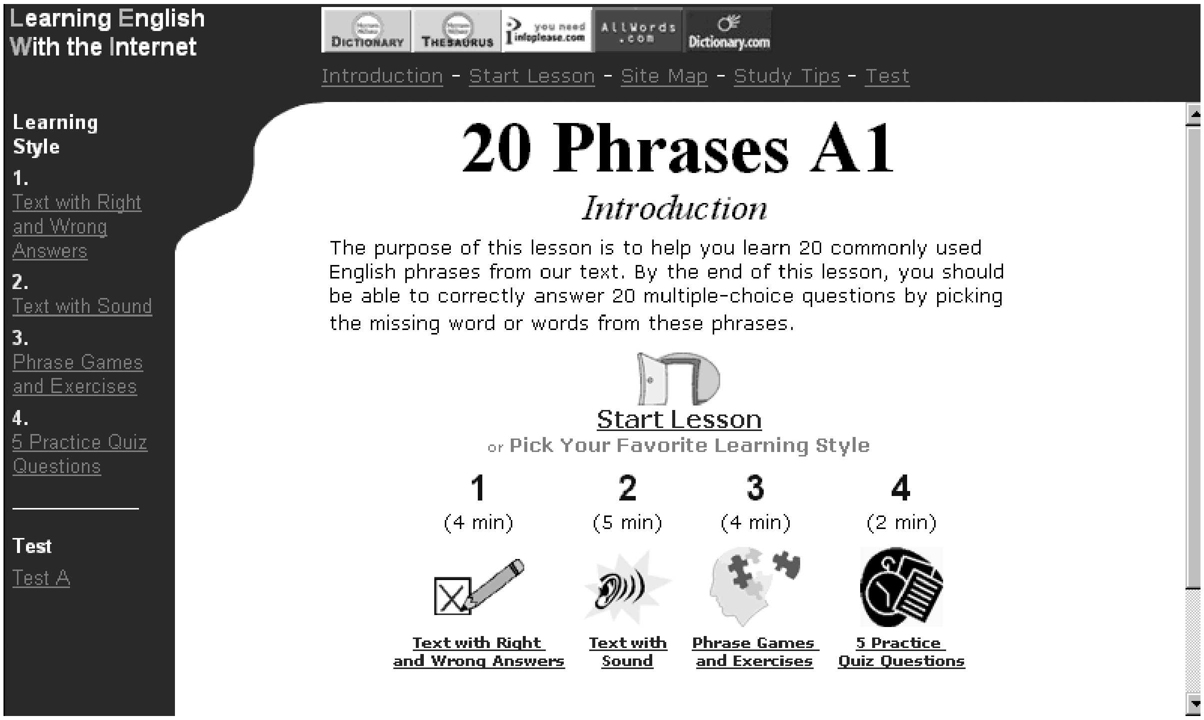


Figure 7. Screenshot of four-frames version of web-based exercise A1 based on Gillani and Relan's instructional model (as used in class E).

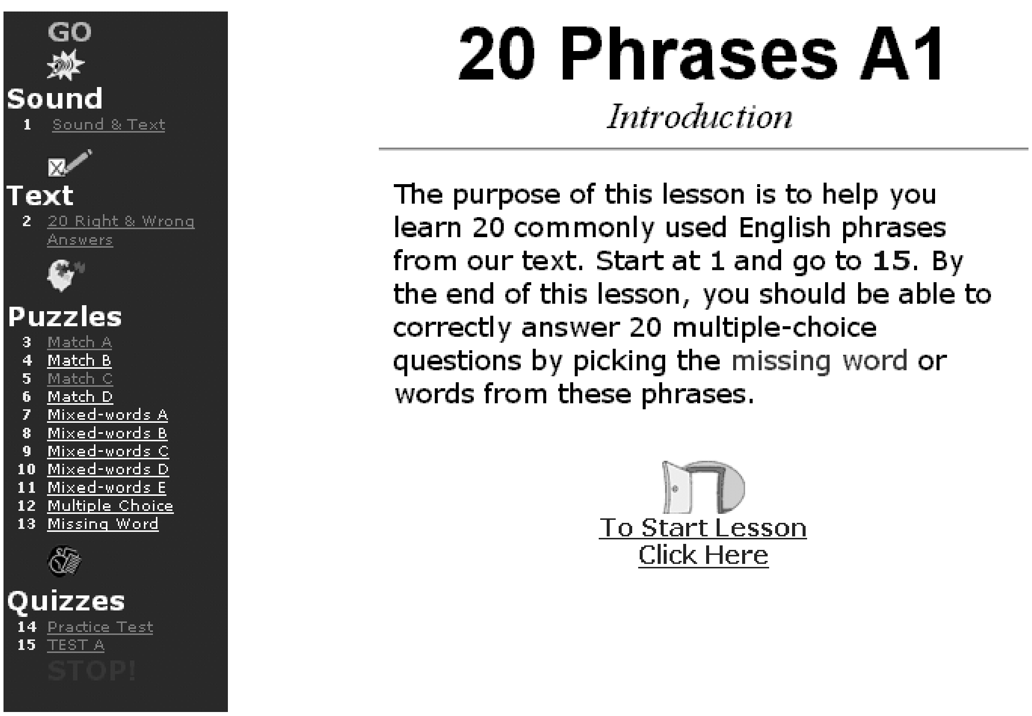


Figure 8. Screenshot of two-frames version of web-based exercise A1 (as used in classes F & G).

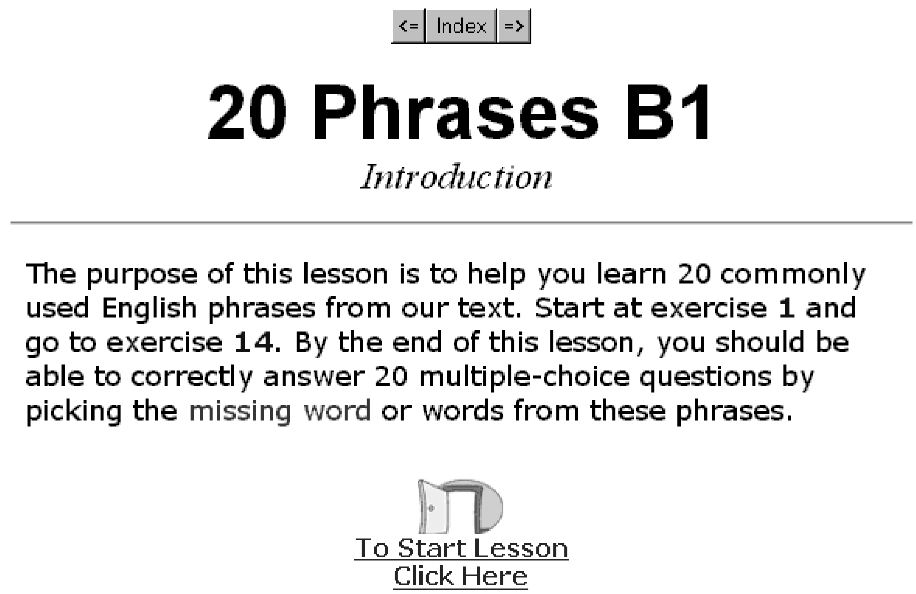


Figure 9. Screenshot of page-based (one-frame) version of web-based exercise B1 (as used in classes B, C & D).

Figure 10. Screenshot of text with sound for web-based exercise A1, created with Flash 4.0.

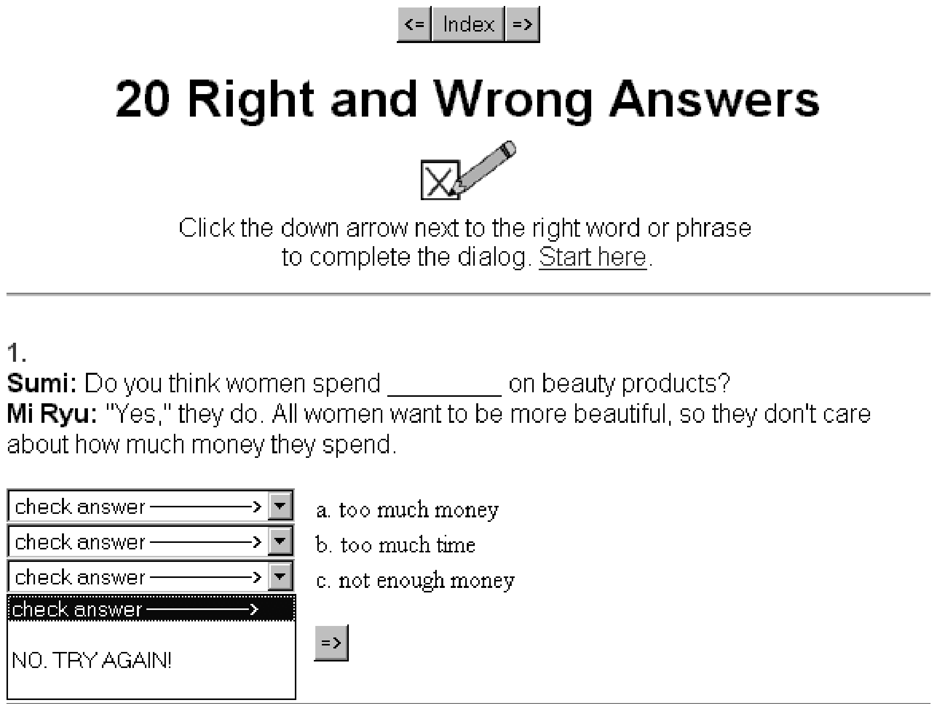


Figure 11. Screenshot of text with right and wrong answer feedback for web-based exercise A1.

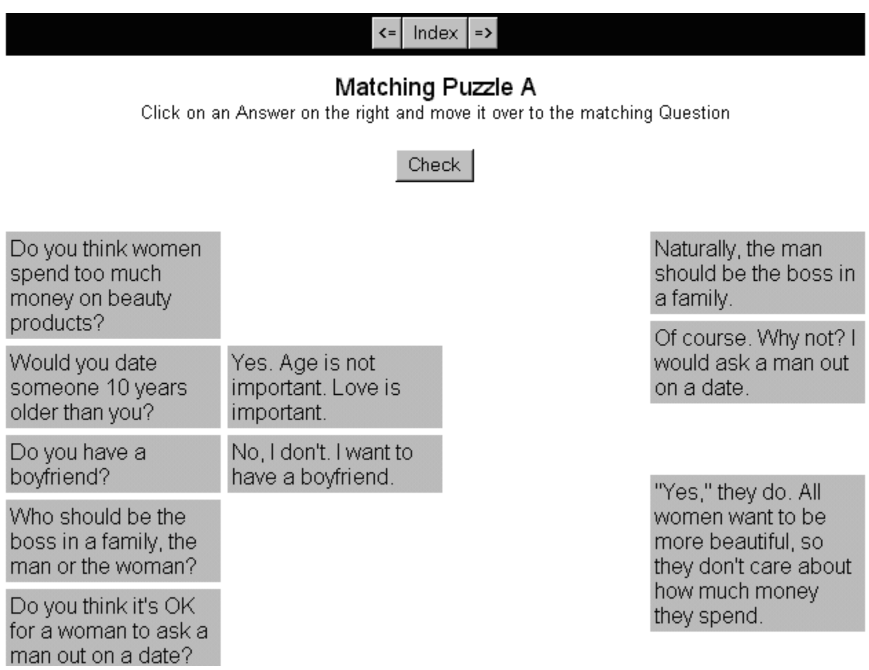
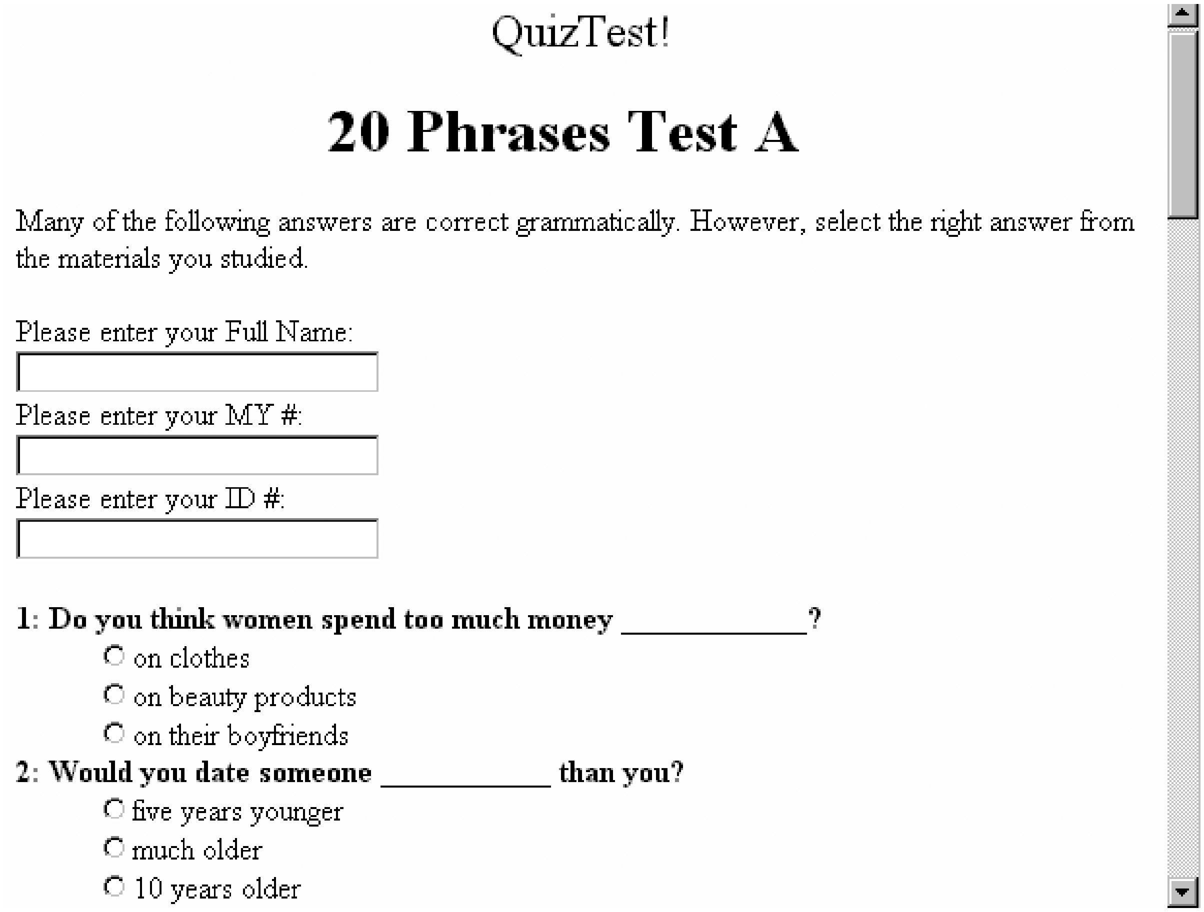


Figure 12. Screenshot of Hot Potatoes Matching Puzzle A for web-based exercise A1.


QuizTest!

20 Phrases Test A

Many of the following answers are correct grammatically. However, select the right answer from the materials you studied.

Please enter your Full Name:

Please enter your MY #:

Please enter your ID #:

1: Do you think women spend too much money _____________?

- on clothes
- on beauty products
- on their boyfriends

2: Would you date someone ____________ than you?

- five years younger
- much older
- 10 years older

Figure 13. Screenshot of online quiz for web-based and text-based exercises A1 and A2.

****

20 PHRASES -- A2

****

DIRECTIONS

Below are 20 phrases from the GEP II text. You have 15 minutes to study all 20 phrases. When I tell you to STOP, click Test A to take the test. I will give you a password. You will have 5 minutes to complete the test.

PHRASES

1.
Sumi: Do you think women spend too much money on beauty products?
Mi Ryu: Yes, they do. All women want to be more beautiful, so they don't care about how much money they spend.

2.
Sumi: Would you date someone 10 years older than you?
Ki Nyun: Yes. Age is not important. Love is important.

3.
Sumi: Do you have a boyfriend?
Shin Hye: No, I don't. I want to have a boyfriend.

Figure 14. Screenshot of text for text-based exercise A2.

2. *Control Group Exercises (A2 and B2)*. The control group exercises were designed using the following guidelines (see Appendix C for a list of all 40 phrases):
   a. *Point Size and Font*. Black 12 point Times Roman was used for the text.
   b. *Line Spacing*. Single-space text.
   c. *Paragraphs*. Insert a blank line between phrases. Do not indent.
   d. *Title*. Capitalize all letters, underline with an asterisks e.g., ********** and insert a blank line following.
   e. *Heading*. Capitalize all letters and insert a blank line following.

f. *Phrases*. Begin each phrase with a number followed by a period. Start a new paragraph after the number. Insert one blank line after each question and answer.
g. *Page Design*. Use a plain white background with default margins (except for the quiz link, no HTML should be used in the design of the control group exercise).
h. *Quiz Link*. Include a link to the online quiz at the top and bottom of the page.

<u>Control procedures</u>. The following control procedures were used:

1. Students were given 15 to 30 minutes to study the online materials and 5 to 10 minutes to answer the quiz (depending on how well they understood the instructions and to overcome difficulties and confusion with the computer equipment and slow connection speeds).
2. Students were not allowed to review materials once they started the online quiz.
3. Students were required to type a user name (peter) and a password (lion) to access the online quizzes.
4. The IE 5.0 Browser was used, with cache controls set to "automatically check for new versions of stored materials."

<u>Procedure</u>

The comparison study was conducted using the following procedures:

1. *Start Date and Duration of Study*. The study was conducted during the first and second week of October from October 4 to October 10.
2. *Location of the Study*. The study was conducted in a computer lab on the SMU campus, in Seoul, Korea. The computer lab contained 40 computers.
3. *Preparation*. Prior to this class, students were told that they would be having a special computer lab class where they would have two Internet-based lessons on English phrases followed by two quizzes. The students were told that only the best mark from either of the online quizzes would be worth a small portion of their final grade. The students were also told that the purpose of these exercises were to not only learn phrases, but to also test two forms of design to see if one

form was better than the other. A special effort was made not to tell students which was the hypothesized superior format. To best reflect actual online learning conditions and motivations, the students were not told that the exercises were part of a thesis study.

4. *English Phrases Handout*. Students were handed out one of four different versions of the English Phrases Handout located in Appendix B. Each of the four versions provided directions to complete one version of exercise A and one version of exercise B. Class E was handed out randomly A1/B2, B1/A2, A2/B1 or B2/A1. Class B and F were handed out A2/B1 or B1/A2. Class C, D and G were handed out A1/B2 or B1/A2. The above method of distribution was chosen to get approximate equal numbers of students beginning with the control group exercise or the treatment group exercise, as well as completing equal numbers of exercise A and exercise B materials.
5. *Identification*. Students were asked to fill in: their name; ID#; MY# (a special number given to each student by the instructor which includes their class number, B, C, D, E, F or G, and their number on the student attendance roll 1-30 e.g., E12, G9); a computer number (in case IP addresses wished to be analyzed); and their major.
6. *Instructions Read*. The instructions on the English Phrases Handout were read.
7. *First Exercise*. Students were given anywhere from 15 to 30 minutes to study the materials in the first exercise. After that they were given 5 to 10 minutes to take a 20-question cloze exercise online multiple-choice quiz. The online multiple choice quiz was developed by removing one word from one phrase in the question and answer grouping. The students then had to select the correct missing word from three possible choices. Students were not allowed to review material once they started the online quiz.
8. *Second Exercise*. Students were given anywhere from 15 minutes to 30 minutes to study the materials in the second exercise and 5 to 10 minutes to take the online quiz.

9. *Surfing ESLenglish.com*. If time was left over at the end of class, and the SMU network was fast enough, students were given 10 to 20 minutes to surf the ESLenglish.com website.
10. *Floppy Disks and Paper-based Quizzes*. If the SMU network was too slow or if students were having connectivity problems with their computer, they were given the exercise materials on a floppy disk. If they could not access the online quiz, they were given a written quiz.
11. *Questionnaire*. After completing the exercises, students were asked to fill out Questions 1 to 5 on the questionnaire on the back of the English Phrases Handout. They were given as much time as they needed to fill out the form. If the student had time to surf ESLenglish.com, they were asked to also fill out Questions 6 to 10.
12. *Observation Notes*. Observational notes were taken while the students worked through the exercises and quizzes.
13. *Study Results*. After all classes had participated in the study and the results had been tabulated, the students were informed of the exact purpose and nature of the study, and of the class average and study averages of the online quizzes.

II. Sever Data Analysis Study

The server data analysis study examined trends of site activity from two sources:

1. at ESLenglish.com over a period of 30 days during September (AS-1); and
2. during the comparison study (AS-2).

Data were gathered and analyzed using a free CGI script based tracking program (AXS by Fluid Dynamics), free web mining software for analyzing server access log files (OpenWebScope 1.00.8, WebTrends Log Analyzer 6.0 trial version, NetTracker 4.5 trial version), free Internet-based tracking services from HitBox (2000), NetWorldMap (2000a), and web host provider Tierranet's 'Statistics Cruncher.'

Participants

For the first part of the analysis study (AS-1), 161 participants came from 23 countries as measured by NetWorldMap (2000a). Although this measurement is not accurate, as the NetWorldMap image often failed to load when accessed and it only measured visitors who entered from the home page, it reported the following: The largest percentage of site visitors were 36 from India (22.4%); 33 from Canada (20.5%); 25 from the U.S. (15.5%); 23 from Korea (14.3% -- many of these visitors were likely SMU students participating in GEP who were told about the ESLenglish.com website at the beginning of the term); 10 from Australia (6.2%); and the remaining 34 from 18 other countries including Thailand, Brazil, and Mexico. More accurately, AXS tracked 311 unique visitors while HitBox totaled 271 unique visitors. Upon examining the server log files, WebTrends Log Analyzer reported 390 unique visitors and NetTracker reported 393. For the second part of the analysis study (AS-2), participants were the same as in the comparison study and totaled 121.

Instruments Used

The instruments and materials used for the server data study were the same as in the comparison study with the addition of web mining software. The web mining software was used to collect, track and analyze site activity and file requests made to the server by World Wide Web. Three software programs, one CGI script, two Internet-based tracking services, and Tierranet's 'Statistics Cruncher' were used to collect and analyze data:

1. *NetTracker 4.5 Professional (14-Day Trial Version).* NetTracker (2000) features over 30 web server summaries. It can be used to answer questions like: Who is visiting your site? Where are they coming from? How long are they staying? What is the most common path? (retail cost: US $495).

2. *WebTrend Logfile Analyzer 6.0 (14-day Trial Version)*. According to WebTrends (2000) Logfile Analyzer is "the most widely used web-site traffic analysis solution on the market." It is a web traffic analysis solution for single-server sites. Appealing interface (retail cost: US $499).
3. *OpenWebScope 1.00.8*. OpenWebScope is a shareware webserver log file analyzer that can show how many visitors a site has, entry and exit pages, path, search engines, search engine key words. The reports can be posted directly to a webserver, saved to a hard drive, or emailed directly to a webmaster. It also has built-in scheduling features and can run minimized (it uses very little memory). This software is fast, simple to use, and has filters which can be used to customize reports.
4. *AXS Site Tracking System*. AXS (Milosevic, 2000) is a free access log CGI script developed by Fluid Dynamics which creates its own log on a site's server. It has a browser accessible administration page which can be used to creates graphs of data collected. Specifically, it logs URL's used to get to a site and URL's used to leave a site, as well as visitor server, IP#, browser, document viewed, and time. It can be used to track average number of hits per visitor and hits to local documents. AXS also has filters which can be used to restrict graphs to recent hits, critical files, or both. AXS was rated 9.51 by 407 voters at the CGI Resource Index (2000). A log sample of visitor flow traffic from AXS is shown in Figure 15.
5. *HitBox*. Hitbox.com by WebSideStory (2000) offers a free website traffic counter and Internet traffic analysis tool. By inserting a 62 x 86 'HitBox button' on a web page, each time a visitor accesses that page, HitBox can track over 500 statistics in real time, available 24 hours a day. It can track hourly, daily, monthly and annual traffic statistics for page view and unique visitors; referrers (e.g., learn how much traffic other sites send, total traffic from search engines and keywords used, and total traffic from bookmarks); user paths; and user profiles. HitBox claims to be "the undisputed leader in free traffic analysis."

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A visitor from 75.131.fl1.ip.foni.net (212.7.131.75) was logged 7
times, starting at 10:52:18 PM on Wednesday, October 18, 2000. The
initial browser was Mozilla/4.0 (compatible; MSIE 5.0; Windows 98;
DigExt).

This visitor first arrived from www.eslenglish.com/
and visited www.eslenglish.com/

0:00:20 later, arrived from www.eslenglish.com/talk.htm
and visited www.eslenglish.com/talk.htm

0:00:04 later, was redirected to www.eslcafe.com/discussion
from www.eslenglish.com/myenglishbuddy_members/Forums/discuss.htm
```

Figure 15. AXS log sample of visitor flow.

6. *NetWorldMap*. NetWorldMap (2000a) provides a free report for Webmasters interested in knowing what geographical location visitors are coming from. It is based on the premise that IP addresses are allocated pretty consistently according to geographical location. In the ongoing creation of NetWorldMap, users plug information about their location in response to a survey. NetWorldMap then records their IP address in relation to this information. This data are then stored in a database and used the next time someone visits a site in the same IP address area. Over 56,000 people have participated in the program (King, 1999). The accuracy of NetWorldMap depends on the honesty of the participants, however the law of averages, i.e., many people entering the correct answer, helps resolve inaccuracies. The developer of the program believes that NetWorldMap has so far mapped about 43.29% of the net, with an accuracy of about 80.71% (NetWorldMap, 2000b).
7. *Tierranet's Statistics Cruncher*. Tierranet uses software to track server requests based on the Apache extended standard which is compatible with the commonly used NCSA extended format (Common Logfile Format). Figure 16 shows sample server access log file records from www.ESLenglish.com hosted by Tierranet.com followed by an explanation of the key areas of these records.

210.191.117.173 - - [08/Aug/2000:07:04:03 -0700] "GET /esl/ HTTP/1.1" 200 13780 "-" "Mozilla/4.0 (compatible; MSIE 5.01; Windows 98)"

210.191.117.173 - - [08/Aug/2000:07:04:05 -0700] "GET /esl/images/d1off.gif HTTP/1.1" 304 - "http://www.eslenglish.com/" "Mozilla/4.0 (compatible; MSIE 5.01; Windows 98)"

Figure 16. Sample log file records from Tierranet stored in the common logfile format.

a. Host (IP Address) -- 210.191.117.173. Each computer that accesses the WWW has a unique address assigned to it via its Internet access account (e.g., ISP modem hookup, LAN hookup, cable hookup). Using the IP address you can track down the location of the computer user and keep track of how many requests they make to the server.
b. Date Time Stamp -- [08/Aug/2000:07:04:03 -0700]. Each time an IP address accesses the server for a file, a date and time is stamped including the year, month, day, hours, minute and second of the request. The time zone is also included. Using the date time stamp you can track how long users stayed on the page, and how long it took to download your page, and whether users left before your page had fully downloaded.
c. File Requested -- “GET /esl/images/d1off.gif HTTP/1.1”. The server records the file accessed (e.g., .htm. .gif, .cgi). Using this information you can determine things like file popularity, path through site and entry and exit pages.
d. HTTP Status Code -- “200”. Status codes summarize the request e.g., 200 OK; 206 Partial content; 301 Document moved permanently; 302 Document found elsewhere; 304 Not modified since last retrieval; 400 Bad request; 403 Access forbidden; 404 Document not found; 405 Method not allowed; 408 Request timeout; 412 Precondition failed; 500 Internal server error; 501 Request type not supported.

e. Number of Bytes Transferred -- “13780”. Records the size of the file in bytes e.g., 13,780 bytes transferred to the user.
f. Referrer -- http://www.eslenglish.com. URL referring to the file (“-“ abbreviation for domain name registered and the main domain name with Web host e.g., http://www.patsula.com)
g. Computer Information -- “Mozilla/4.0 (compatible; MSIE 5.01; Windows 98”. Records such information as browser type e.g., “IE 5.01” and operating system e.g., “Windows 98.

Procedure

The comparison study was conducted using the following procedures:

1. *Start Date and Duration of Study*. Data for the server data study were collected during the month of September and during the comparison study.
2. *Location of the Study*. The first part of the study was conducted on the World Wide Web. The second part of the server data study was conducted in a computer lab on the SMU campus, in Seoul, Korea.
3. *Preparation for HitBox Tracking*. HTML markup and JavaScript code from HitBox was inserted into the bottom of each of the pages being tracked. When a page was requested by a user, the JavaScript code ran and loaded up a 62 x 86 ‘HitBox button.’ Site activity was then recorded including page reloads and to use of the browser ‘back button.’ The HitBox code was inserted into 27 pages out of 49 at ESLenglish.com.
4. *Preparation for AXS Tracking*. A transparent image file request was inserted into the bottom of 44 pages out of 49 at ESLenglish.com using the following code:

```
<IMG SRC="http://www.patsula.com/cgi-bin/ax.cgi?x1.gif">
```

When a page was requested by a user, the image file request ran the AXS CGI script and recorded visitor information in a format as shown in Figure 17.

Figure 17. Sample of AXS log file record.

The name of the image file inserted into each page was changed sequentially e.g., x1.gif, x2.gif, x3.gif, etc., so that they would not be stored in the web host server or user browser's cache. In this manner, each new page request from the same user could be tracked. AXS was also used to track which external links users followed when leaving the site using the following code:

```
<a href="http://www.patsula.com/cgi-bin/ax.cgi?http://www.esl-cafe.com">ESL-
LAB</a><a href="http://www.patsula.com/cgi-bin/ax.cgi?http://www.esl-
cafe.com/">
```

Using this code, when a user clicked on 'ESL-LAB' for example, the AXS CGI script recorded their activity before sending them to esl-lab.com. AXS code was also inserted into each page of the comparison study A1/A2 and B1/B2 materials.

5. *Data Collected.* As users surfed ESLenglish.com, the logging access and statistics software was used to track: (a) number of page hits; (b) number of unique visitors; (c) most popular site pages; (d) most popular entry pages; (e) paths taken through the site; (f) average time spent on the site; (g) average time spent on a page; (i) average time spend on the site; (j) average page hits per visit; and (k) most popular external links.

III. Evaluation Study of A1/B1, A2/B2 and ESLenglish.com Using WeBIC

The evaluation study used WeBIC to examine and assess:

1. the ‘treatment group’ instructional materials used during the comparison study (ES-1);
2. the ‘control group’ instructional materials (ES-2); and
3. ESLenglish.com (ES-3).

Instruments Used

The 200 questions in WeBIC (see Appendix A) were used to evaluate ES-1, ES-2 and ES-3.

Procedure

The evaluation study was conducted using the following procedures:

1. *WeBIC Questions*. Each of the 200 questions outlined in WeBIC as listed in Appendix A were used as a basis to review and assess ES-1, ES-2 and ES-3.
2. *Rating*. Each question area evaluation was assigned a rating of ‘Strongly Disagree’ (SA = 0); ‘Disagree’ (D=1); ‘Agree’ (A=2); and ‘Strongly Agree’ (SA=3). Depending on the nature of question, the WeBIC rating scale was also interpreted as: 0 = ‘no evidence of application or development,’ 1 = ‘some evidence of application and development,’ 2 = ‘moderate evidence of application and development,’ and 3 = ‘strong evidence of application and development.’ The question area ratings were based on value judgments by the designer of the online instructional materials in regards to whether or not it was evident that a specific strategy and question area had been considered in the design of the materials or implemented. Question areas that did not relate to the specific online instructional materials being evaluated were rated ‘0.’
3. *Evaluation Scores Table*. Each rating was entered into a table and the results totaled. To create this table, only the question numbers were listed (as they relate to their parent strategy) along with their rating.
4. *Summary Table*. The results of the Evaluation Scores were totaled and entered into a summary table to facilitate comparison and analysis.

CHAPTER VI

RESULTS

Results Expected: Brief Review of the Research Question

At the beginning of this thesis, it was hypothesized that the results of the three studies would support that the application of specific web-based strategies for designing online materials as outlined by WeBIC would improve the effectiveness of online instructional materials. More specifically, it was also hypothesized that the comparison study would show individual learning gains from participants studying with the web-based materials designed using WeBIC strategies compared with their results studying with the text-based materials.

Results of the Three Studies

Study I Results

Both Exercise A and B quizzes were completed by 121 students for a total of 242 quiz results (see Appendix D). Of these, 25 were graded by hand (10.3%). Of those graded by hand, half were from Class E which experienced the most LAN congestion problems.

The quiz score mean average for the web-based materials was 95.5% and the quiz score mean average for the text-based materials was 93.4% indicating an overall 2.1% learning gain. However, these gains were found to be non-significant. An unmatched-pairs t-using only the FIRST set of quiz results (i.e., only the scores of the student's first quizzes), showed no significant differences between the treatment group and the control group, and although not statistically significant, an actual learning loss of -1.3% was noted ($P = 0.36$). Interestingly enough, an unmatched-pairs t-test comparing only the SECOND quiz results (i.e., only the scores of the student's second quizzes), showed a learning gain of 5.5% (P <

0.01). However, although the learning gains for the SECOND quiz results are significant and supportive of the strategies outlined in WeBIC, they are questionable considering that they may have been confounded by the effect of the FIRST sets of exercises on the SECOND.

By comparing each participant's web-based exercise quiz score with their corresponding text-based exercise quiz score, it was found that out of the 121 participants, 46 showed learning gains, 46 stayed the same, and 29 showed learning losses. Of the 46 who stayed the same, 36 received 100% on both the web-based and text-based exercises indicating that the learning materials were too easy and perhaps would have been better designed to show learning gains or losses had they been more difficult. Out of the B, C, D, E, F and G class groups, only class B showed a majority of learning losses with three gains, nine who stayed the same, and 10 losses.

In comparing the class mean averages of A1 with A2 quizzes and B1 with B2 quizzes, in 8 out of 12 cases the A1 and B1 scores were greater than the A2 and B2 scores (see Appendix D). In comparing quiz score averages of A1 with B2 and B1 with A2, in 9 out of 12 cases the A1 and B1 averages were greater than A2 and B2 averages. Class B, which included a majority of English Literature and Education student majors, performed better using the text-based materials in both exercises A and B by a margin of 2.4 and 2.3%. Class E performed very poorly on the A2 materials with an average of 85.4%, compared with an average of 96.3% on the A1 materials. This difference was largely due to student E16 who received a 5% grade on exercise A2 and a 50% grade on exercise B1. Student G14 received an 85% grade for A1 and a 50% grade for B2. If the results of these two students are not included in the calculation of the overall mean average, the overall learning gains of the web-based materials over the text-based materials is reduced from 2.1% to 1.4%.

Variance between exercises A and B. Two unmatched-pairs t-tests, that tested for differences between quiz results for exercises A and B for both the web-based ($P = 0.63$) and text-based ($P = 0.71$) versions, showed no significant differences.

Variance between FIRST quiz scores and SECOND quiz scores. Four unmatched-pairs t-tests of quiz results between students who did exercises A1, A2, B1 or B2 FIRST, compared with those who did them SECOND, showed no significant differences. However, two unmatched-pairs t-tests combining both exercise A and B results found some significant differences in the web-based and text-based scores. It was found that the mean average for the FIRST web-based quiz results compared with the SECOND web-based quiz results was significant at 3.3% lower ($P = 0.013$), and that the mean average for the FIRST text-based quiz results compared with the SECOND text-based quiz results was somewhat significant at 3.5% higher ($P = 0.1$).

The results of this analysis suggest that the study participants scored better on the text-based exercises when they did them FIRST and better on the web-based exercises when they did them SECOND. It is very possible that the FIRST web-based exercises were confounded by the confusion of this new learning format, the procedures of the study itself (the ESL learners may not have clearly understood the study instructions), and LAN connection and computer problems, all of which would have contributed to less concentration on the web-based learning materials and lower scores. On the other hand, the higher FIRST quiz scores on the text-based exercises were likely due to increased concentration that these materials allowed due to the simplicity and familiarity of their format, and the likelihood that after studying with the web-based materials, the study participants took the text-based materials less seriously.

Variance between groups. An ANOVA test of the text-based FIRST quiz scores from exercises A and B and the SECOND quiz scores from A and B showed no significant differences ($P = 0.41$), meaning that as far as it might affect the quiz results, it did not matter whether the participants studied with text-based exercises A or B, or whether they did it FIRST or SECOND. However, this was not the case with the web-based materials.

Survey results. As expected, there was a positive reaction to the web-based materials with 110 students rating the *treatment group* exercises with an average score of 7.96 out of 10 and 91 students rating the *control group* exercises with an average score of 5.89 out of 10.

Differences between one-, two-, and four-frame versions. There did not seem to be any noticeable pattern between the four-frames, two-frames and one-frame versions of the web-based materials and quiz score averages. However, it was apparent from observations made during the study that the two-frames and one-frame versions were easier to navigate than the four-frames version.

Use of disk. After Class E participated in the study, due to problems experienced with the SMU LAN, it was decided to copy both the 'control group' and 'treatment group' instructional materials to 26 floppy disks (13 containing exercises A1 and B2 and 13 containing exercises B1 and A2). For classes B, C, D, F and G, students were provided with a floppy disk if they had problems accessing the Internet from their particular computer, or if the LAN was congested. As shown in Table 9, 31% of the students needed the disk to complete the exercises. The majority of the students however (89.7%) were able to take the online quiz.

Observations of activity. The following observations were made during the comparison study for classes B, C, D, E, F and G (classes are listed in the order that they participated in the study):

1. *Class E -- October 4, 0900-1100, Lab 102, Four-Frames Version*:
   a. The four-frames version provided too much visual information for the ESL learners. The four methods of learning – text with right and wrong answer feedback, text with sound, 'Hot Potatoes puzzles', and practice quizzes - confused learners rather than empowered them. A few students confused the practice quiz with the graded quiz. It was decided that the 'practice quiz' should be removed from the instructional materials.
   b. The online materials took far greater time to complete than initially calculated due to the students being unfamiliar with the format. No students completed all the A1 and B1 exercise materials.
   c. The LAN was very slow. In many cases, the password protected online quiz could not be accessed. The Flash text with sound regularly froze due to net congestion. Although, the Flash file sizes were quite large at 494 KB and 521 KB each for Exercise A1 and B1, being that each was about four minutes long, both should have streamed quite well at about 2 KB per second, with a 5 KB first frame demand rate.
   d. Some students laughed when first viewing the A2 and B2 materials, as if to say, 'Is this a joke? Do we really have to study this?' On the other hand, for the A1 and B1 materials, there was keen interest in the matching and jumbled words exercises.

Table 9. *Use of Floppy Disk*

Disk Use	Class						
	B	C	D	E	F	G	Total
Total	22	26	11	24	22	16	121
No Disk (LAN use only):	13	22	7	24	10	8	84
Used Disk:	9	4	4	0	12	8	37
% used Disk	41	18	37	0	45	50	31%

e. It was apparent that students would not read text instructions. Instead, they looked around the room to see what others were doing. It was concluded that the interface and navigation needed to be redesigned to be simpler, the tool bar needed to be removed, and to further reduce cognitive overload, the four-frame format needed to be simplified to a two-frame format (see Figure 7 and Figure 8). The AXS image files being used to track activity also needed to be removed as they were causing difficulties with loading the Hot Potatoes JavaScript puzzles and the online quizzes.

2. *Class F --October 5, 1000-1200, Lab 102, Two-frames Version*:

a. When students tried the A2 and B2 materials, some looked bored in less than 10 minutes. They wanted to take the online quiz right away and had to be told to go back and study the text-based materials.

b. The two-frame version was easier to navigate than the four-frame version. There was less confusion. Nevertheless, students would still avoid reading the instructions and start clicking on anything that looked clickable.

c. Students spent more time on the A1 and B1 exercises than the A2 and B2 exercises. A number of students kept playing and listening to the Flash text and sound not reading the bottom of the page which said ‘Click and go on to the next link.’

d. Only a few students made it to the jumbled exercise puzzles.

e. It was still evident that many students were experiencing some degree of cognitive overload with the online materials and navigational difficulties.

3. *Class G -- October 5, 1200-1400, Lab 107, Two-frames Version*:

a. A different computer lab was used. The computers used were faster. However, 7 out of 16 students had no audio as their headphones were broken. The same lab could not be used due to scheduling problems and availability.

b. The LAN was slow, but not as slow as for classes E and F. Many of the students were able to use the entire A1 and B1 materials without use of the disk. Curiously enough, one computer would not access the materials at all from the Internet, even though it was connected to the LAN.

c. Some students were found staring at the end of the Flash text with sound exercise and waiting. It was decided that the Flash file needed an aural and visual message that told them to click on the next activity.

d. A number of students had to be shown how to drag the answer phrase to the question phrase in the Hot Potatoes matching puzzle exercises. It was decided to try and reword the instructions to make them clearer.

e. Two students finished all exercises. Five others made it up to the jumbled phrase exercises. A small portion of students also had time to surf ESLenglish.com.

f. Some students struggled quite hard to memorize the A2 and B2 materials. Using the A1 and B1 materials, their concentration level looked more natural.

g. Some students required an explanation to figure out how to navigate the learning materials. Despite instructions on the introduction page, they could not understand the ‘Go’ and ‘Stop’ points in the navigational frame (see Figure 8), as well as the numerically sequenced activities. It was decided that the two-frames should be changed to a one-frame page-based screen design.

4. *Class B -- October 10, 1000-1130, Lab 102, One-frame Version*:

a. It was evident that a number of students did not really know how to use the computer. They kept clicking the wrong buttons and easily got lost. A number of students had to be told to click on the left navigation arrow at the top to move to the next exercise (see Figure 9 thru Figure 12). It was evident that many students were not familiar with navigating with right and left arrow buttons.

b. It was noted that the aural and visual ending directions on the Flash text and sound exercise helped some students go to the next exercise.

c. This class constantly needed directions and help. They would not read instructions. The rewritten directions for the matching puzzles did not help. It was concluded that as much as possible, ESL students avoid reading English text.

d. A number of students tried to cheat by going back and looking at the study materials while taking the online quiz.

e. One student tried to make A2 and B2 interactive by highlighting text with the mouse so that it changed colors.

f. Students were very quick to take the A2/B2 quiz when it was announced.

5. *Class C -- October 10, 1130-1300, Lab 102, One-frame Version*:

a. This class seemed brighter than Class B and more computer savvy. Students who were late, and were not given verbal instructions, seemed to manage fine as they worked their way through the materials.

b. As soon as I announced the A2 and B2 Quiz, very quickly students were ready to take the online quiz. For A1 and B1 exercises, the opposite was true. Students preferred to continue working on the web-based exercises.

c. Five students finished all the web-based learning materials, a few others made it up to the jumbled phrases.

d. It was observed that Hangul characters (Korean lettering) were replacing contractions in the HTML making the online quiz materials confusing to read.

6. *Class D -- October 10, 1400-1600, Lab 102, One-frame Version*:

a. The instructor had to constantly walk around and solve problems. By no means did the instruction run itself. It was evident that the one-frame version was no better than the two-frame version when it came to navigating the materials.

b. A number of students did not know how to maximize windows when clicking on the online quiz.

c. It was noticed that some students who did indeed read the instructions performed faster and were able to complete all exercises without any help.
d. Students were quite excited and pleased with the rapid feedback from the quizzes.

Comparison study survey results. Out of 121 students who participated in the comparison study, 110 were able to complete the survey. The survey results were as follows (see Table 10 for complete results of the survey):

1. *Study Materials Preference*. According to the results of the first five survey questions, 94.5 % of the students preferred the web-based materials over the text-based materials. Half the students who preferred the text-based materials were from Class E which experienced the most connectivity problems. Class E rated the web-based materials 13% lower than the study average and had the lowest number of students who thought the web-based materials were 'interesting' despite being the second largest class.
2. *Web-based Exercise Feedback*. Sixty-one percent of the students found the web-based exercises very interesting; 20% found them okay; 17% were unsure; and 2% did not like them.
3. *Text-based Exercise Feedback*. Fifteen percent of the students found the text-based exercises very interesting, 27% found them okay, 40% were unsure and 18% did not like it.
4. *Learning Format Preference*. Thirty-five percent of the students preferred the 'Flash Text with Sound,' 18% preferred the 'Text with Right and Wrong Answers,' 26% preferred the 'Hot Potatoes Puzzles' and 22% preferred the online quizzes. There was a 17% difference from the *most* preferred format to the *least* preferred format with the results for each ranging between one third to one fifth of the total. In three out of six classes, students rated the Flash text with sound as the most desirable web-based learning activity. In class E, which experienced the most connectivity problems, more than 57% of the students rated the online quiz as the more desirable web-based learning activity.

Table 10. *Survey Results of Web-based vs. Text-based Learning Materials at ESLenglish.com (Total Participants = 110)*

Survey Question /Answer	Class							
	B	C	D	E	F	G	Total	%
1. Which exercise did you prefer?								
Exercise 1 -- Web-based Instruction	21	21	11	16	22	13	104	94.5
Exercise 2 -- Text-based Instruction	1	0	0	3	0	2	6	5.5
2. Would you study English using the format of Exercise 1 -- (web-based)?								
Never. I don't like it.	0	0	0	1	0	1	2	1.8
Maybe?!	4	3	0	5	6	1	19	17.3
Sure. Why not.	5	6	1	4	4	2	22	20.0
YES! I think it was very interesting.	13	12	10	9	12	11	67	60.9
3. Would you study English using the format of Exercise 2 -- (text-based)?								
Never. I don't like it.	4	2	2	2	6	4	20	18.2
Maybe?!	11	9	3	10	7	4	44	40.0
Sure. Why not.	4	9	3	6	5	3	30	27.3
YES! I think it was very interesting.	3	1	3	1	4	4	16	14.5
4. Which types of activities did you like the best in Exercise 1 -- (web-based)?								
Flash Text with Sound.	10	7	7	1	7	6	38	34.5
Text with Right and Wrong Answers.	5	2	2	4	4	3	20	18.2
Puzzles (matching, jumbled words).	5	9	0	3	7	4	28	25.5
Quiz.	2	3	2	11	4	2	24	21.8
5a. Rate Exercise 1 -- (web-based).								
(1)	0	0	0	0	0	0	0	0.0
(2)	0	0	0	1	0	0	1	0.9
(3)	0	0	1	0	0	0	1	0.9
(4)	1	1	1	0	0	1	4	2.7
(5)	1	1	0	3	3	3	11	10.0
(6)	0	1	1	2	0	0	4	4.5
(7)	2	5	0	5	3	0	15	13.6
(8)	5	3	1	4	5	1	19	17.3
(9)	6	6	3	3	7	5	30	26.4
(10)	7	4	4	1	4	5	25	22.7
Average (7.96)	8.50	8.00	8.00	7.00	8.14	8.13	110	100.0
5b. Rate Exercise 2 -- (text-based).								
(1)	0	0	0	0	0	1	1	0.9
(2)	1	0	0	0	1	1	3	2.7
(3)	2	7	2	0	2	2	15	13.6
(4)	2	1	2	0	0	0	5	4.5
(5)	6	2	1	0	4	1	14	12.7
(6)	3	2	2	0	3	1	11	10.0

(7)	3	8	2	0	4	3	20	18.2
(8)	3	1	0	0	3	3	10	11.0
(9)	1	0	2	0	2	2	7	6.4
(10)	1	0	0	0	3	1	5	4.5
Average (5.89)	5.82	5.29	5.73	--	6.55	6.07	91	100.0

Note. The double hyphens (--) mean that no data were available for this entry. In the case of Class E, on the version of the survey that they were given, a rating of the text-based materials was not asked for.

5. *Web-based and Text-based Rating*. One hundred and ten students rated the web-based materials 7.96 out 10 and 91 students rated the text-based materials 5.89 out of 10. Students from Class E who has the most connectivity problems, rated the web-based materials the lowest, with an average score of 7 out of 10. Class B, which performed better on the A2 and B2 quizzes than the A1 and B1 quizzes, rated the web-based materials the highest at 8.5 out of 10.

Study II Results

Detailed in this section are the results of both studies of website activity at ESLenglish.com (Study AS-1), and during the comparison study (Study AS-2). Where necessary, the meaning and possible ramifications of these results have been further explained and clarified.

Analysis study of online activity at ESLenglish.com (AS-1). Data for Study AS-1 were compiled under 12 headings and listed in Table 11 thru to Table 19. Where necessary, the following abbreviations have been used for the web mining instruments: OpenWebScope (OPW or OpenWeb), NetTracker (Net or NetT), WebTrends (Web or WebT), and HitBox (Hit or HitB).

Table 11. *Browser, Computer Platform, Screen Size, Color Palette and Netscape Plug-ins*

Item	%			
	HitBox	WebTrends	NetTracker	AXS
IE	85.31	83.75	81.0	81.92
Netscape	14.69	13.02	15.1	15.94
IE 5.x	73.01	71.87	68.5	68.84
IE 4.x	11.84	11.38	12.5	12.62
IE 3.0 or Netscape 3.0 or Less	0.94	0.49	2.8	0.66
Windows 98	63.36	67.80	66.6	65.95
Windows 95	25.79	21.2	19.0	23.66
Windows NT	4.52	4.81	4.3	5.49
Macintosh PowerPC	1.81	2.08	2.6	2.61
800 x 600	49.28	--	--	--
1024 x 768	29.71	--	--	--
640 x 480	16.75	--	--	--
Other screen resolutions	5.27	--	--	--
65,536 Colors	59.34	--	--	--
16.7 Million Colors	35.88	--	--	--
256 Colors	4.78	--	--	--
Shockwave Flash	96.77	--	--	--
RealPlayer	67.74	--	--	--
Adobe Acrobat	48.39	--	--	--
QuickTime Plug-in	48.39	--	--	--
FireTalk	25.81	--	--	--
Authorware WebPlayer	22.58	--	--	--
Percentages Based On	221 Visitors*	16,976 Hits	536 Visits	311 Uniques

Note. Plug-in information is valid only for users of Netscape browsers. The plug-in percentages are based on 31 Netscape visitors as tracked by HitBox. Percentages on screen size and color depth is based on information tracked from 209 visitors. The double hyphens (--), in this table and the others that follow in this section, mean that no data were available in this category.

Table 12. *Number of Page Views, Reloads, Daily Uniques, Monthly Uniques and Repeat Visits*

Item	HitBox #	HitBox %	WebTrends #	WebTrends %	NetTracker #	NetTracker %	AXS #	AXS %
Page Views	1091	100.0	1586	100.0	1472	100.0	1225	100.0
Reloads	36	100.0	--	--	--	--	--	--
Daily Uniques	325	100.0	560	100.0	536	100.0	--	--
Monthly Uniques	271	72.3	390	69.6	393	73.3	311	100.0
2 to 4 Visits	52	13.9	158	28.3	--	--	--	--
2 Visits	--	--	104	18.6	--	--	--	--
3 Visits	--	--	49	8.8	--	--	--	--
4 Visits	--	--	5	0.9	--	--	--	--
5 to 9 Visits	29	7.7	8	1.4	--	--	--	--
10 to 24 Visits	23	6.1	4	0.7	--	--	--	--

Note. For this study, a *unique visitor* (i.e., monthly unique) is defined as a single unique IP address as recorded or tracked by various web mining instruments irrespective of how many times the users visits a site during the course of the study.

Table 13. *Number of Pages Viewed Per Visit*

	HitBox		NetTracker	
Number of Pages Viewed	Visitors	%	Visitors	%
1	167	38.4	190	35.4
2	161	37.0	78	14.6
3	60	13.8	24	4.5
4	18	4.1	11	2.1
5-6	19	4.4	39	7.3
7-9	9	2.1	131	24.4
10-14	1	0.2	35	6.5
15-24	0	0.0	24	4.5
25-49	0	0.0	4	0.7
50-99	0	0.0	0	0.0
Totals	435*	100.0	536	100.0

Note. HitBox tracked 325 daily visitors in its traffic summary, however 435 visitors are recorded above. The reason for this discrepancy is unclear, however it is possible that this total also included repeat visitors who had returned within 24 hours of their initial visit.

Table 14a. *Page Views, Average Time Spent and Time Spent*

Page Name	Page Views					Avg. Time		<5	<15	<30	<1	<5	>5
	Net	Web	OPW	AXS	Hit	Net	Web	S	s	s	m	m	m
1. home	394	403	--*	286	514	0:36	1:37				100		
2. listen	114	117	119	171	166	0:35	2:17			50	50		
3. chat	59	65	65	100	114	1:13	2:03		50			50	
4. quizzes	61	65	66	109	104	1:49	5:00					50	50
5. games	53	57	58	77	91	2:03	3:42		100				
6. pen pals	52	57	57	91	83	1:10	2:13				100		
7. talk	50	54	55	57	75	0:52	1:12	33				66	
8. links	29	32	34	34	48	0:57	1:51		100				
9. stories	24	28	28	32	37	1:33	2:14		50			50	
10. discuss	17	22	22	20	32	1:04	1:24	25	25			25	25
11. books	19	25	25	30	30	0:30	2:31					100	
12. javachat	22	26	26	23	29	2:49	7:23	50	50				
13. lovequiz	17	19	19	11	28	2:22	3:52					100	
14. chat_acronyms	14	17	17	12	18	0:09	1:02					100	
15. links1_reading	8	9	10	11	12	0:19	1:07		100				
16. email_writing	6	7	8	4	10	0:00	0:01				100		
17. links3_listening	8	7	8	8	9	0:00	0:02			25	25	25	25
18. song1bwb.htm	6	9	9	7	9	0:31	1:35					100	
19. links2_writing	4	5	4	4	7	0:10	0:19	100					
20. links4_speaking	3	3	3	3	3	0:27	--	100					
21. links7_programs	4	5	6	4	3	2:13	1:43						
22. talkinstructions	3	6	6	2	3	0:03	0:23						
23. chatroom_meet	2	5	5	0	2	0:17	9:16		50				
24. links6_courses	3	4	4	3	2	0:00	0:01					100	
25. suggestions	5	8	8	0	2	0:04	0:11						
26. links5_grammar	2	2	2	1	0	0:00	--		50			50	
Sub-total	979	1057	664*	1100	1431								

Table 14b. *Page Views, Average Time Spent and Time Spent (continued)*

Page Name	Page Views Net	Web	OPW	AXS	Hit	Avg. Time Net	Web	<5 S	<15 s	<30 s	<1 m	<5 m	>5 m
27. esl_survey2	14	--	14	10	--	2:34	--						
28. lesson1.htm	12	12	12	27	--	0:04	0:19						
29. crossword.html	9	11	12	6	--	4:56	7:58						
30. lesson4.htm	7	7	7	5	--	0:07	0:13						
31. famous_speeches	6	8	8	4	--	0:25	1:23						
32. required_plug-ins	5	9	10	3	--	0:47	0:59						
33. endlesstale.htm	5	6	6	3	--	0:23	5:45						
34. lesson2.htm	5	5	5	7	--	0:03	0:04						
35. esl_survey_view	5	--	4	4	--	1:37	--						
36. jokebook.htm	4	6	6	2	--	0:43	1:58						
37. lesson3.htm	3	3	3	4	--	0:07	--						
38. phrase1match	3	3	3	3	--	1:53	1:53						
39. crossword3.htm	3	3	3	1	--	3:20	8:00						
40. famous_sp_.rm	3	--	0	--	--	0:50	--						
41. esl_survey1	2	--	2	--	--	0:08	--						
42. phrase6quiz2.htm	1	1	1	1	--	3:36	--						
43. crossword0.htm	--	5	5	1	--	--	6:16						
44. quiz4_acronyms	--	3	3	--	--	--	0:00						
45. quiz2_opposites	--	3	3	--	--	--	0:01						
46. 101.htm	--	--	40	7	--	--	0:01						
47. wwwboard2.html	--	--	13	8	--	--	0:01						
48. dialogs	--	--	12	--	--	--	0:01						
49. wwwboard1.html	--	--	7	--	--	--	0:01						
50. story.pl	--	--	5	5	--	--	0:01						
Totals	1064	1142	848*	1210	1431								
Totals from Log	1472	1586	--	1225	1431								

Note. OpenWebScope did not report requests made to the home page: index.shtml.

Table 15. *Most Popular Entry Pages and Single Access Pages*

Page Name	Entry Pages								Single Access	
	NetTracker		WebTrends		OpenWeb		HitBox		HitBox	
	#	%	#	%	#	%	#	%	#	%
1. home	303	56.5	310	55.75	301	56.68	260	69.33	71	51.82
2. listen	24	4.5	32	5.74	22	4.14	12	3.20	4	2.92
3. pen pals	19	3.5	28	5.02	22	4.14	15	4.00	6	4.38
4. quizzes	15	2.8	23	4.12	16	3.01	9	2.40	0	0.00
5. chat	13	2.4	21	3.76	21	3.99	16	4.27	6	4.38
9. talk	12	2.2	15	2.68	2	0.38	7	1.87	4	2.92
6. javachat	11	2.1	14	2.51	14	2.64	11	2.93	11	8.03
7. games	10	1.9	17	3.04	18	3.39	9	2.40	1	0.73
8. chat_acronyms	7	1.3	8	1.43	3	0.57	8	2.13	8	5.84
9. lovequiz.htm	7	1.3	7	1.25	4	0.75	3	0.8	3	2.19
10. email_writing	5	0.9	--	--	8	1.51	4	1.07	4	2.92
12. discuss	4	0.8	12	2.14	5	0.94	3	0.8	3	2.19
13. links	3	0.6	5	0.89	3	0.57	2	0.53	2	1.46
14. stories	3	0.6	--	--	3	0.57	2	0.27	2	0.73
15. books	2	0.4	7	1.24	4	0.75	2	0.80	2	1.46
16. swf, ram, ra	39	7.3	--	--	25	4.71	--	--		
17. f_1, f_2, f_3	36	6.7	--	--	15	2.82	--	--		
18. Other	23	4.2	61	10.03	45	8.47	12	3.20	14	8.03
Sub-totals	536	100.0	560	100.0	531	100.0	375	100.0	137	100.0
Totals				100.0						

Note. For WebTrends and NetTracker, entry page totals include pages entered from the frames and single pages e.g., as tracked by NetTracker [f_listen.htm (17) + listen.htm (7)] = 24.

Table 16. *Links Followed as Tracked by AXS*

Top Ten Links Followed	#	%	Other Links	#	%
1. esl-lab.com	62	15.05	tripod.com/../endless_tale.htm	5	1.21
2. pacificnet.net/../student.html	22	5.34	amazon.com/../0375752102	5	1.21
3. clubs.yahoo.com/clubs/	19	4.61	eslcafe.com/discussion/	5	1.21
4. quickchat.org/chat/	17	4.13	allwords.com	4	0.97
5. eleaston.com/listen.html	15	3.64	chatpro.cgi	4	0.97
6. aitech.ac.jp/~itesls/proverbs/	14	3.40	flash_poem.swf	4	0.97
7. 62.6.162.42/intro.html	13	3.16	m-w.com/thesaurus.htm	3	0.73
8. chat.yahoo.com	13	3.16	blowwind.ram	3	0.73
9. aitech.ac.jp/~itesls/vq/	12	2.91	amazon.com/../redirect-hom/	2	0.49
10. download1.firetalk.com/..	11	2.67	dictionary.com	2	0.49
amazon.com/…/B0001SHKP/	7	1.70	hangman.cgi	2	0.49
englishtown.com/../games/	7	1.70	guestbook.mv	2	0.49
englishtown.com/../pen pals/	6	1.46	ibister.com/worldtime/	1	0.24
m-w.com/dictionary.htm	6	1.46	Other links Followed	146	35.41
Sub-total	224	54.39	Total	412	100.00

Table 17. *Paths Taken Through the Site*

	HitBox		NetTracker*	
Most Popular Path	Visitors	%	Visitors	%
1. home/listen	34	16.67	49	18.3
2. home/quizzes	17	8.33	11	4.1
3. home/games	11	5.39	20	7.5
4. home/pen pals	10	4.9	15	5.6
5. home/livetalk	6	2.94	13	4.9
6. home/listen/home/listen	5	2.45	0	0
7. home/stories	4	1.96	7	2.6
8. home/games/home	3	1.47	0	0
9. chat/chatacronyms	3	1.47	0	0
10. home/chat	3	1.47	17	6.3
Sub-totals	96	47.05	132	49.3
Totals	204	100.00	268	100.0

Note. NetTracker was queried for the most common three file path (esl_tv.swf counted as a file). It did not include other common path lengths in this query, such as a two file path or a four file path.

Table 18. *Time Spent on Site*

Duration	NetTracker #	NetTracker %	HitBox #	HitBox %	WebTrends #	WebTrends %
Did not stay	199	37.1	--	--	--	--
<1 min	143	26.7	83	30.59	633	39.14
6 – 15 secs	--	--	12	4.28	--	--
16 - 30 secs	--	--	30	11.18	--	--
31 - 60 secs	--	--	41	15.13	--	--
1 – 5 min	82	20.9	110	40.79	422	26.08
1 - 2 min	58	10.8	--	--	204	12.61
2 - 3 min	33	6.2	--	--	117	7.23
3 - 5 min	21	3.9	--	--	101	6.24
6 - 10 min	38	7.0	33	12.17	189	11.11
11 - 30 min	40	7.5	40	14.80	--	--
10 - 15 min	12	2.2	--	--	77	4.76
15 - 19 min	--	--	--	--	82	5.01
15 - 20 min	10	1.9	--	--	--	--
20 - 30 min	18	3.4	--	--	--	--
> 19 min	--	--	--	--	223	13.79
31 - 60 min	4	0.8	4	1.32	--	--
> 1 hour	0	0.0	1	0.33	--	--
Totals	536	100.0	271	100.00	1617*	100.00

Note. WebTrends percentages are based on total page views by visitors. NetTracker bases its results on total visits and HitBox on total unique visitors.

Table 19. *Top Search Engines and Search Phrases*

Search Engine/Search Phrase	NetTracker (Site)		HitBox (Site)		WebTrends (Pages)	
	#	%	#	%	#	%
Google	33	33.0	3	13.04	32	33.68
Yahoo	31	31.0	1	4.35	29	30.52
AltaVista	18	18.0	14	60.87	21	22.1
Dogpile	7	7.0	4	17.39	1	1.05
Netscape	4	4.0	0	0.00	7	7.36
Others	7	7.0	1	4.35	5	5.29
Total	100	100	23	100	95	100.0
1. asian pen pals	7	1.3	0	0.00	7	7.36
2. learn english online	5	0.9	4	17.39	4	4.21
3. chat acronyms	4	0.7	0	0.00	4	4.21
4. esl games	3	0.6	1	4.35	3	3.15
5. chatroom acronyms	3	0.6	0	0.00	3	3.15
6. email writing	3	0.6	0	0.00	2	2.10
7. learn english grammar	3	0.6	0	0.00	3	3.15
8. stories for esl	2	0.4	1	4.35	2	2.10
9. esl listening games	2	0.4	0	0.00	2	2.10
10. international pen pals	2	0.4	0	0.00	2	2.10
Other	60	11.2	17	73.91	63	66.39
Total Phrases Found in Log Files	95	17.7*	23	100.0	95	100.0

Note. *NetTracker search phrase percentage results are based on those referred by the search phrases out of 536 visits. NetTracker found a total of 69 different unique search phrases in the log files.

1. *Browser, Computer Platform, Screen Size, Color Palette and Plug-ins*. As shown in Table 11, the typical visitor at ESLenglish.com was using the IE browser under the Windows operating system, with at least an 800 x 600 screen and 65,536 colors. Over 16% of the visitors had screens at 640 x 480 and nearly 30% had screens at 1024 x 768. The typical user also had Shockwave installed (96.8%) and 68% could listen to the RealAudio files (32% did not have the RealPlayer plug-in). It is being assumed however that the data compiled for Netscape plug-ins as tracked HitBox can also be applied to IE users.

2. *Number of Page Views, Reloads, Daily and Monthly Unique Visitors, and Repeat Visits*. As shown in Table 12, HitBox, WebTrends, NetTracker and AXS tracked very different results for the number of page views and unique visitors. These results vary because of the different ways in which each type of software defines a page view and a visitor. WebTrends and NetTracker also recorded significantly more unique visitors than HitBox and AXS because these results are based on log file analysis of all possible files, including direct hits to frames pages, while HitBox and AXS results are based on the insertion of tracking code onto 27 pages and 44 pages. Tierranet's 'Statistics Cruncher' reported 394 server requests for the home page. It also reported 11 requests for the favicon.ico (an icon pulled off the server when a user bookmarks a site using IE) which indicates that at least 11 users bookmarked the site. By comparing the monthly uniques to the multiple visits it can derived from the HitBox and WebTrends data that between 28 to 31% of the visitors returned to ESLenglish.com. HitBox also tracked only 36 reloads out of 1091 page views (3.3%).

3. *Number of Pages Viewed Per Visit*. Table 13 shows, as tracked by both HitBox and NetTracker, that more than one third of the visitors left after viewing only one page. Strangely enough, HitBox reports less than 7% of its visitors viewing more than five pages, while NetTracker reports more than 40% of the visitors viewing more than five pages, with almost one quarter viewing between seven and nine pages. AXS tracked that the average number of documents viewed per

visitor as 2.785. Once again, the differences between the results of HitBox and NetTracker can be attributed to they way they measure activity. Further discrepancies may be attributed to the fact that the HitBox code may only load partially, before the user clicks to another page this is unable to track all results.

4. *Page Views, Average Time Spent and Time Spent*. Although the actually figures from each tracking instrument varied considerably, Table 14a shows that the listening page was the most accessed page. A high interest was also evident for the chat, quizzes, pen pals and games pages. The 'lovequiz.htm,' with a viewing time between two minutes and 22 seconds and 3 minutes and 52 seconds indicates that users were completing the quiz from start to finish. A great disappointment however was the low interaction levels in the forums and wwwboards as shown in Table 14b. Although, the /wwwboard2/messages directory (Pen Pal Sign-up Forum) received 180 hits, while the parent directory /wwwboard2/ received only 14 hits, and the /wwwboard/messages directory ('Ask Peter Forum') received 32 hits, while the parent directory wwwboard/ received 8 hits, only two responses from one visitor were posted. These results indicate that a number of visitors were viewing messages but not responding.

   OpenWebScope also reported that the Activities, Opinions, Hobbies, Music, and Friends forums received only 10 hits combined, with the Friends and Music forums receiving four hits and three hits respectively. None of the message files in the forums were hit. No responses were entered. NetTracker tracked 640 requests for the hangman.cgi. AXS tracked only two 'links followed' for the hangman.cgi indicating that one or two persons played the hangman game for a long time or it was bookmarked by a number of unknown users.

   The song1bwb.htm listening activity, which provides text to an original song and RealAudio along with a fill-in-the-blanks quiz was also a disappointment with only six to nine hits and a low viewing/listening time between 31 seconds and one minute and 35 seconds. These results were also quite similar to the famous_speeches.htm listening activity with only six to eight hits and a viewing/listening time between 25 seconds and one minute and 23 seconds.

WebTrends reported 250 downloads of the Flash .swf home page file compared with 403 views of the home page (62%). NetTracker reported 328 downloads of the Flash .swf home page file compared with 389 (84%) views of the home page. Tierranet's Statistics Cruncher reported 324 downloads of the Flash .swf home page file compared with 394 (82%) views of the home page. What these results may reveal is that either the .swf file: (a) was frequently accessed via the users cache or a cache somewhere on the Web and thus did not register a request to a server; (b) did not load properly;(c) viewers left the home page before the file could load; and/or (d) the viewers did not have the Flash plug-in.

5. *Least Popular Site Pages*. As shown in Table 14b, lesson1.htm, lesson2.htm, lesson3.htm and lesson4.htm received about 25 views in total, less than 2% of the total page views. Required_plug-ins.htm, song1bwb.htm, jokebook.htm, story.pl and the quizzes also received less than 1% and 0.5% of the total page hits. The guestbook.mv was accessed only twice.

6. *Top Entry and Single Access Pages*. As Table 15 shows, out of 536 visitors, NetTracker tracked 303 visitors who entered through the home page. NetTracker also tracked 36 visitors (6.7%) who entered the site entering through the navigation frames f_1.htm, f_2.htm and f_3.htm. Fifty visitors entered one of the ten main menu items from a single page and 55 visitors entered the site through the main menu item's frame page. Altogether 165 visitors (30.8%) entered the site through a non-frames page and were left with limited navigational tools.

   WebTrends, on the other hand, tracked 310 visitors out of 560 (55%) who entered the site through the home page. WebTrends also tracked that altogether more than 144 visitors (25.7%) entered the site through a non-frames page. As shown in Table 15, HitBox tracked that, except for the quizzes and games page, most visitors left when entering a non-frames page. HitBox also tracked 51.9% of the users accessing only the home page before leaving.

7. *Links Followed*. By far the most common exit link for ESLenglish.com, as tracked by AXS was esl-lab.com at 15.1 % of the total ‘links followed’ (see Table 16). Pen pal links also received more that 11% of the links followed while quiz related links received about 7% of the links followed. The tool bars (e.g., 62.6.162.42/intro.html -- grammar; m-w.com/dictionary.htm; etc.) totaled less than 7% of the links followed. The grammar link was twice as popular as the dictionary link. The FireTalk download link was accessed by 11 visitors. No visitors downloaded any of the plug-ins from the plug-ins page.

8. *Paths Taken Through the Site*. More than 20% of the visitors, after entering the home page, visited the listening page or quizzes page (see Table 17). More than 35% of the visitors left the site after following one of the four most popular paths. As tracked by HitBox, nearly 50% of the users left ESLenglish.com after navigating through two pages, e.g., home/listen, home/quizzes, and home/games.

9. *Average Time Spent on Site*. NetTracker reported an average length visit of two minutes and 48 seconds while WebTrends reported an average of two minutes and 21 seconds. These reports include single page view sessions (which are tracked as zero length visiting sessions). Without non-zero length visitor sessions, WebTrends tracked that visitors surfed ESLenglish.com for an average of six minutes and 22 seconds before leaving. As can be derived from Table 18, HitBox reported that more than 65% of the visitors stayed for one minute or longer and more than 16% stayed for 10 minutes or longer. WebTrends found that over 13% stayed for 19 minutes or longer. NetTracker’s results included 199 single page viewers tracked as zero and thus do not match the percentages of HitBox. It should be noted that average time figures cannot be considered accurate as it is difficult for tracking software to accurately measure when a visitor leaves a site as no server request is logged.

10. *Top Referring Sites, Search Engines, Search Phrases and Search Keywords*. Out of 536 visitors, NetTracker tracked 100 referrers from search engines (17.7%), 56 from firetalk.com (10.4%), 22 from elmo.netnation.com (4.1%), 13 from cde.athabascau.ca (2.4%), and seven from snowblue.sookmyung.ac.kr (1.3%). NetTracker reported 238 'no referrers' and 92 referrers from eslenglish.com. Table 19 lists top search engines and search phrases. The top search keywords found in the log file, as reported by WebTrends were English (24), esl (16), learn (16), games (14), pen (14), pals (14), online (8), and grammar (8). Other search word phrases not listed in include: english listening, play hangman.com, learn english, learn esl, and flash quiz.

    The search engine on ESLenglish.com was used only once to search for the term 'Sports 8800.' A site checkup revealed that the search engine on the home page, while working in the frames pages, was not functioning properly on the home page. After fixing the home page code, additional searches on the key words 'language' and 'slang' were tracked in the fourth week of October.

11. *Most Active Periods*. WebTrends tracked that ESLenglish.com received a total of 17,019 hits (hits include all file requests made to the server including image files). Activity was quite consistent on both the weekdays and weekends with Monday receiving the highest percentage of hits (16.60%) and Saturday the lowest (12.32%). However, Thursday by far received the most visitor sessions (28%), Friday the second most (17%), while Sunday the least (7%).

12. *Cached Hits*. WebTrends tracked 3,304 out of 17,019 hits as cached hits (19.36%). Cached hits are those where the page was found in the cache of the browser, so the server did not need to transfer the file. How this may have affected its calculations of site activity is not clear in its documentation and cannot be estimated.

Analysis of online activity during comparison study (AS-2). As tracked by NetTracker, it can be estimated from Table 20 that students spent an average of seven minutes and 24 seconds studying with B2 and A2 materials and 23 minutes and 30 seconds with A1 and B1 materials. Students also spent an average of three minutes and 37 seconds on the online tests. More than 50 students used the exercise A and B site map for an average of one minute and 10 seconds. Class E, using the four-frame screen format, accessed the study tips page only three times with an average viewing time of five seconds. It can also be estimated from the results in Table 20 that more than 60% of the students made it past puzzle_a1.htm and puzzle_b1.htm, while only 12 students managed to completely finish the A1 and B1 exercises. Students also repeatedly reloaded the Flash phrasea.swf and phraseb.swf files, twice as much as the sound_a1.html and sound_b1.html indicating that many may have listened to the file more than once.

WebTrends also tracked that more than 98% of the students used IE 5.0 to browse the materials, with 80% under Win95 and 20% under Win98. WebTrends also tracked that 12.84% of the hits were cached, the average stay was 25 minutes and 13 seconds, and the average number of page viewed per visitor was 9.8 pages.

ESLenglish.com survey results. Thirty-nine out of 110 students were able to surf ESLenglish.com after completing the comparison study. The survey results were as follows:

1. *Website Navigation*. Ninety-seven percent agreed that ESLenglish.com was easy to navigate. Of these, 10% strongly agreed with this statement. Only 3% disagreed.

Table 20. *Study Results for AS-2 (Comparison Study Exercises A1, A2, B1 and B2): Most Requested Files and Average Viewing Time*

Page Name (A1 Exercise)	Average Time	Views	%	Page Name (B1 Exercise)	Average Time	Views	%
Index.htm	0:31	144	20.3	index.htm	0:42	119	20.0
Sound_a1.html	1:43	122	17.2	sound_b1.html	2:38	99	16.6
text_a1.htm	4:22	111	15.7	text_b1.htm	4:04	97	16.3
Puzzle_a1.htm	2:14	85	12.0	puzzle_b1.htm	2:19	73	12.3
Puzzle_a2.htm	2:21	56	7.9	puzzle_b2.htm	2:41	54	9.1
Puzzle_a3.htm	2:58	45	6.3	puzzle_b3.htm	1:14	36	6.1
Puzzle_a4.htm	1:12	30	4.2	puzzle_b4.htm	1:36	25	4.2
Puzzle_a5.htm	1:13	32	4.5	puzzle_b5.htm	0:39	32	5.4
Puzzle_a6.htm	0:42	23	3.2	puzzle_b6.htm	1:05	23	3.9
Puzzle_a7.htm	0:44	11	1.6	puzzle_b7.htm	0:45	10	1.7
Puzzle_a8.htm	0:20	12	1.7	puzzle_b8.htm	0:59	10	1.7
Puzzle_a9.htm	0:50	12	1.7	puzzle_b9.htm	0:38	4	0.7
Puzzle_a10.htm	1:40	8	1.1	puzzle_b10.htm	2:27	6	1.0
Puzzle_a11.htm	1:02	8	1.1	puzzle_b11.htm	1:15	5	0.8
finished_a.htm	0:45	10	1.4	finished_b.htm	1:21	2	0.3
Totals	22:37	709	100	Totals	24:23	595	100
a2/index.htm	7:42	102	100	b2/index.htm	7:06	90	100
Other Files							
phrasetesta	3:39	201	--	phrasetestb	3:34	208	--
Lesson_mapa.htm	1:17	59	--	lesson_mapb.htm	1:04	55	--
studytips_a.htm	0:05	2	--	studytips_b.htm	0:06	1	--
phrasehome_a.htm	0:50	46	--	phrasehome_b.htm	0:32	48	--
f_1.shtml*	0:32	61	--	--	--	--	--
f_2a.shtml	0:05	34	--	f_2b.shtml	0:38	25	--
f_3a.htm	0:06	46	--	f_3b.htm	0:08	49	--
phrasesa.swf	2:32	333	--	phrasesb.swf	2:41	294	--

Note. The file f-1.shtml was used for both A1 and B1 exercise materials.

2. *Site Contents*. Ninety-two percent agreed that they liked the contents of ESLenglish.com, while 8% of these strongly agreed with this statement. Only 8% disagreed.
3. *Motivational Appeal*. Ninety-two percent agreed that ESLenglish.com grabbed their attention and motivated them to learn English, while 13% of these strongly agreed with this statement. Only 8% disagreed.
4. *Site Comments*. Twenty-eight percent of the students enjoyed the quizzes the most. 39% said they would come back to try the listening exercises, 54% said they would visit this site again, and 36% said they would recommend this site to others. Less than 3% thought the site was too busy.
5. *ESLenglish.com Rating*. Thirty-nine students rated ESLenglish.com an average score of 7.83. The median average was 8 out 10. The mode average was 8 out of 10. Students from Class G rated ESLenglish.com the lowest with an average score of 7.09 (see Table 21 for complete results of the survey).

Study III Results

A summary of the WeBIC evaluation results is shown in Table 22 under its 15 sub-processes (see Table 23, Table 24, and Table 25 for a more detailed breakdown of these results.) Using WeBIC, the design of the Web-based instructional materials were assessed 344 out of 600 (57.3%), while the text-based instructional materials were assessed 226 out of 600 (37.5%). The web-based materials scored well in the media/technologies analysis and usability design, but are still open for improvement in the areas of practice and feedback design, participation design and support services development. The text-based materials scored very low in preparation, participation, and practice and feedback design, but quite high in presentation design and usability design.

Table 21. *Survey Results of Surfing ESLenglish.com (Total Participants = 39)*

Survey Question /Answer	Class							
	B	C	D	E	F	G	Total	%
6. I found the website well organized and easy to navigate.								
Strongly Disagree	0	0	0	0	0	0	0	0.0
Disagree	0	0	0	0	0	1	1	2.6
Agree	9	2	6	5	4	8	34	87.2
Strongly Agree	0	2	0	0	0	2	4	10.2
7. I liked the contents of this site.								
Strongly Disagree	0	0	0	0	0	0	0	0.0
Disagree	1	0	1	0	1	0	3	7.7
Agree	8	2	4	5	3	11	33	84.6
Strongly Agree	0	2	0	1	0	0	3	7.7
8. The site grabbed my attention and motivated me to learn English.								
Strongly Disagree	0	0	0	0	0	0	0	0.0
Disagree	0	0	0	1	0	2	3	7.7
Agree	8	3	6	4	2	8	31	79.5
Strongly Agree	1	1	0	0	2	1	5	12.8
9. Select comments you agree with.								
I enjoyed the games the most.	1	2	1	1	1	2	8	20.5
I enjoyed the quizzes the most.	3	2	0	2	2	2	11	28.2
I listened to the 'Famous Speeches.'	2	0	1	1	1	2	7	17.9
I thought the site was too busy.	0	0	0	0	0	1	1	2.6
Will try listening exercises.	3	2	2	0	3	5	15	38.5
I will visit this site again.	6	4	3	1	2	5	21	53.8
I would recommend this site.	4	3	4	0	1	2	14	35.9
The links were interesting.	5	1	1	2	1	3	13	33.3
10. Rate ESLenglish.com.								
(1)	0	0	0	0	0	0	0	0.0
(2)	0	0	0	0	0	0	0	0.0
(3)	0	0	0	0	0	0	0	0.0
(4)	0	0	0	0	0	1	1	2.6
(5)	1	0	1	1	1	2	6	15.4
(6)	1	0	0	0	0	1	2	5.1
(7)	1	2	0	0	0	3	6	15.4
(8)	2	0	3	3	0	1	9	23.1
(9)	2	0	1	1	3	1	8	20.5
(10)	3	2	0	0	0	2	7	17.9
Average (7.83)	8.20	8.50	7.60	7.60	8.00	7.09	39	100.0

Table 22. *Summary of WeBIC Evaluation Results for ES-1, ES-2 and ES-3*

Main Process:	Web-based (ES-1)	Text-based (ES-2)	ESLenglish (ES-3)	Total
1.0 Purpose Definition:	16	15	21	36
2.0 Learner Analysis:	6	7	9	15
3.0 Performance Analysis:	10	10	13	18
4.0 Media/Technologies Analysis:	43	19	47	57
5.0 Format Design:	18	9	17	18
6.0 Instructional Objectives Development:	12	12	10	18
7.0 Preparation Design:	29	7	31	60
8.0 Presentation Design	66	43	63	101
9.0 Participation Design:	14	0	19	30
10.0 Practice and Feedback Design:	17	1	30	45
11.0 Performance Assessment Design:	8	8	7	9
12.0 Usability Design:	68	57	68	99
13.0 Support Services Development:	2	0	8	24
14.0 Website Development:	26	31	24	39
15.0 Evaluation:	9	6	11	21
Totals	344	225	378	600
%	57.3	37.5	63.0	100.0

Table 23. *ES-1: WeBIC Evaluation Questions Applied to the Design of Web-based Phrase Exercises A1 and B1 as Used in the Comparison Study*

Main Process:		WeBIC Questions with Evaluation Scores										Total
1.0	Purpose Definition:	1a3	2a3	b3	c1	3a0	b0	4a2	5a1	b0	6a1	
		b1	c1									16
2.0	Learner Analysis:	1a2	b2	c0	2a1	b1						6
3.0	Performance Analysis:	1a2	b2	c2	2a1	b0	3a3					10
4.0	Media/Technologies	1a3	b2	c2	d2	e3	f3	g3	h2	2a1	3a2	
	Analysis:	4a1	5a2	b2	6a2	b2	7a3	b3	8a3	b2		43
5.0	Format Design:	1a3	b3	2a3	3a3	b3	c3					18
6.0	Instructional Objectives Development:	1a3	b2	c3	d1	2a0	3a3					12
7.0	Preparation	1a0	b0	c0	d0	2a3	b3	3a3	b2	4a3	b2	
	Design:	5a2	b2	6a3	7a1	8a0	b0	c0	9a0	b2	10a3	29
8.0	Presentation Design	1a2	2a2	3a2	b2	4a2	5a0	b0	6a2	7a1	b2	
		c2	d2	e2	f0	8a2	b2	c1	9a2	b2	c2	
		d2	10a3	11a2	b2	c2	d2	e2	12a3	b2	13a0	
		b2	14a2	b2	15a2	b2	c1	16a3				66
9.0	Participation Design:	1a2	b2	2a3	b1	c0	3a3	4a1	5a2	b0	c0	14
10.0	Practice and	1a3	b3	c2	2a0	b3	c2	3a2	4a0	b0	5a0	
	Feedback Design:	b0	6a0	b0	7a2	b0						17
11.0	Performance Assessment Design:	1a2	2a3	b3								8
12.0	Usability Design:	1a2	b2	c2	2a2	b3	c2	d2	e2	3a3	b2	
		c2	4a2	b2	c2	d2	e2	f2	g2	5a2	6a3	
		b2	c3	d0	7a2	b3	c1	d2	8a3	b2	c1	
		9a3	b1	c2								68
13.0	Support Services Development:	1a0	b0	c0	d0	2a0	b0	c0	d2			2
14.0	Website	1a2	b3	c3	d0	e2	f2	2a2	3a2	b2	c2	
	Development:	d2	e2	f2								26
15.0	Evaluation:	1a2	b2	c3	2a1	3a1	4a0	5a0				9
									TOTAL (out of 600)			344

Note. For each of the WeBIC questions in Table 23, Table 24 andTable 25, the following rating scale has been used: 0 = strongly disagree (SD), 1 = disagree (D), 2 = agree (A), and 3 = strongly agree (SA). Depending on the nature of question, the WeBIC rating scale has also been interpreted as: 0 = no evidence of application or development, 1 = some evidence of application and development, 2 = moderate evidence of application and development, and 3 = strong evidence of application and development.

Table 24. *ES-2: WeBIC Evaluation Questions Applied to the Design of Text-based Phrase Exercises A2 and B2 as Used in the Comparison Study*

Main Process:	WeBIC Questions with Evaluation Scores										Total
1.0 Purpose Definition:	1a3	2a3	b3	c0	3a0	b0	4a2	5a1	b0	6a1	
	b1	c1									15
2.0 Learner Analysis:	1a2	b2	c0	2a1	b2						7
3.0 Performance Analysis:	1a2	b2	c2	2a1	b0	3a3					10
4.0 Media/Technologies	1a3	b3	c2	d1	e1	f0	g0	h1	2a2	3a1	
Analysis:	4a1	5a2	b2	6a0	b0	7a0	b0	8a0	b0		19
5.0 Format Design:	1a3	b1	2a2	3a3	b0	c0					9
6.0 Instructional Objectives Development:	1a3	b2	c3	d1	2a0	3a3					12
7.0 Preparation	1a0	b0	c0	d0	2a1	b3	3a0	b0	4a0	b0	
Design:	5a0	b0	6a0	7a1	8a0	b0	c0	9a0	b0	10a2	7
8.0 Presentation Design	1a0	2a0	3a2	b2	4a1	5a0	b0	6a2	7a1	b2	
	c2	d0	e0	f0	8a0	b0	c0	9a2	b2	c2	
	d2	10a0	11a2	b2	c2	d2	e2	12a2	b2	13a0	
	b1	14a1	b2	15a2	b2	c1	16a0				43
9.0 Participation Design:	1a0	b0	2a0	b0	c0	3a0	4a0	5a0	b0	c0	0
10.0 Practice and	1a0	b0	c0	2a0	b0	c0	3a1	4a0	b0	5a0	
Feedback Design:	b0	6a0	b0	7a0	b0						1
11.0 Performance Assessment Design:	1a2	2a3	b3								8
12.0 Usability Design:	1a2	b2	c2	2a2	b3	c2	d2	e2	3a0	b0	
	c0	4a2	b1	c0	d2	e1	f2	g2	5a0	6a2	
	b1	c3	d0	7a3	b3	c2	d3	8a0	b3	c3	
	9a3	b2	c2								57
13.0 Support Services Development:	1a0	b0	c0	d0	2a0	b0	c0	d0			0
14.0 Website	1a3	b3	c3	d2	e2	f2	2a3	3a3	b2	c2	
Development:	d2	e2	f2								31
15.0 Evaluation:	1a1	b2	c1	2a1	3a1	4a0	5a0				6
								TOTAL (out of 600)			225

Table 25. *ES-3: WeBIC Evaluation Questions Applied to ESLenglish.com*

Main Process:		WeBIC Questions with Evaluation Scores										Total
1.0	Purpose Definition:	1a3	2a3	b3	c0	3a2	b0	4a2	5a2	b0	6a2	
		b2	c2									21
2.0	Learner Analysis:	1a2	b2	c2	2a1	b2						9
3.0	Performance Analysis:	1a2	b2	c2	2a2	b2	3a3					13
4.0	Media/Technologies	1a3	b3	c2	d2	e2	f3	g3	h3	2a2	3a2	
	Analysis:	4a2	5a2	b2	6a2	b2	7a3	b3	8a2	b1		47
5.0	Format Design:	1a3	b3	2a2	3a3	b3	c3					17
6.0	Instructional Objectives Development:	1a2	b2	c1	d1	2a2	3a2					10
7.0	Preparation	1a3	b2	c0	d0	2a3	b2	3a0	b0	4a2	b2	
	Design:	5a3	b3	6a0	7a1	8a3	b2	c3	9a0	b0	10a2	31
8.0	Presentation Design	1a2	2a0	3a2	b2	4a3	5a0	b0	6a2	7a2	b2	
		c1	d2	e2	f0	8a2	b2	c1	9a3	b2	c2	
		d2	10a2	11a3	b2	c2	d2	e1	12a2	b2	13a2	
		b1	14a2	b2	15a1	b2	c1	16a2				63
9.0	Participation Design:	1a3	b1	2a2	b1	c2	3a3	4a2	5a2	b2	c1	19
10.0	Practice and	1a2	b2	c2	2a2	b1	c3	3a2	4a2	b1	5a3	
	Feedback Design:	b3	6a2	b2	7a2	b1						30
11.0	Performance Assessment Design:	1a1	2a3	b3								7
12.0	Usability Design:	1a2	b2	c2	2a2	b2	c2	d2	e1	3a3	b2	
		c3	4a2	b2	c3	d3	e2	f3	g2	5a3	6a2	
		b2	c2	d0	7a2	b3	c2	d2	8a2	b1	c1	
		9a2	b2	c2								68
13.0	Support Services Development:	1a0	b2	c0	d1	2a0	b3	c0	d2			8
14.0	Website	1a2	b2	c2	d2	e2	f2	2a1	3a2	b2	c1	
	Development:	d2	e2	f2								24
15.0	Evaluation:	1a3	b2	c3	2a1	3a1	4a0	5a1				11
										TOTAL (out of 600)		378

ESLenglish.com was assessed 378 out of 600 (63%). The value of this score is not significant in itself unless compared with evaluations of other similar sites. However, the evaluation of each of the 15 sub-process areas indicates weakness in the areas of preparation design, support services development, and instructional objectives development. Presentation, participation, practice and feedback and usability design are also weak areas.

Confounding Variables and Other Threats to Internal and External Validity

"Every piece of research aims to produce an answer to a scientific question. And it is reasonable to ask just *how good* an answer the research provides" (Simon & Burstein, 1985, 17-18). To judge these answers, and to help better design research efforts, *internal* and *external* validity must be considered:

1. *Internal validity* -- is primarily concerned with the *soundness of internal procedures* e.g., in the case of experimental research, to what extent the independent variable can be shown to be "the *only* reasonable explanation for differences in the dependent variable" (Porter, 1997, 530).
2. *External validity* -- is primarily concerned with the *generalizability of results* e.g., in the case of survey research, to what extent the findings of a local survey can be shown to be valid nationally.

Threats to Internal Validity and External Validity

Internal validity. Two threats to internal validity are *confounding variables* and *low reliability*. *Confounding variables* result when internal research procedures are flawed. In the case of experimental research, a "variable is said to be confounded with the independent variable of a study if the two variables are inseparable" (Porter, 1997, 531), i.e., the researcher cannot tell 'which' caused 'what.' The key to controlling confounding variables and creating internal validity lies with *random assignment*. The idea behind random assignment is that, as long as each subject from the initial pool of subjects "has an equally likely chance of being assigned to any one of the experimental conditions to be compared" (Porter, 1997, 531), a state of *ceteris paribus* can be achieved.

Low reliability results when the research cannot be repeated and verified by others. It is caused by sloppy internal procedures, too much random error in the measurement process, and unclear reporting. To increase *reliability*, operational definitions and internal procedures of studies I, II and III were clearly defined so that others could test and verify the results in similar circumstances. To make results more reliable, Simon and Burstein (1985) advise to "measure the same concept in several different ways" (p. 210), an assertion supported by Porter (1997) who advises to investigate a research problem using multiple methods, with each designed to overlap the weaknesses of the other (p. 541). In Study II, this was attempted by using a variety of web mining instruments to get a better idea of what was actually being measured, and by using a combination of quiz score, web mining, observation and survey analysis for Study I.

<u>External validity</u>. Two threats to external validity are *lack of internal validity* and *lack of generalizability to other environments*. Porter (1997) advises that although there can sometimes be tension between designing research that has good internal validity and good external validity (p. 540), without internal validity there can be NO external validity and no generalizations. To have external validity, research *must* first have internal validity.

Lack of generalizability to other environments can result when similarities between the research environment compared with the 'real world' or 'other environments' are questionable. In Study I, it is possible that SMU students may react differently when using web-based materials at home then in the computer lab. Without classmates and noises to distract them, their concentration may be greater at home, where most likely, web-based learning will take place. It is also questionable whether the results can apply to ESL students in other countries such as Brazil. Although Korean ESL learners often demonstrate poor speaking abilities, their ability to memorize vocabulary and grammar structures is superior. Language learning in Korean schools typically takes places in large classes, leading teachers and students to emphasize grammar, vocabulary, and memorization. Along with this fact and the fact that "to enter an institute of higher education, students [often] have to memorize as many important points as they can in a short time" (Lewis, 1999), Korean students become excellent rote learners making it more difficult to generalize their results in the comparison study with ESL students from other nations.

To increase generalizability, Porter (1997) also recommends providing a complete description of the subjects participating in the research, as in doing so, makes it easier for others to ascertain the range of external validity and hence their "willingness to generalize the results" (p. 539). To increase the generalizability of results, Porter also recommends *random selection*. To use this technique, the 'largest group possible' for a study is defined and then a sample randomly selected. Although Study II was able to sample users from around the globe, Study I was limited to female Korean ESL learners. Therefore, although it might seem reasonable to expect similar results from other ESL learners around the world, caution must be taken in making this presumption.

Study I Confounding Variables

The results from Study I should be considered against the following possible confounding variables:

1. Difference in time. According to general observations made during the comparison study, backed by data from Study II, learners spent on average 300% more time on the web-based materials. Although part of this time was spent adapting to the new media and dealing with heightened accessibility problems created by a sluggish network and greater bandwidth demands of the web-based materials, the 2.1% learning gains could be attributed to the increase in time. Originally, Study I was designed to keep the time spent on materials the same. However, along with an excruciatingly sluggish network -- and the desire for the students to stop using the text-based materials, quickly take the online quiz, and spend more time on the web-based materials -- it became almost impossible to control this variable. For this potentially confounding variable to be better controlled, the learning materials should have built-in timing controls and be delivered under a more reliable network.

2. Interaction with the FIRST control group or treatment group materials affecting the results of the SECOND quiz. To limit the impact on the predicted learning gains caused by the possibility of the FIRST exercise and quiz affecting the results of SECOND quiz score (and for that matter the anticipation of the SECOND quiz affecting the FIRST quiz), an equal number of study participants were assigned randomly to start with either the web-based or text-based materials. The implementation of this experimental design however led to significant differences between the web-based exercises FIRST and SECOND quiz results, limiting the amount of quiz score data that could be used to test for significance.

3. Sluggish network. The A1 and B1 materials were designed for more than adequate performance over a 28.8 modem loading on average in less than 15 seconds per file. However, the SMU network was experiencing severe congestion problems during the study which caused even small files to freeze or not load properly. This made the 4 KB A2 and B2 materials more usable than the approximately 900 KB A1 and B1 materials.

4. Possibility of the 'post hoc' fallacy. The 'Post Hoc' fallacy says that "if B follows A then A caused B" (Huff, 1993, 87). In this experiment, it was hypothesized that by applying WeBIC strategies to online materials the treatment group would perform better than the control group. However, it is possible that the 2.1% learning gains were due to increased motivation and effort to study with the new learning materials. Clark (1983), commenting on reported achievement gains in comparison studies of computer instruction with conventional instruction contends that "the increased attention paid by students sometimes results in increased effort or persistence, which yields achievement gains" (p. 449). The problem, Clark cautions is that if the gains are due to a novelty effect, these gains tend to diminish, as students become more familiar with the new medium.

5. Not a true random sample of the population. The 121 Study I participants came from 1,793 students registered in GEP II classes for September 2000. Although classes were for the most part assigned randomly to instructors to meet the program scheduling needs, thus in effect creating a random selection of participants from the population, it should be kept in mind that students often register in classes grouped according to their major and preference of instructor. Generalizations made to the whole GEP II program should thus be made with some degree of caution.

Study II Confounding Variables

The results from Study II should be considered against the following possible confounding variables:

1. Use of the term 'average' and definition of terms. The web mining statistics compiled by the various instruments in Study II are flawed by unclear definitions and explanations of how the software actually compiles its data. Measurement results are confounded by the frequent use of the word 'average' and 'visitor' with unclear operational definitions. Huff (1993) warns that "often an average--whether mean or median, specified or unspecified--is such an oversimplification that it is worse than useless" (pp. 42-43). He adds that a good deal of misunderstandings can be avoided if to the *norm* or *averages* of results, an indication of the *range* is added (p. 45). None of the web mining instruments provide ranges of error for their data figures. In the data tabulation charts of the various web mining instruments, the terms 'page view', 'hits', and 'page hits' are also unclear and not always defined as to what exactly they are measuring.

2. Population sample not large enough and not clearly defined in AS-1. In order to be able to reproduce and test the results of an experiment, the 'universe' or 'population' must be specified. Without a reliable sample of the population, a research cannot get reliable results. Even though NetWorldMap provided some indication of where visitors were coming from, it cannot be known for sure whether these visitors were indeed ESL learners. With only about 1,500 page hits to work with and a little over 300 unique visitors, it is possible that the results could have been heavily confounded by a group of ESL instructors or educators and webmasters interested in designing a similar ESL site.

3. Time zones did not match. Data compiled though AXS were set at Korean time. However, the data for the other web mining instruments were based on local times of the host servers of HitBox and Tierranet which are based in San Diego. Being that Seoul is 16 hours ahead of San Diego, AXS data included the first 16 hours of Sunday, October 1, and did not include data for the first sixteen hours of Friday, September 1. However, considering the greater impact of the other confounding variables, the impact of this confounding variable is small and does not threaten the usability of the results.

4. Caches stores popular and previously accessed files. IE stores recently accessed pages, images and others files in its browser cache. This speeds up future access by other users and allows quicker use of the browser's 'back' and 'forward' buttons. The problem is that once in the browser's cache, access to various files are not registered by the server log files. This can have a serious impact on averages and percentages if not properly factored into the results. WebTrends reports that almost 20% of its hits were cached i.e., accessed from the browser's cache, for AS-1 and 13% for AS-2 indicating that these results were factored into its data. However, how its cached percentages were derived or tracked is unclear in its documentation. HitBox and AXS, on the other hand, are able to track use of the 'back' button, with limited and erratic accuracy. For a more controlled study, it would be better to eliminate the browser cache. However, due to the sluggishness of the SMU network, this would be unwise.

   It should also be kept in mind that browser cache is not the only cache that can confound the results. Through out the Web, there are numerous small caches which store frequently accessed data to help speed up the Web. These caches are essential for the web but disastrous for statistics. Goldberg (1995) comments that "without caching, the web would have collapsed long ago." Goldberg outlines at least five possible caches within a web system as outlined below. During AS-2, for example, an SMU student's request for the text_b1.htm might go as follows.

   a. *Browser Cache*. IE looks for text_b1.htm in its own memory. If it finds it, it will bring it up without making any request to the server it originally came from.
   b. *Local Site Cache* Next it may look for the file in its site cache, that is, if someone at the user's same site recently retrieved the page.
   c. *Local Regional Cache*. If its not there, it may look for it in a local regional cache such as one set up by SMU.
   d. *Larger Regional Cache*. Next, it may look at a larger regional cache set up for SMU's ISP, Seoul and or the Asia Pacific region.

e. *Accelerator*. Next, it may look at an accelerator setup by Tierranet, the web host for this page, to see if it is stored with other frequently accessed files.
f. *Tierranet Server*. Lastly, it will make a request from the Tierranet server. The text_b1.htm file would then be retrieved and its request recorded in a server access log file.

Turner (2000) maintains that almost everyone is now accessing the Web through a cache. "If the proportion of requests retrieved from the cache is 50% (a not unrealistic figure) then half of the users requests aren't being seen by the servers."

Study III Confounding Variables

The results from Study III should be considered against the following possible confounding variables.

1. Bias and subjectivity of the evaluator. ESLenglish.com and the comparison study materials were evaluated by the author of this thesis and are thus filled with the authors biases and subjective judgments. A more accurate study would have compiled results from numerous reviewers of the online instructional materials at ESLenglish.com as well as other online instructional materials from other websites and other online educational agencies. This lack of depth, makes Study III quite biased and difficult to generalize beyond ESLenglish.com.

2. Unclear methodology for evaluation. Simon and Burstein (1985) state that "behind every numerical measurement lies an operational definition" (p. 15). The evaluation scoring system used by WeBIC is easy to explain to others, however it is quite difficult to apply consistently and relate its application scientifically to others. The WeBIC scoring system is highly subjective, despite its design to be otherwise. Due to the depth and variety of its questions, it is near impossible to provide a clear operational definition for what measures a score of zero, one, two or three.

CHAPTER VII

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

In this concluding section, the usability of WeBIC as an instructional design tool is discussed under a number of key areas as brought out by the results of the three studies. In summarizing these conclusions, only the most relevant issues have been addressed.

Study I Conclusions

The 2.1% learning gains reported in Study I can be attributed in part to their superior design and greater instructional effectiveness. Although these gains were found to be non-significant, and possibly confounded by unforeseen variables in the design of the experiment including the fact that students spent more time on the web-based learning materials than the text-based materials, the observations made during the study and the results of the survey indicate a strong preference for these materials over the text-based materials and a greater sense of accomplishment. These learning gains are even somewhat surprising considering the sluggishness of the SMU network and the confusion at the beginning of the study which directly affected the usability of the web-based materials. The results of Study I also confirm the importance of many of the strategies in WeBIC and hence its usefulness as a design tool. The most important of these are explained below **under the reference number of the corresponding WeBIC strategy** as listed in Appendix A (e.g., 4.7 refers to WeBIC Strategy 4.7 ‘Audio Effectiveness’ under the sub-process of ‘Media/Technologies Analysis’).

4.7 Audio is effective for ESL learners. With a preference rate of 35% overall, nine percent higher than the second place Hot Potatoes puzzle activities at 26%, and rated first in three out of six classes, the 'Flash Text with Sound' proved to be the most desirable learning format. With the Flash exercises streaming at about 2 KB per second, a bandwidth demand quite attainable even over a 14.4 K modem, for ESL learners, web-based listening activities in conjunction with interactive instant feedback quizzes present a unique learning opportunity unavailable in other media.

8.11 Navigation ease is essential. During the study, it was observed that a number of students were puzzled and did not know what to do next. Despite numerous design attempts to simplify navigation, provide navigation aids, and simplify instructions, the ESL learners still had trouble navigating. It can be concluded that navigation is never simple or easy enough and must always be in a constant state of improvement.

9.2 Interactivity is motivating. The increased interaction between the materials and the students in the form of increased attention and focus when listening to the Flash files, increased cognitive activity during puzzle solving, and the positive reinforcement of the online quiz feedback, may have contributed to the learning gains of the web-based materials. The importance of interaction was evident with the students of class E, who rated the online quizzes as by far the most important web-based activity. For class E, the online quizzes loaded significantly faster than the other web-based materials, supporting the design principle that the quality of interaction is heavily influenced by speed of access.

10.1 Instant feedback is highly motivating. The surprisingly high survey results of the online quiz, as being a highly desirable web-based learning activity, demonstrates the positive correlation between instant feedback and learning satisfaction. In fact it could be argued that the rating of the 'control group', text-based exercises at 5.89, as shown in Table 10, may have been confounded somewhat and higher than it should be, due to the likely perception that the online-quiz was part of the learning experience for exercises A2 and B2.

12.1 An uncluttered interface is essential for ESL learners. The two-frame and one-frame versions of the web-based materials received more positive feedback than the four-frame version. Although the four-frame version was based on design principles outlined by Gillani and Relan (1997), it was observed to be quite ineffective for ESL learners using the web-based phrase exercises. Three or four frames may be possible for ESL users studying over an extended period and who have had time to master an interface, but not for learners who need to learn a new interface quickly.

12.5 Page length should be small enough to keep navigational aids visible without scrolling. While students were using the Flash text with sound, and the Hot Potatoes puzzles, navigation links disappeared from the menu screen. This left a number of students confused as to what they should do next. Unless exercises are sequenced i.e., numbered, it is advisable to keep all activities within a 800 x 600 viewing field, including the space occupied by the browser controls. No scrolling should be required.

12.7 Speed of access is critical. Class E rated the web-based materials the lowest, had the highest number of students who actually preferred the text-based materials over the web-based materials, and had the lowest number of students who thought the web-based materials were 'interesting.' Although, there is no clear connection between learning gains and speed of access, the connectivity and access problems class E experienced, which were the highest out of all six groups, is the most likely source of their greater frustration with the web-based materials. The fact that the use of floppy disks for other class groups helped to alleviate this problem further supports the WeBIC principle that poor access speed can create serious usability problems.

Study II Conclusions

The results of Study II point out many of the shortcomings of the web-based Study I instructional materials, as well as the instructional materials at ESLenglish.com. They also confirm the importance of key strategies in WeBIC, especially the importance of proper navigation, meaningful content, speed of access, use of frames and social learning structures. Each of these, as well as other important key areas are explained below under the **reference number of the corresponding WeBIC strategy** as listed in Appendix A (e.g., 7.3 refers to WeBIC Strategy 7.3 'Index and Site Map' under the sub-process of 'Preparation Design').

7.3 Site map proved to be quite popular. The frequent use of the Lesson A and B site maps, as summarized in the results of comparison study, indicate that ESL learners are quite familiar with site maps and like to frequent them to figure out the structure of a site. ESLenglish.com does not have a site map. It would be wise to include one.

7.8 Search capabilities were rarely used. The ESLenglish.com search engine was rarely used. Although Nielsen's research (2000) reports on the importance of search engines, for ESL learners or visitors looking for instruction rather than information, a search engine may not be as critical.

8.4 Content should be practical and meaningful to ESL learners. As summarized in the results section of the comparison study, although more than 90% of SMU students surveyed rated ESLenglish.com as motivational and that they liked the content, only 54% said they would visit the site again. As summarized from Tables 18, 19, and 20, 15% of the site visitors left ESLenglish.com through the esl-lab.com link, 50% left ESLenglish.com after only two pages, and only 16% of the visitors stayed longer than 10 minutes. Mobasher (1997c) advises that since many users do not browse further than two pages into a site "it would be prudent to ensure that important information is contained within . . . common site entry points."

These results suggest that to retain visitors ESLenglish.com must feature more listening activities that are clearly accessible from the navigation menu and clearly accessible at common entry points. It would also be prudent to feature and promote listening and quiz activities using icons and text near the navigation menu or other visually attracting point. One method would be to use a random .cgi script to insert HTML links and images in a 'Featured Activity' box located near the main menu.

8.8 Graphic and animation files were small enough to avoid bandwidth problems. The Flash text with sound .swf files were simple in design with reasonable audio quality. Although, the file sizes were quite large at 494 KB and 521 KB each for Exercise A1 and B1, under conditions of proper connectivity (i.e., the LAN was not congested), both streamed quite well at about 2 KB per second. This streaming rate is very usable over the Internet. Even users with modest bandwidth access can take advantage of this type of learning format.

8.10 Multiple versions of the learning materials suited different learning styles. The web-based learning materials provided four different ways of learning: Flash text with sound, text with right and wrong feedback, puzzle activities, and instant feedback online quizzes. Although the highest percentage of students preferred the Flash text with sound, the percentages for the preferred learning formats ranged reasonably close to each other from 18 to 35%, indicating that each learning format had a sufficient enough support to merit inclusion.

9.3 Some 'interactive technologies' do not support interaction. The popularity of the quizzes and quiz links indicates a preference for instant feedback from ESL users. However, with few people accessing the guestbook.mv, it is questionable whether this "at one time interactive medium" can still be considered usable on the Web with today's web users being more sophisticated, easily distracted, and perhaps quite weary of this type of interaction.

9.5 Social learning and collaboration support are necessary to encourage interaction. Interaction on the wwwboards and chat rooms was virtually non-existent. Although an examination of the log file revealed that a number of the pen pal board messages were viewed, and a few users accessed the chatpro.cgi script, minimal interaction resulted. A sense of community was not created. The chat rooms were also infrequently used with only three or four visitors logging in. Along with the fact that the discussion forums were only accessible from the home page and the discussion page, further contributed to a sense that these forums were unimportant and not worthy of participation. Obviously, a forum cannot be considered interactive if no one posts any responses.

The higher interest in links to pen pal signup sheets, the high number of 'pen pal' search engine referrers, and the high access to the site's pen pals page, indicate an opportunity for the development of social learning and collaboration, if the site can better design and implement these materials. With the highest visitor sessions during Thursday and Friday, North American Time, (Wednesday and Thursday Korean time), it would be advisable to set up and promote chatting times on these days.

<u>12.2 Content is not always as usable as it should be</u>. With more than 400 users following links to sites and activities outside of ESLenglish.com, as a link resource, ESLenglish.com is providing a useful instructional service. A 28 to 31% visitor return rate as shown in the results of Table 12 is also quite exceptional. However, with the average number of pages being viewed only between two to three pages, this suggests weaknesses in content. For a web site dedicated to providing instruction, ESLenglish.com should be keeping its visitors for longer than two or three pages.

The interactive JavaScript based ‘lovequiz’ proved to be of interest to users and suggests that more of its type should be developed. However, the song1bwb.htm, which provided text to an original song and RealAudio along with a fill-in-the-blanks quiz, did not seem to attract enough attention. This learning exercise should be redesigned as a Flash plug-in with a multiple-choice quiz. The low viewing/listening times for this file along with the famous_speeches.htm file may also suggest that ESL learners may not like to type while listening. It might be better to design listening activities that require learners to click rather than type, and if they must type, to type single easy-to-spell words with plenty of time.

12.3 Frames should be avoided. Although the two-frames version of the web-based comparison study materials was observed to be as usable as the one-frame or single page version, it is obvious from the web mining data, that too many visitors are entering ESLenglish.com from non-frame pages. When this happens, the users are left with minimal navigation tools and are highly likely to leave the site and not to return. It would be more prudent to use pop-up frames for outside links and some exercises where it is difficult to add proper navigation menus, and perhaps two-frames for lesson activities to simplify navigation.

12.4 Layout should be usable at all screen resolutions. With over 16% of the visitors having screen sizes at 640 x 480 and nearly 30% of the users at 1024 x 768, ESLenglish.com must develop a usable screen design at all resolutions. Currently, the screen design at smaller resolutions reserves too much wasted space for a background image. Also, considering that horizontal scrolling is one of the worst web interactions as experienced by users (Nielsen, 2000), the layout must be made more compact to eliminate scrolling, yet at the same time remain expandable, so that users are able to take advantage of their larger screens.

12.7 Speed of access is reasonable on the inner pages but too slow on the home page. The reload count tracked by HitBox displays the total number of times a visitor clicks on the ‘Refresh’ or ‘Reload’ button within 30 seconds of the first time they view a page. A low count is a good indicator that visitors are not having too many problems loading the web pages. On the other hand, a higher count may indicate a connectivity or capacity problem, or pages that are too large and images not optimized for fast download. With a reload rate of 3.3%, it can be concluded that most users were able to view the contents of ESLenglish.com. However, with more than half of the home page visitors leaving right away, it is quite possible that the homepage is either too slow or does not have enough visible benefits to entice visitors into the site. The graphics on the home page should be simplified and better navigational links provided to inner pages. For ESLenglish.com, the home page should be one of the fastest loading pages on the site, if not *the* fastest.

12.8 Principles of ‘technological minimalism’ should be applied to audio components. Although the Flash component on the home page should be removed to speed up access, considering the potential Flash has to help ESL learners improve their listening skills along with the fact that most users have it installed on their system, Flash should be used more frequently on ESLenglish.com. On the other hand, with about one third of the visitors not having the RealPlayer plug-in, along with the fact that no user downloaded this plug-in from the required_plug-ins.htm page, it can be concluded that this type of technology may not be user-friendly to typical visitors of ESLenglish.com and should be used less frequently.

13.2 Inadequate support tools. In the comparison study, class E pretty much ignored the study tips page. For short lessons, such tips are not relevant and should not waste valuable screen space. The tool bars links on ESLenglish.com received only a small percentage of the total links followed. This use is not sufficient to justify the amount of valuable screen space they occupy. The popularity of the grammar link over the dictionary link, may indicate that more grammar tools and less dictionary related tools might better meet user needs. It would also perhaps be instructionally more effective to include a HTML content page in the ESLenglish.com site that focuses on grammar quizzes and resources.

14.1 Website should be more accessible. With between 1,000 to 1,500 pages hits per month, traffic to ESLenglish.com is insufficient. More traffic is needed to take advantage of interactive elements and develop a sense of community. The keywords ‘asian pen pals’, ‘chat acronyms’, ‘stories for ESL’, and others as listed in Table 19, should be added to the keyword and description META tags in the HTML pages. The purchase of additional domain names with keywords in them especially ‘English’, ‘listening’, ‘grammar’, and ‘pen pals’ may also be appropriate for increasing site traffic.

15.1 ‘Organizational learning’ from web mining data should be taken with a grain of salt! From the variety and inconsistency of results tracked and reported by the various web mining instruments, it is apparent that web mining data cannot be fully trusted. Goldberg (1995) takes an even more aggressive stance on the meaninglessness of web usage statistics. He says:

> Web usage statistics, such as those produced by programs such as analog cannot be used to make any inferences about the number of people who have read it. Although those who compile these statistics usually try to make this clear, people still insist on using them. Attaching meaning to meaningless numbers is worse than not having the numbers at all. When you lack information, it is best to know that you lack the information. Web statistics may give the user a false sense of knowledge which is worse than being knowingly ignorant.

Goldberg compares web mining to putting up advertising posters: “You will never really know how many people notice or read them.” He gives the following explanation:

1. Although “it is probably safe to say this if one page shows more hits then another that there really were more accesses to that page,” it should be kept in mind that popular pages also have a tendency to be cached more.
2. It is difficult to use stats to assess changes over time, because you never know when a new cache might be added to a system to speed up a network.
3. Stats cannot assess the relative popularity of different Internet domains such as .ac.uk, .jp, .ac.kr or .ca, because for example, if Japan has a very high level of regional and national caching while Korea does not, under these circumstances, web statistics might show more accesses from Korea than Japan even if more people in Japan accessed a site.
4. It is possible to ensure that a document is never cached however this will make the page “(much) harder for people to get to and add to network traffic unnecessarily.” In fact, “if someone fails to reach your page at your site, they may give up on the site all together.”

Goldberg concludes that “web stats are useful for web administrators to get a sense of the actual load on the server.” This information is useful for planning purposes, for detecting unusual behavior, and for improving the speed and reliability of obtaining documents from the site. Ironically, "the best way to achieve [speedy downloads] is to have browsers retrieve documents from places closer to where they will be used [i.e., the browser cache] than to get them from the disk on the server." However, since "it is only when the file is retrieved from the server that the server has the ability to keep track of the access," this goal is counter productive to obtaining accurate stats. Goldberg adds:

> It would take serious statistic analysis of the sort that professional market research firms may be able to undertake and still the estimates . . . would remain iffy at best . . . performing complicated analyses on dubious data only compounds the problem, and the marginal utility would be negative (i.e., the large amount of extra effort would not be justified by the tiny gain in meaningfulness of the statistics).

Turner (2000) is also cautious about inferring too much from web usage statistics. He contends that "the only things you can know for certain are the number of requests made to your server, when they were made, which files were asked for, and which host asked you for them." He explains the following:

1. You cannot tell how many visitors you have had because (a) if users get your pages from a local cache server, you will never know about it, and (b) many users can appear to connect from the same host.
2. You cannot tell how many visits you have had especially since, under pressure from advertiser's organizations, many programs (like WebTrends) define a *visit* or a *session* as "a sequence of requests from the same host until there is a half-hour gap." Many users also may follow a link out of a site and then use the browser back button to continued from a previously cached page.
3. Cookies do not necessarily solve these problems because they can be turned off.
4. You often cannot tell where a returning visitor enters your site because they may have retrieved your home page from their cache, but not subsequent pages they want to read.

5. You cannot tell how long people spent reading each page because they might have followed a link out of your site or were busy playing a quick game of Minesweeper.

15.3 Performance indicators developed from web mining statistics should be interpreted cautiously. Web mining is more of an art form than an exact science. Results are open to endless speculation and interpretation due to numerous confounding variables. The home pages view totals from NetTracker (394), WebTrends (403), AXS (286) and HitBox (514), averaged 399 plus or minus 29%. The total page view counts averaged 1344 plus or minus 19%. The monthly uniques averaged 342 plus or minus 21%.

In evaluating the usability of NetTracker, WebTrends, OpenWebScope, AXS, and HitBox the following conclusions were drawn: (1) HitBox provides the most statistics but is slow to access over the Web. It also frequently fails to load and hence track during periods of net congestion. The required ‘HitBox Button’ is also quite ugly and distracting. (2) NetTracker provides more data to analyze than WebTrends, but the WebTrends interface is more usable and clean. Both these programs take from five to ten minutes to analyze the 40 MB server log file. (3) OpenWebScope has a poor interface design, and its data are not as usable as WebTrends’ and NetTrackers.’ On the upside, it was very fast. It analyzed a 40 MB log file in under a 40 seconds. Its reported results also compare quite closely to the results of WebTrends. Furthermore, it is also free, while both NetTracker and WebTrends retail at US $495 and $499. (4) AXS is an outstanding free CGI script. In particular, its ability to track ‘links followed’ is a feature that sets it apart from the others. Its disadvantage, like HitBox, is that tracking code has to be inserted into each page. AXS has an admin script that analyzes data right off the Web quite smoothly. It processed a 345 KB log file from Study II in under a minute.

Study III Conclusions

Although the assessment of the web-based, text-based and ESLenglish.com instructional materials using WeBIC was quite subjective, the process itself provided a systematic way of looking at the materials to help determine areas that needed improvement. The scores themselves could be used as benchmarks and starting points to evaluate and compare any future online instructional materials developed for ESLenglish.com. To some extent, the evaluation results of WeBIC could have been more objective if an outside researcher had been brought in to evaluate the instructional materials. Indeed, a possible use for WeBIC would be for instructional agencies to hire independent researchers to use it as a basis for conducting a complete feature analysis of the final version of an online instructional product, as well as an extensive interview of the ID team to determine to what extent the IDE team actually met objectives like purpose definition, participant analysis, and needs analysis.

Understanding the purpose of WeBIC. Andrews and Goodson (1980) list four purposes that an instructional design model can serve (p. 3-4):

1. Improving learning and instruction by means of the problem-solving and feedback characteristics of the systematic approach.
2. Improving management of instructional design and development by means of monitoring and control functions of the systematic approach.
3. Improving evaluation processes by means of the designated components and sequence of events, including the feedback and revision events, inherent in models of systematic instructional design.

4. Testing or building learning or instructional theory by means of theory-based design within a model of systematic instructional design.

WeBIC is most concerned with the first three of these purposes and thus is aimed at improving the learning, management, and evaluation processes of online instruction. WeBIC has not been designed to test or build instructional theory, as it represents a synthesis and balance of existing models, learning theories and practical strategies as researched in the literature.

Understanding the strength and weaknesses of WeBIC. WeBIC appears to be a prescriptive artifact of the ADDIE model. But it also strives to create an online instructional design process that is flexible to the practical time and money constraints of instructional designers, as well as open to non-linear applications of ID. It can be used from the beginning to end or in stages. Gayeski (1998) cautions that:

> Discrete, step-by-step procedures are too linear and time-consuming to be practical in the real world of training on fast-changing topics. The development cycle time is too long, and too much time is spent on detailed analysis and design before getting people's feedback on drafts or before actual rollout. Linear approaches tend to make developers think that they can't offer anything at all until analysis and design are done. But that can mean that critical problems aren't addressed for many months.

Gayeski surmises that "linear models don't reflect the way that experts actually work when designing learning and performance improvement systems." Most instructional designers "challenge assumptions, brainstorm solutions, and rapidly generate a rich set of possibilities before gradually narrowing them down after considering wide factors." In fact, in many corporations, Gayeski adds, "most executives are trying to foster management cultures of speed, performance, collaboration, flexibility, continuous improvement, and diversity" while models like ADDIE, and derivations of it, keep ID professionals out-of-step with the times and back in the dark ages.

Therefore, the new ID model of the future must be closely in tune with the financial needs of organizations and realize that "one size doesn't fit all." WeBIC has been designed around the central process of *purpose definition*. All processes flow from and interact with the purpose definition, just like all policies and decisions from modern day corporations are derived from mission and goal statements. The purpose definition is unique to every organization and gives WeBIC the flexibility and non-linearity that other prescriptive linear models do not have. The purpose definition also gives the instructional designer the theoretical framework to cut out or add processes to the sub-processes of WeBIC, if necessary, to be more closely in turn with the needs and constraints of the organization.

WeBIC is not a design model. It is a design tool, that offers strategies and insights into the design process. These strategies are flexible and changeable and in this lies their strength and perhaps weakness.

Recommendations

Based on the results and conclusions of the three studies, a number of recommendations have been made for the redesign of: (1) the online instructional materials used in the comparison study; (2) the online instructional materials at ESLenglish; and (3) the WeBIC strategies and questions.

Recommendations for Improving Web-based Exercises A1 and B1

Based upon the study results, to improve the A1 and B1 online instructional materials, the following changes should be made:

1. *Hot Potatoes Puzzles*. All matching exercises and jumbled phrase exercises should be redesigned to reduce and better yet completely eliminate the need for any scrolling on an 800 x 600 interface.
2. *Text with Right and Wrong Answer Feedback*. This page should be redesigned to use JavaScripts or CGI scripts as the form-based feedback is rather clunky and perhaps silly.
3. *Pop-up Frame*. The comparison exercises should be linked to ESLenglish.com in a pop-up frame. A second navigation frame placed in the top of the pop-up frame should be considered in its design to aid navigation.
4. *Online Quizzes*. As feedback, the online quizzes are fine. However, as a testing instruments they are too easy. The online quizzes should be more made more difficult, and the number of possible answer options increased from three to four.
5. *Navigational Menu*. The navigation menu at the top of the page should be redesigned to be recognized more easily as a navigation menu.

Recommendations for Improving ESLenglish.com

Based upon the study results, to improve ESLenglish.com, the following changes should be made:

1. *Home Page*. The home page should be reduced in size. Images should be optimized. Navigation aids should be visible without scrolling. The home page should load in 10 seconds or less.
2. *Frames*. Frames should be removed to allow users to enter anywhere on the site. Instead, virtual includes should be used e.g., <!--#include virtual="/cgi-t/menu.cgi?file=navigationmenu.txt"-->. Virtual includes will simplify navigation menu design. If a change is made, the navigation menu will not have to be updated on every page.

3. *Listening Activities*. Listening activities should be added to keep users on the site.
4. *Discussion Forums*. Links to the discussion forums should be placed on every page. To jump start discussions, students at SMU should be asked to post a comment or reply. A more usable wwwboard should also be investigated to simplify interaction.
5. *Tool Bar*. The tool bar should be redesigned to load faster, occupy less space and include more grammar links.
6. *Chatting Time*. One chatting time per week should be set up on Thursday, Korean time, the highest traffic day.
7. *Pen Pal Sign Up*. The pen pal signup sheet should be simpler to use, based on a question and answer form script to replace the awkward wwwboard sign-up sheet. A search engine should then be set up so users can access a pen pal database and find users of similar interests.
8. *Site Map*. A site map should be created that is accessible from every page.
9. *Screen Design and Layout*. The screen should fit and look good on all screen sizes. The site layout of www.testden.com, which loads in under 24 seconds using a 28.8 modem offers a good design model, following a high percentage of the design principles of WeBIC. Sites like www.scorecard.org, which feature NO images and loads in under four seconds, should also be considered as a screen design option.
10. *Quizzes and Exercises*. Quizzes and exercises should progress from easy to difficult. Confidence can be built by "using easy to difficult sequencing of content, exercises, and [quizzes]" (Keller & Burkman, 1993, 18). Quizzes can also be designed at a challenge level "to produce an appropriate expectancy for success" (p. 16).
11. *Background Image*. All background images should be removed. The background image on the frames pages takes up too much prime viewing screen and at 16 KB increases bandwidth demand with no real user benefits. A more simpler design would speed up the site and allow greater flexibility.
12. *Directory Structure*. To encourage linking from other sites, the directory structure should be simplified. For example the current URL for the quiz page is

http://www.eslenglish.com/myenglishbuddy_members/Quizzes/quizzes.htm. A simpler more usable URL would be http://www.eslenglish.com/quizzes.htm.

13. *Site Speed*. Flanders (1999) 47.8 KB rule is a useful guide to follow when developing web material. However, to become truly user-friendly, this size is still too large. Nielsen's 30 KB, 10 second rule encourages more usability. As much as possible, all ESLenglish.com pages should be kept under 30 KB, especially those pages that mainly function as navigation pages, and where users are the least likely to wait.

Recommendations for Improving WeBIC

Based upon the study results, to improve WeBIC, the following changes should be made:

1. *Tested on More Online Instructional Materials*. WeBIC needs to be used to evaluate more sites and online instructional materials. With more practical applications, the utility and scope of the questions can be reassessed and refined.
2. *Question Wording*. The wording of the WeBIC questions must constantly be rethought so they encourage the most objective evaluation possible yet at the same time cover the most important areas of online instructional design.
3. *Evaluation Scale*. A variety of evaluation scales should be reviewed to determine if a more objective rating scale can be adopted. As well, rating criteria should be improved and clarified after feedback from practical applications.

Suggestions for Further Research

Outlined below are seven possible areas of further research related to WeBIC, online instructional design and web mining.

1. Using WeBIC to Design and Study Other Online Instructional Materials

Study I and III could be repeated using a wider variety of online instructional materials to verify or challenge the learning gains achieved in the comparison study.

2. Using WeBIC to Evaluate Online Educational Delivery Applications

WeBIC could be used to evaluate online educational delivery applications (i.e., course in the box-software) that is currently being used in web-based learning and training such as those available at Blackboard.com and WebCT.com. Landon, Bruce and Harby (2000) have currently evaluated and reviewed more than 40 online educational delivery applications, with more than 60 others pending review as of October 24, 2000. Their results are available online at http://www.olin.nf.ca/landonline/ and would provide an excellent starting point for such research. The results from this evaluation study could also be used to further refine WeBIC and more accurately reflect effective strategies being used in the field of online ID.

3. Developing a Web-Based Program Design and Development Model

WeBIC offers strategies for online instructional materials, but does not address other important issues such as program planning, cost factors and other important constraints. WeBIC could be used as a basis for designing a new web-based program design and development model, based on existing ID models, learning theories and practical web design strategies. This model could be applied to developing web-based courses and programs at a University or College, factoring in needs analysis, marketing, administrative, cost, management, design, implementation, evaluation, and other important variables. The focus of this model will be efficiency (profitability), effectiveness (quality) and usability. This model could also be used to evaluate online educational delivery applications, or propose an 'ideal' web-based program, that could operate profitably under existing technology and financial constraints, common to many educational organizations wishing to adopt a web-based delivery application.

4. Expanding WeBIC to Design More 'Usable' WBI Materials

The term 'usability' has perfectly captured the essence of web design and online instructional design in a single word. WeBIC offers nine strategies and 33 questions to help users develop usable instructional materials. However, these may not be enough. Keith Instone (2000) has created usableweb.com which offers 1124 links directed towards the study of web usability. He summarizes, "Usable Web is a collection of links about human factors, user interface issues, and usable design specific to the World Wide Web." It would be an interested study to research each or the best of these links to sum up the most valid usability research and design strategies on the Web, and use this information to redefine, refine and expand upon WeBIC and to create a home for this information at a website such as usablewebdesign.com (a domain name under the ownership of the author of this thesis). Usability design principles could also be further researched through an extensive bulk email questionnaire targeted towards webmasters to survey their design practices. As well, webmasters offering content sites could have their sites evaluated for usability. Considering that Jakob Nielsen charges $30,000 for this service, it would be reasonable to assume that webmasters would be interested in a free site usability assessment in exchange for letting their results be published.

From another perspective, it might be more beneficial to use the above research resources to reduce rather than expand upon WeBIC so as to derive questions, strategies and classifications that address only the most essential areas of web usability. This would provide instructional designers with only the most important, usable and necessary tools for web design, rather than overburden them with a seemingly never ending list of strategies and questions.

5. Developing the Ideal Web Mining Tool

Because the web mining of server data are limited to actual server requests and not page views, and because caches are likely to continue to exist on the Web for sometime, the reliability and accuracy of log file mining is limited. What needs to be developed is a simple trackable code like AXS and HitBox that always loads, always makes a request to the server, and loads extremely fast. This code could be perhaps designed into web design software like FrontPage and automatically inserted into every page. A CGI script or other programming language could then be configured to store data into a log file, and if necessary, periodically summarize large logs to keep them from taking up too much server space. To conserve server space, it would also be useful for the log script to record data that is customizable so as to track only the desired information.

6. Finding Out What Web Mining Software Actually Measures

Web mining software has grown out of the need for dot.com companies to track users and determine advertising charges, as well as for the knowledge on how to make their site more usable. However, this data are highly error prone. And being that caches are so important to the usability of the entire Web, it is highly unlikely that this data will become much more accurate in the near future. Thus, it would be beneficial to find out what these tools really measure, how each of them defines their terminology, such as ‘page visit’, ‘page hit’, ‘document hit’, ‘unique visitor’, ‘visiting session’, and how cache systems truly affect their results. The challenge for this study would be to find a way to design pages so they would not be cached, and at the same time, keep the site speed usable enough so users would not have a tendency to leave non-cached pages more than cached pages.

7. Using Microsoft Access to Data Mine Server Access Logs

It would be interesting to explore how current database software like Microsoft’s Access could be configured to analyze log files. A template could be developed to compile statistics in tables similar to those of WebTrends and NetTracker.

Final Thoughts

The World Wide Web offers a promising method for disseminating information, education, and training, but its future as an education tool is limited by the thoughtfulness of its application, and as concluded by this thesis, the *usability* of its design. The next phase of the WWW phenomenon is the introduction of inexpensive, broadband satellite connections, secure e-commerce, and the union of the TV and the Internet. Once large amounts of video and sound information can be exchanged rapidly and without bugs, and people can pay for it without fear of credit card fraud, the distance education market will explode -- everything on the Web will explode -- the face of the world will change, permanently.

With 200 questions, 84 strategies, 15 objectives, and a unifying process of purpose definition, WeBIC can help ID teams set standards of quality to create usable online instruction and training materials and meet the challenges of the Web phenomenon. WeBIC however does not pretend to be an instructional design model based on new theories or instructional approachs. Rather, it is a synthesis of existing design ideas and practices to help designers address essential issues in online instructional design. It summarizes planning techniques and analytical tools borrowed from learning theories and practical design strategies that can be used to help design a web-based instructional product from beginning to end or evaluate and improve an existing one. WeBIC, or at least some form or derivation of it, should be a part of every competent designer's toolkit.

The 2.1% learning gains achieved by applying WeBIC strategies to plain text-based materials are encouraging, though not conclusive, and certainly open to further speculation and research as the comparison study quiz results may have been confounded by unforeseen variables. Nevertheless, the three studies as a whole do support the need for speed, navigation ease, proper screen design, interactivity, technological minimalism and numerous other strategies as outlined in WeBIC, including the need for a site map, proper use of frames, and effective use of audio.

It should be kept in mind that although the Web offers considerable advantages over other instructional materials, instructional designers must also consider the limitations of the Web as a teaching and training vehicle and that potentially it can be a major cause of wasted time. To its disadvantage, the Web is (Fahy 1999, 181-182):

a. easy to get lost in (users can get confused bouncing around from one link to another);
b. unstructured;
c. non-interactive (although this is changing);
d. complex (the amount of information on the Web is mind-boggling); and
e. time-consuming (because it is non-linear and invites exploration).

These problems can be lessened to some extent by applying WeBIC strategies, but they will never by completely overcome.

In closing, McDonald (1996, as cited in Fahy, 1999, 182) concludes that the Web will only become a useful educational tool when it exhibits:

1. *Ease of Use*. The Internet must become as easy to use as a telephone.
2. *Accessibility*. Learners and teachers must have access to the Internet as convenient as the telephone.

Similarly, this thesis concludes, supported by its research in the development of WeBIC and its related studies, that ID for the Web will only become usable when it exhibits:

1. *Navigation ease*. The vast amount of information and learning materials available on the Web and individual sites must be easy for users to find and be related to their interests and learning needs.
2. *Speed of access*. Online instructional materials must offer response times less than ten seconds and ideally, closer to one second, and eventually one tenth of a second. Indeed, site speed is the single most important 'human factor' to make training and online instructional materials more effective. As Nielsen (2000b) affirms "download times rule the web."

APPENDIX A

Web-based Instruction Checklist (WeBIC).

Sub-process	WeBIC Questions
1.0	*Purpose Definition*:
1.1	Stakeholder identification. a--Have stakeholders been identified?
1.2	Purpose statement. a--Has a purpose statement been developed for the ID project? b--Is the purpose statement concise and relevant (no more than 100 words)? c--Is the purpose statement expressed in the instructional materials?
1.3	Goal statements. a--Have goal statements been developed to expand upon the purpose statement? b--Are they expressed in the instructional materials?
1.4	Constraints summary. a--Have constraints, resources, and stakeholder needs and priorities been considered and factored into the purpose statement and goal statements?
1.5	Philosophy statement. a--Does the organization have a philosophy/values statement? b--Is this statement expressed in the instructional materials?
1.6	Detailed needs assessment. a--Has a detailed needs analysis been conducted? b--Have the results of this analysis been incorporated into the purpose definition? c--Was the needs assessment conducted in a scientific manner that can be verified by outside sources if necessary?
2.0	*Learner Analysis*:
2.1	Learner needs and characteristics. a--Have learner characteristics been identified? b--Have the learner characteristics and needs been incorporated into the instructional goals and design of materials? c--Is there a learner summary statement?
2.2	Required entry skills and prerequisites. a--Are entry skills, equipment and other prerequisites clearly stated? b--Do learners have access to the necessary equipment to properly access the online instructional materials?
3.0	*Performance Analysis*:
3.1	Performance goals. a--Has the desired performance been determined? b--Have performance goals been written? c--Are these goals realistic?
3.2	Task and content analysis. a--Was a proper task and content analysis conducted? b--Did the task and content analysis include feedback from stakeholders?
3.3	Performance gap statement. a--Has a performance gap statement or similar statement been developed to summarize the performance analysis?
4.0	*Media/Technologies Analysis*:
4.1	CASCOIME criteria. a--Is the medium or technology cost efficient? b--Accessible and convenient? c--Socially and political suitable? d--Culturally friendly? e--Open and flexible? f--Interactive? g--Motivational? h--Effective?
4.2	Proven technologies. a--Do the media and technologies selected have a strong record of proven performance and web usability?
4.3	Technologies that impede interaction. a--Are the media and technologies selected unlikely to produce conflicts, difficulties and behaviors in learners that will reduce interaction?
4.4	Media effectiveness supported. a--Is the medium backed by research or usability studies

that validate its suitability and effectiveness at solving the types of instructional problems that the ID team wishes to solve?

4.5 Print effectiveness. a--Are printed media appropriate and feasible? b--Do they increase the usability and effectiveness of the instructional materials?

4.6 Visuals effectiveness. a--Are visual media appropriate and feasible? b--Do they increase the usability and effectiveness of the instructional materials?

4.7 Audio effectiveness. a--Are audio media appropriate and feasible? b--Do they increase the usability and effectiveness of the instructional materials?

4.8 Video effectiveness. a--Are video and animation media appropriate and feasible? b--Do they increase the usability and effectiveness of the instructional materials?

5.0 *Format Design*:

5.1 Web-based format. a--Is the web-based format selected feasible considering the resources of the instructional agency? b--Are there valid reasons for the selection of the web-based format in terms of learner needs, effectiveness, usability features, and ease of design and maintenance?

5.2 Screen option. a--Is the page-based, frame-based, or screen-based option selected the most effective delivery format for the targeted learners in terms of usability, ease of design, and ease of maintenance?

5.3 Learning format support. a--Do the media and technologies selected support the desired learning format? b--Does the learning format take advantage of the Web medium? c--Does the learning format support and facilitate interaction and collaboration?

6.0 *Instructional Objectives Design*:

6.1 Performance objectives. a--Have instructional objectives been developed? b--Are they appropriate? c--Do they describe what the learners need to learn and how this will be measured? d--In greater detail, do they describe what the learners will be able to do upon completion of the objective, under what special conditions (if any) must the learners demonstrate the performance, and what the minimum acceptable level of performance is as measured by a specified performance measure?

6.2 Bloom’s taxonomy. a--Have a variety of instructional objectives been written to help learners develop related knowledge, comprehension, application, analysis, synthesis, and evaluation skills?

6.3 Overuse of objectives. a--Are there enough instructional objectives to properly carry out the performance goals without overloading students with too many learning demands?

7.0 *Preparation Design*:

7.1 Configuration help. a--Are links and help pages provided for required plug-ins and special software? b--If the instructional materials are best viewed in a specific browser or at a certain screen size (e.g., 800 x 600 pixels), is this information provided? c--Is information provided regarding the desired connection speed and computer setup? d--Are students provided with a list of any additional materials required to complete the instruction?

7.2 Guidance elements. a--Are guidance elements and site features designed to attract, hold, and focus attention? b--Are clear and easy-to-follow directions provided?

7.3 Index and site map. a--Does the site have a detailed index or site map? b--Is the index or site map easy to find and access?

7.4 Introduction page. a-- Is there an introduction page? b--Does the introduction page have all the necessary components including time required to complete the instructional materials?

7.5 Navigation menu. a--Does the navigation menu accurately reflect the structure of the site? b--Is the navigation structure shallow, but broad?

7.6 Objectives clearly stated. a--Have objectives been clearly stated in the instructional materials, either as an introduction or review of the content?

7.7 Past knowledge. a--Do the instructional materials have activities or content that remind learners of past knowledge?

7.8 Search capabilities. a--Does the course website provide search capabilities for its content? b--Can the search criteria be defined? c--Is the search feature available on every single page of the course site for easy access?

7.9 Study guidelines. a--Is a study guide provided? b--Are guidelines and strategies provided to help learners meet the performance objectives?

7.10 Titles and headings. a--Do titles and headings clearly reflect the content of the instructional materials?

8.0 *Presentation Design*:

8.1 Captions. a--Are captions provided for all images, tables and charts?

8.2 Color use. a--Are colors used in the instructional materials necessary and appealing and do they add to the instructional effectiveness?

8.3 Content non-biased. a--Is the content non-discriminatory to minority groups? b--Is the content non-gender biased?

8.4 Content practical and meaningful. a--Is the content practical, relevant and meaningful to the learners?

8.5 Content sources cited. a--Are all sources referenced? b--Are links provided for all Web-based sources and references?

8.6 Content up-to-date. a--Are the instructional materials up-to-date?

8.7 Credibility and authorship. a--Is authorship of the instructional materials clearly stated? b--Is the author credible? c--Is the agency sponsoring the instructional materials credible? d--Do the instructional materials look credible? e--Do the instructional materials compare well with the offerings of competitive educational organizations? f--Is there a ‘last updated’ notice?

8.8 Graphics and animations. a--Are graphics and illustrations used effectively? b--Are animations used appropriately so that they are not distracting and properly focus attention where important? c--Are the animations files sizes small enough to avoid bandwidth problems?

8.9 Linking. a--Are internal links well-positioned and easily accessible to users? b--Are related links grouped together? c--Are links properly labeled to facilitate comprehension and help users make quick decisions about whether they need to click the link? d--Have the number of links been limited to keep students from drifting off task?

8.10 Multiple versions provided. a--Are different versions of the instructional materials provided to make the content more accessible to learners with different computer systems and learning styles?

8.11 Navigation ease. a--Is navigation simple, fast and intuitive? b--Do learners always know where they are? c--Do learners always know where they have been? d--Do learners always know where they can go next? e--Do learners know right away where to start a lesson and right away when they have finished?

8.12 Quantity of materials. a--Is the right amount of text used? b--Is enough material provided to keep learners occupied and motivated, but not so much as to make them feel overwhelmed?

8.13 Reusable design. a--Have standards been established to help make instructional materials reusable? b--Are tutorials and sequenced lessons easy to change, rearrange, expand upon, and subtract from to develop new or updated instructional materials?

8.14 Sequencing of objectives. a--Are the performance objectives and learning tasks sequenced using a proven sequencing strategy? b--Is the sequencing strategy appropriate for the targeted learners?

8.15 Simulations and examples. a--Are enough examples presented? b--Do the examples adequately illustrate the range of material being presented? c--Are simple as well as complex examples included?

8.16 Variety of instructional activities. a--Are a variety of instructional activities provided to accommodate different learning styles and multiple intelligences?

9.0 *Participation Design*:

9.1 Friendly and motivational environment. a--Is the online environment friendly and motivational? b--Does the site motivate students to interact?

9.2 Interactivity. a--Do the instructional materials encourage learners to participate actively in the instruction? b--Are opportunities provided for the learners to apply the instructional materials to their own experiences? c--Are group activities and/or projects provided?

9.3 Interactivity technologies. a--Are design and delivery technologies being used to support interaction?

9.4 Interactive innovation. a--Have steps been taken to innovate and improve existing interactive components and technologies?

9.5 Social learning and collaboration support. a--Do the instructional materials have characteristics of interpersonal face-to-face communication? b--Is the instruction supported by online discussion forums (CMC), chat and email components that are easy to use? c--Is there a sense of community and collaboration?

10.0 *Practice and Feedback Design*:

10.1 Instant feedback. a--Is the feedback immediate? b--Is the feedback positive? c--Is the feedback provided in gradual steps?

10.2 Feedback methods. a--Is exploration feedback provided in the form of links to definitions, concepts principles and facts? b--Are feedback links provided for right and wrong answers? c--Are CGI scripts or JavaScripts used to provide feedback?

10.3 Feedback variety. a--Are a variety of worked examples and problems repeated throughout the materials to provide users with a more complete understanding of the instructional materials?

10.4 Online access to experts and instructors. a--Are email links provided to instructors and other experts so that learners can easily ask questions and seek help from their browsers? b--Is there a Q & A discussion board?

10.5 Survey tool. a--Can online surveys be easily designed and implemented to collect user opinions and feedback? b--Is the feedback provided immediately after the user has entered their opinion?

10.6 Student work displayed. a--Does the course site have a page where student work can be displayed? b--Are contributions screened before being posted to the course site?

10.7 User feedback and input forms. a--Are online forms provided for users to make suggestions or ask questions? b--Are suggestions and feedback regularly posted and responded to?

11.0 *Performance Assessment Design*:

11.1 Objective consistency. a--Is their consistency between the objectives, content and testing i.e., do the tests actually measure what is being taught?

11.2 CGI quizzes. a--Are online quizzes provided with immediate feedback to learners? b--Are the results automatically tabulated and sent to the site instructor in a reliable and secure manner?

12.0 *Usability Design*:

12.1 Clutter-free (low cognitive bandwidth). a--Has excessive information and unessential design elements been removed from the interface? b--Does every element on the interface have a distinct purpose that facilitates the mastery of the instructional objectives? c--Does the interface look and feel clutter free?

12.2 Content usability. a--Is the content authoritative? b--Accurate? c--Objective? d--Current? e--Complete?

12.3 Frames. a--If frame pages are used, do they follow the basic principles of Gillani and Relan's instructional design model to provide some semblance of an advance organizer phase, a modeling phase, an exploring phase, and a generating phase? b--Are each of the frame viewing areas easily understandable and clearly related to the learning objectives? c--Do the frames encourage overall usability of the instructional materials?

12.4 Layout usability (screen design). a--Is the layout simple in design, balanced and easy to understand? b--Has attention been directed to what is important and away from what is not important? c--Has important information been highlighted with visual cues? d--Does the layout help the learner form an accurate picture of the site structure and contents? e--Is the layout visually appealing? f--Is important information at the top of the page? g--Does the overall layout improve comprehension of the content?

12.5 Page length usability. a--Are introductory and navigational pages short enough to minimize scrolling?

12.6 Readability. Is content easy to read and understand for the target market i.e., has the content been presented at a level appropriate to the target audience? b--Is the content well formatted? c--Have proper fonts been used? d--Have writing guidelines been established to make future content additions readable and suitable for the target audience?

12.7 Speed of access. a--Is each page size, including text, HTML code, images, and other components, under 47.8 KB, and preferably under 30 KB? b--Have all graphics been shrunk as small as possible? c--Has page access speed been tested on the platform of the typical user and is this speed acceptable? d--Are logo, banner, PDF, audio, and video file access speeds reasonable?

12.8 Technological minimalism. a--Do all bleeding-edge technologies incorporated into the instructional materials have a definable purpose that supports learning? b--Are no silly technologies used that merely 'showcase' the talents of the ID team? c--Do all bleeding-edge technologies such as Java, JavaScript, RealAudio and other plug-ins function smoothly without any glitches on a variety of browsers and operating systems, and under realistic access speeds?

12.9 User friendliness. a--Are simple text and graphics used to avoid bandwidth problems? b--Do the learners and teachers feel comfortable using new technologies incorporated into the instructional materials? c--Is the software required to use the instructional materials easy to learn?

13.0 *Support Services Development*:

13.1 Support services and materials. a--Is there an online library? b--Is support provided for technology related problems? c--Is the assignment turn-around-time within one week or less? d--Are additional support services and materials offered to help learners master the instructional objectives, such as downloadable PDF manuals, a web-based email account, a 24 hour email answering desk, an online tutor, virtual study groups, and resource study centers in disadvantaged areas?

13.2 Support tools. a--Is there an online glossary of important terms? b--Is there a related links page? c--Is there an online help button or FAQ link on every page? d--Are additional support tools provided such as online dictionaries and encyclopedias that are usable and functional on a variety of user platforms?

14.0 *Website Development*:

14.1 Implementation ease. a--Are sufficient resources, staff and infrastructures available to support the design and development of the website? b--Is a web server or web host easily available to upload the instructional materials to? c--Is the web server reliable? d--Is enough bandwidth available to support the number of users during peak periods and to keep the response times fast enough? e--Will students and staff be able to use the website easily without training? f--Is the course website easily accessible with an easy-to-remember URL address and proper search engine placement?

14.2 Maintenance and tinkering. a--Once the instructional materials have been installed, do they literally 'run themselves' requiring only minor maintenance, modifications and updates?

14.3 Web-based resources management. a--Are the materials compact and easily added to? b--Is there room for growth? c--Are links tested regularly? d--Does only one person have edit privileges? e--Are there no 'under construction' notices? f--Has a webmaster been appointed?

15.0 *Evaluation*:

15.1 Organizational learning. a--Does the design of the instructional materials facilitate the gathering of data which can be used to evaluate and improve its effectiveness and efficiency, as well as provide a deeper understanding of its impact on the learners? b--Are server access logs being analyzed regularly to spot usage trends? c--Has special web mining software been installed to monitor critical design areas?

15.2 OPEQ criteria. a--Does the evaluation plan address each of the questions outlined in OPEQ?

15.3 Performance indicators. a--Have performance indicators been developed that provide useful information and benchmarks to help improve the effectiveness and efficiency of the instructional materials?

15.4 Accountability. a--Have policies and standards of accountability been established to outline the roles and responsibilities of all participants in the evaluation process?

15.5 End-of-course questionnaire. a--Is there a properly designed end-of-course online questionnaire that can be used to survey learners to help assess the effectiveness of instructional materials and make improvements?

Note. For each of the WeBIC questions the following rating scale has been used: 0=strongly disagree (SD), 1 = disagree (D), 2 = agree, (A) and 3 = strongly agree (SA).

APPENDIX B

GEP II: English Phrases Handout (Version A1/B2)

NAME **A1**		ID#		MY#	
Comp **B2**		MAJOR			

Introduction: Today we are going to cover 40 phrases related to our text *Springboard English II*. We are going to use materials that are text-based (words only) and web-based (words + graphics + sound). to see which format is better for learning phrases. (1) First, you will study 20 phrases from **exercise A** (text-based) followed by a short online quiz where you will have to fill-in-the-blanks of missing words from the phrases. You will have 15 to 20 minutes to study the materials and about 5 minutes to take the quiz. Write down your quiz score on the sheet of paper I have given you. (2) Second, you will study 20 phrases from **exercise B** (web-based) followed by another short quiz. Again, you will have about 15 to 20 minutes to study the materials and 5 minutes to take the quiz. (3) Third, following the quizzes, you will have 30 minutes to freely surf ESLenglish.com, as long as the SMU server is not too busy. Do not visit Korean sites. At the end of the class answer the survey questions. This survey to help me improve the content of my site.

The two quizzes will be graded, however only the highest grade will count for a small portion of your final grade. You will be given a test sheet or you will take the quiz on the Internet. There are two different sets of phrases for exercise A and exercise B (A1, A2, B1 and B2). You will start with exercise **A1** and then **B2** **OR** **B1** and ten **A2**. Please do not talk during the exercise. If you have a problem raise your hand. Please turn on your speakers for sound.

Instructions:

Exercise A:

1) Go to **http://www.eslenglish.com/go/a1** (or type in a:\go\a1\index.htm)
2) Study for 15-20 minutes. I will let you know when your time is up.
3) When time is up, click on "**Test A**." The "user name" is "Peter." I will give you the password when it is time. You have five minutes. After the five minutes is up, click "submit quiz" at the bottom of the page whether you are finished or not.

QUIZ SCORE 1

Exercise B:

1) Go to **http://www.eslenglish.com/go/b2** (or type in a:\go\b2\index.htm)
4) Study for 15-20 minutes. I will let you know when your time is up.
2) When time is up, click on "**Test B**." The "user name" is "Peter." I will give you the password when it is time. You have five minutes. After the five minutes is up, click "submit quiz" at the bottom of the page whether you are finished or not.

QUIZ SCORE 1

PART C:

1) Go to **http://www.eslenglish.com**
2) Surf for 30 minutes. I will let you know when your time is up.

PART D:

1) Answer the ten questions on the back of this sheet (the first five if we do not surf).
2) When finished, hand it in to me.
3) You can now leave. Have a nice day! ☺ And thank you for your participation.

Questionnaire

PART I -- 40 English Phrases

Answer each of the following questions about the two phrase exercises:

1) Which exercise did you prefer?
   - ❒ **Exercise 1** -- Web-based Instruction (with sound, images, colors, answers, links, puzzles, etc.).
   - ❒ **Exercise 2** -- Text Based Instruction (no sound, black and white text).
2) Would you study English using the format of **Exercise 1** -- (web-based)?
   - ❒ Never. I don't like it.
   - ❒ Maybe?!
   - ❒ Sure. Why not.
   - ❒ YES! I think it was very interesting.
3) Would you study English using the format of **Exercise 2** -- (text-based)?
   - ❒ Never. I don't like it.
   - ❒ Maybe?!
   - ❒ Sure. Why not.
   - ❒ YES! I think it was very interesting.
4) Which types of activities did you like the best in **Exercise 1** -- (web-based)?
   - ❒ Text with Sound.
   - ❒ Text with Right and Wrong Answers.
   - ❒ Puzzles (matching, jumbled words).
   - ❒ Quiz.
5) Rate **Exercise 1** and **Exercise 2** from 1 to 10 (10 is the highest, 1 is the lowest):

Exercise 1 (Web-based)	**Exercise 2** (Text-based)
❒ 1	❒ 1
❒ 2	❒ 2
❒ 3	❒ 3
❒ 4	❒ 4
❒ 5	❒ 5
❒ 6	❒ 6
❒ 7	❒ 7
❒ 8	❒ 8
❒ 9	❒ 9
❒ 10	❒ 10

PART II -- ESLenglish.com Website

Answer each of the following questions regarding the website ESLenglish.com:

6) I found the website well organized and easy to navigate (i.e., I knew where everything was; it was easy to understand).
   - ❒ Strongly Disagree
   - ❒ Disagree
   - ❒ Agree
   - ❒ Strongly Agree
7) I liked the contents of this site.
   - ❒ Strongly Disagree
   - ❒ Disagree
   - ❒ Agree
   - ❒ Strongly Agree
8) The site grabbed my attention and motivated me to learn English.
   - ❒ Strongly Disagree
   - ❒ Disagree
   - ❒ Agree
   - ❒ Strongly Agree
9) Select comments that you **agree** with (more than one can be selected):
   - ❒ I enjoyed the games the most.
   - ❒ I enjoyed the quizzes the most.
   - ❒ I listened to the "Famous Speeches" and filled in the missing words.
   - ❒ I thought the site was too busy. There was too much happening. It gave me a headache.
   - ❒ I will come back and try some of the listening exercises.
   - ❒ I will visit this site again in my spare time.
   - ❒ I would recommend this site to my friends.
   - ❒ The links were interesting.
10) Rate ESLenglish.com from 1 to 10 (10 is the highest, 1 is the lowest):
   - ❒ 1
   - ❒ 2
   - ❒ 3
   - ❒ 4
   - ❒ 5
   - ❒ 6
   - ❒ 7
   - ❒ 8
   - ❒ 9
   - ❒ 10

Note. The font size for this handout has been reduced to properly show the page design of the original.

APPENDIX C

Text for Phrase Exercises A2 and B2

Note. Shown below is the exact formatting of the A2 and B2 exercises as used in the comparison study.

****
20 PHRASES -- A2
****

DIRECTIONS

Below are 20 phrases from the GEP II text. You have 15 minutes to study all 20 phrases. When I tell you to STOP, click Test A to take the test. I will give you a password. You will have 5 minutes to complete the test.

PHRASES

1. Sumi: Do you think women spend too much money on beauty products?
Mi Ryu: Yes, they do. All women want to be more beautiful, so they don't care about how much money they spend.

2. Sumi: Would you date someone 10 years older than you?
Ki Nyun: Yes. Age is not important. Love is important.

3. Sumi: Do you have a boyfriend?
Shin Hye: No, I don't. I want to have a boyfriend.

4. Sumi: Who should be the boss in a family, the man or the woman?
Joo Young: Naturally, the man should be the boss in a family.

5. Sumi: Do you think it's OK for a woman to ask a man out on a date?
Joo Yun: Of course. Why not? I would ask a man out on a date.

6. Sumi: Do you organize your time well?
Peter: I like to think so, but sometimes I feel like I'm wasting too much time.

7. Sumi: What do you do when you can't sleep?
Go Eun: I go out for a smoke at midnight when I can't sleep.

8. Sumi: Do you think you get enough sleep?
Seung Eun: No, I don't. I have lots of homework.

9. Sumi: Do you drink less than 3 cups of coffee, tea, or cola?
Su Hee: Yes, I do. I only drink cola twice a day.

10. Sumi: Do you like to read?
Peter: I usually read every day. In fact, I think reading is the most important way of improving your English.

11. Sumi: Who is your Favorite Korean author?
Kum Shil: My favorite Korean author is Park, Kyung-Ri, because her work always touches my heart. How about you?

12. Sumi: Have you ever met a famous author?
Seung Hee: Yes, I have. Her name is Park, Wan-seo, a famous female author in Korea. She graduated from my mother's high school. So when she visited our school, I met her.

13. Sumi: Who sings, "I Will Always Love You"?
Ji Na: Whitney Houston! This song is the theme song of the movie "Bodyguard."

14. Sumi: Have you ever seen the "Oprah Winfrey Show"?
Ji Young: Yes. I have seen her show on CNN.

15. Sumi: What kind of food did you eat?
Su Yeon: I mostly ate rice and Kim-chi.

16. Sumi: What kinds of things did you do during your summer vacation?
Bia: I went to the beach. I swam, tanned, and had fun with my friends. Some times though, I should have just stayed at home and relaxed.

17. Sumi: Do you want to go shopping?
Peter: Not really. I don't like shopping. I only shop when I have to.

18. Sumi: Where is the party?
Jee Yeon: It's at Bia's place. She lives in Pun-dang.

19. Sumi: What time does the party start?
Hyo Jung: I think the party starts at 7 o'clock.

20. Sumi: Insa-Dong is a good place for window-shopping. Do you want to come with me on Friday?
Kyung Mi: Oh yeah. I'd like to go.

When I tell you to STOP, click Test A to take the test. I will give you a password. You will have 5 minutes to complete the test.

****
20 PHRASES -- B2
****

DIRECTIONS

Below are 20 phrases from the GEP II text. You have 15 minutes to study all 20 phrases. When I tell you to STOP, click Test B to take the test. I will give you a password. You have about 5 minutes to complete the test.

PHRASES

1. Sumi: What are you doing?
Hee Young: I am going to study English. I have a test.

2. Peter: What do you usually do in the evening?
Hae Ran: I usually watch TV with my friends or have a conversation with my family. I also enjoy radio programs and gossiping with my roommates. I live in a dormitory.

3. Sumi: What is your favorite holiday?
Seung Mi: My favorite holiday is Chusock, because I like to cook and I can see my relatives?

4. Sumi: Who is your favorite female singer?
Hwa Young: I am fond of Enya's music and I think that she has a mystical voice. Her music is very unique.

5. Sumi: Who is your favorite actress?
Hye Hyun: My favorite actress is Ann Heché. I think that she is a special actress.

6. Sumi: What is the best movie you've seen in the past 6 months?
Min Hee: "Titanic" is the best movie I've seen in the past 6 months. It made me cry and I can still remember every scene in the movie. I also like the theme song which is "My Heart Will Go On."

7. Sumi: What is your all-time favorite movie?
Hye Jung: My all-time favorite movie is "Gone with the Wind." I was impressed with the leading lady.

8. Sumi: What kind of music do you absolutely hate?
Bo Young: I hate Korean trot music.

9. Sumi: What's important for you when you buy clothes or accessories?
Peter: Quality! Buy the best and it will last longer and look better.

10. Sumi: Do you like wearing school uniforms?
Hye Young: I don't like to wear uniforms. It's an intolerable custom.

11. Sumi: Have you ever used C++?
Moon Young: What did you say? I mean, pardon? I don't know what C++ is.

12. Sumi: What are you working on?
Min Jung: I'm composing a song about my last winter vacation.

13. Sumi: What do you do?
Mi Young: I'm an office worker.

14. Sumi: What are you studying?
Chae Hee: I am studying English.

15. Sumi: Have you ever been to an Indian restaurant?
Gil Sun: No, I haven't. Indian restaurants are very rare in Korea. I'd like to visit one sometime.

16. Sumi: Did you eat spaghetti last night?
Youn Jin: Yes, I did. I also ate Pizza and ice cream. It was delicious.

17. Sumi: How often do you drink beer?
Eun Joo: I drink beer at every opportunity.

18. Sumi: Have you ever been to McDonald's?
Jin A: Of course! I often go there. However, I was disappointed to hear that the Bulgogi Burger is not made with real beef.

19. Sumi: How often do you ride a bicycle?
Peter: Never! Here in Seoul, that's the quickest way to get yourself killed. There are too many crazy drivers in big cities like Seoul.

20. Sumi: What do you like to do when you have free time?
Eun Ju: I usually enjoy playing racquetball. But these days I can't play, because I don't know where a racquetball court is and I can't find a partner to play with here in Seoul.

When I tell you to stop, click Test B to take the test. I will give you a password. You have about 5 minutes to complete the test.

APPENDIX D

Quiz Results Data from Classes B, C, D, E, F and G

	B				C				D			
S	A1	A2	B1	B2	A1	A2	B1	B2	A1	A2	B1	B2
1		100	100			100	100					
2	100			100		100	85					
3						85	100					
4						100	100		85			90
5	75			95	100			80	75			75
6	90			95	100			95		100	100	
7		100	100			100	100		95			90
8	95			100	100			95				
9		100	90			95	95			75	85	
10		100	100		80			95	90			85
11	100			95	100			100		85	80	
12		85	100							80	95	
13									95			100
14		100	100			95	95					
15	100			100		95	100			100	100	
16					95			95	90			75
17		90	100		75			70				
18	90			95		100	100					
19	100			100		100	100					
20		95	90		100			100				
21	100			100	100			100				
22					100			100				
23						95	100					
24					95			100				
25	100			100		100	95					
26		100	90			100	100					
27	90			100	100			95				
28	95			100		100	100					
29		100	90									
30												
Total	1135	970	960	1180	1145	1365	1370	1125	530	440	460	515
# of	12	10	10	12	12	14	14	12	6	5	5	6
Avg.	94.6	97.0	96.0	98.3	95.4	97.5	97.9	93.8	88.3	88.0	92.0	85.8
A1>A2	No		No		No		Yes		Yes		Yes	
A1>B2	No		No		Yes		Yes		Yes		Yes	

Note. Classes B, C and D used a modular page-based WBT design for exercises A1 and B1 (one frame).

	E				F				G			
S	A1	A2	B1	B2	A1	A2	B1	B2	A1	A2	B1	B2
1										90	95	
2	100			100		100	100					
3		70	100		90			100				
4	100			95		95	100					
5	90			80		85	95					
6		100	100			100	100		100			85
7		95	100		100			95				
8		100	90			95	100					
9	100			100		100	95			100	100	
10	100			100	100			100				
11		95	90			100	100		100			100
12					95			100				
13					100			100		95	95	
14	90			95					85			50
15		95	95		100			100	100			95
16		5	50			95	100			100	90	
17	100			95	100			100		95	100	
18		95	95			80	100		100			100
19						85	95					
20	100			100	95			100	100			90
21	85			100		95	100					
22	90			80	100			90	95			90
23		85	100									
24						95	100					
25		100	90		85			90		80	100	
26		90	95							100	100	
27										90	85	
28		95	100						100			100
29	100			85								
30	100			95								
Total	1155	1025	1105	1125	965	1125	1185	975	780	750	765	710
# of	12	12	12	12	10	12	12	10	8	8	8	8
Avg.	96.3	85.4	92.1	93.8	96.5	93.8	98.8	97.5	97.5	93.8	95.6	88.8
A1>A2	Yes		No		Yes		Yes		Yes		Yes	
A1>B2	Yes		Yes		No		Yes		Yes		Yes	

Note. Classes F and G used a two-frame frame-based WBT design for exercises A1 and B1, while Class E used a four-frame frame-based WBT design based on Gillani and Relan's (1997) Instructional Design Model.

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