CHAPTER 1
INTRODUCTION

The Internet, the World Wide Web and Cyberspace

Although the quality of information available on the Internet has been questioned, Cyberspace has truly opened an information highway. Technology has gained attention in education today because of its prevalence; its promise to provide low cost education; and it may help some people to participate more easily, to learn more effectively, and to enjoy learning more (Palmieri, 1997). Given adequate access to technology, the Internet, the World Wide Web (WWW), and Cyberspace can provide both teachers and students with an ever-growing resource of information. Teachers can introduce and use information from the WWW for instruction and supplementing almost any subject matter. Used effectively, this environment has the potential to level the playing field for education in rural communities that typically lack the resources found in major metropolitan areas.

Imagine the student sits at a classroom computer grazing the Internet—a global network linking the student with vast databases. Schools are rushing to install networks and Internet nodes so that all classrooms might sit down to sample the electronic feast. How might we take advantage of the Internet to raise a generation of free-range students? The rich information resources to be found in Cyberspace are both a blessing and a curse. Unless students have a toolkit of thinking and problem-solving skills, which match the feasts of information, they may emerge from their meals bloated with techno-garbage, information junk food or info-fat. We must teach students to graze and digest the offerings thoughtfully in order to achieve insight. For the computer to bring about a revolution in higher education, its introduction must be accompanied by improvements in our understanding of learning and teaching. (Simon, 1996, p. 23)

Three issues of particular concern to educators emerge in using the seemingly infinite resources available on the Internet and WWW. The first concern relates to information overload and lack of useful instructional format; the second concern relates to identifying the necessary skills and attitudes to enable users to critically evaluate and use the resources; and the third is to effectively design and evaluate different learning formats. Access to the WWW has the potential to change how educators think of themselves, their roles, and their instructional techniques. Learning through the Internet provides the flexibility and efficiency of computer instruction as well as individual attention of traditional instruction (Huang, 1997). Instructors could be more than knowledge providers, as the WWW could allow them to devote attention to a more global facilitation of learning such as appropriate presentation formats. McDonald and Ingvarson (1995) found that technology may have the potential to free teachers from the moment-by-moment demands of whole class teaching, enabling them to concentrate on challenging students and catering to students as individuals. The WWW and subsequent electronic media can move beyond didactic instruction to model directly the modes of inquiry made easier with computers. Also, by including the Internet and the WWW in classrooms, teachers can assist students in becoming active participants in the construction of their own knowledge. Results have shown that Internet use can increase post-secondary student performance on learning in science concepts (Follansbee, 1997). This increase can be related to using the Internet as a supplemental resource for students to use to conduct their own forms of investigative inquiry. By using it as a tool, the information available through the Internet provides a wealth of resources for both students and teachers to search and research issues and topics of concern. The nonlinear organization of text and graphics on the Internet allows greater user control and learners may be motivated to engagement. However, materials must be presented clearly by establishing relational paths without eliminating multiple selections. A constructivist approach permits this and the freedom to explore (O’Carroll,
1997). Authentic research and learning activities used to promote inquiry and knowledge construction by these approaches can be motivating for Internet users.

One note of caution--some educators are demonstrating academic anxiety about the information age. Novek’s (1996) study suggests that the expansion of the information economy is a cause for deep concern in higher education. If educators are to take full advantage of the interactive characteristics of new technology then we must do more than simply adapt the technology to old styles of pedagogy.

**The Interface Between the Internet and Informal Settings**

The new computer aspect of pedagogy is not without precedence. In essence, the approach to accessing useful information through the Internet is analogous to learning in other, more familiar, informal settings. Informal settings are typically places where learning takes place in out-of-school settings, such as museums, zoos, aquaria, science and technology centers, homes, and clubs. They are also characterized by intrinsic motivation, the content is variable and possibly unsequenced, attendance is voluntary, displays and objects are provided, learners of all ages may participate, and there is more diversity in the learners’ backgrounds. Therefore, the freedom or “free choice” environment which the learner finds in a museum setting is similar to the freedom one may experience in an Internet setting, providing multiple options, or links in which to direct his or her attention.

Attention is a necessary prerequisite for learning. Attention and engagement are pivotal to perception and coding, which are involved in the subsequent retrieval of information. Even though museums have existed for many years, actual learning in museum research is relatively new. Koran, Longino and Shafer (1983) have found that a considerable amount of sensory stimulation, learning, and affect appears to be influenced in these “free-choice” settings. Shettel (1996) suggested that time on task (i.e., holding power) have been found to be one of the most useful predictors of educational effectiveness. Similarly, Falk (1983) found that both the time spent at an exhibit and the nature of the interaction affect the amount of learning which occurs. The time and stops at a museum can be equivalent to the duration and engagement of a WWW homepage. Falk and Dierking’s model (1992) suggested that visitors construct their own unique meaning for the visit experience according to personal background and interaction with their social and physical environment. They have found that memories from visits to informal learning settings are persistent in the minds of children and remain with them into adulthood. Thus, by applying appropriate educational theories, this lifelong learning is another strong argument for the importance of learning in informal settings.

Application of appropriate educational learning theories is critical for instruction in informal settings. A firm theoretical foundation offers teachers a starting point from which they can build a series of learning opportunities, responding to all styles and encouraging a wide range of strategies in order to encourage successful learning. Innovative approaches plus access to appropriate technologies will lead to the creation of new learning environments that are flexible and provide a custom education for each student, regardless of class size, time and distance constraints, previous preparation, and personal factors. Selection of appropriate technologies should be defined by the desired learning outcomes and students' needs to perform tasks according to their individual styles and strategies, not because the technology may provide an alternate “fun” approach to learning. Rather than depend on a single set of materials and activities within a content area, all learning becomes interdisciplinary as students expand on prior knowledge, pursue interests, combine information in new ways to solve problems, and reach new understanding of old knowledge. Learning becomes a dynamic, customized pursuit of new solutions rather than the acquisition of a preconceived package of facts. Learners may become teachers within a new cycle of exploration and discovery. Technology may add the tools that facilitate access to the people, content, strategies, activities, guidance, and opportunities to apply new information that make learning a personal process.

However, passively hoping that learners will be able to activate appropriate learning strategies in an informal learning environment without guidance is insufficient to ensure successful learning and development. Instead, strategy development and application can be actively included in learning opportunities. In this light, appropriate technologies can enable teachers to provide students with choices as to when, where, and how they
access information. These choices allow students to apply a variety of strategies that help organize and advance the learning event. This type of “self-regulated” learning can become a vital and enhancing part of learning through computers. In this manner, it offers a natural indoctrination into this helpful learning style which has shown success in other venues, but has been difficult to incorporate into student skill sets.

There are several characteristics of computer technology that make it a desirable vehicle for examining the concept of self-regulated learning. Self-regulated learning is not a mental ability, such as intelligence, or an academic skill, such as reading proficiency; rather, it is the self-directive process through which learners transform their mental abilities into academic skills (Schunk & Zimmerman, 1998). Computers make it possible to independently store data collected via interaction with the student thus providing the possibility for following student moves as a source of data and later providing feedback to them. This capability has instructional benefits: first, learner interaction with concepts can be stored and retrieved for later analysis; and second, the immediate feedback that the learner receives allows a greater degree of learner control by providing individualized opportunities for review. McDonald and Ingverson (1995) found that independent learning of this type has a strong chance of success due to the extended resources which the computer offers. Theoreticians seem to agree that the most effective learners are self-regulating (Zimmerman, 1996; Winne, 1995). In academic contexts, self-regulation is a style of engaging with tasks in which students exercise a suite of powerful skills: setting goals for upgrading knowledge; developing strategies; and, as steps are taken and the task evolves, monitoring the accumulating effects of their engagement. As these events unfold, obstacles may be encountered. It may become necessary for self-regulating learners to adjust or even abandon initial goals, to manage motivation, and to adapt and occasionally invent tactics for making progress. Self-regulated students are thus aware of qualities of their own knowledge, beliefs, motivation, and cognitive processing. This awareness provides grounds on which the students judge how well unfolding cognitive engagement matches the standards they set for successful learning (Corno, 1994; Howard-Rose & Winne, 1993; Zimmerman, 1989).

Purpose

The purposes of this study are to (a) identify optimal instructional formats for on-line learning; (b) identify the relationship between post-assessment scores and the student’s gender, age or racial identity; (c) examine the effects of verbal aptitudes on learning in different formats; (d) identify the relationships between computer attitudes and achievement; and (e) identify the potential power for self-regulated learning and self-efficacy on Internet WebPages.

Although the information processing theory (attention, knowledge acquisition, and retention), self-regulated learning and constructivism have been previously examined in other educational settings, this research study adds to the literature because it translates these approaches and their usefulness into the informal setting of Cyberspace.

Statement of the Problem

Developments in media and communication technologies are set to revolutionize education. With modern technology, it is possible to deliver lectures, assignments and information to anyone in possession of a modem and computer (Rose, 1996). The significance of this new technology with respect to education is the ability of the educational superhighway to provide on-demand service; automate assessment techniques and improvements to instructional strategies. Although there is still a way to go in building the education superhighway, the type and usefulness of the material available through the Internet should be considered now. A Report to the Nation on Technology and Education (Dept of Ed, 1996) on technological literacy states that computer skills and the ability to use computers and other technology to improve learning, productivity, and performance has become as fundamental to a person's ability to navigate through society as traditional skills like reading, writing, and arithmetic. The Technology Literacy Challenge envisions a 21st century where all students are technologically literate will require the fulfillment of four main goals: (a) all teachers in the nation will have training to help students learn to use computers and the Internet; (b) all users will have modern multimedia
computers in their classrooms; (c) every classroom will be connected to the information superhighway; and (d) effective software and on-line learning resources will be an integral part of every school's curriculum. A partnership between the private sector, state government, local communities, and the federal government is necessary to achieve these technological goals.

Sherritt and Basom (1997) proposed that the use of the Internet by colleges and universities for delivery of distance education is one trend likely to continue. Unlike previous educational trends driven by research and tradition inside the academic community, Internet use for education is enthusiastically supported by forces outside of academe. The most widely used practices are formal courses, self-directed learning, on-line lecture notes, newsgroups, electronic mail, and virtual reality. Both advantages and limitations apply to Internet learners, educators, and institutions. The economy to offer classes to hundreds of learners is balanced by the enormous costs of establishing and maintaining an infrastructure to manage it. The advantage to learners of acquiring customized education at their convenience is offset by the need for expensive equipment to access the curriculum. The list of established universities adopting or seeking to adopt WWW courses for distance delivery is long. The issues, which are yet to be well researched, are cost effectiveness, quality of learning, accreditation, access, curriculum, assessment, and effective learning formats.

In this age of information, the need for technical skills has put new burdens on our schools, families and communities. The traditional view of education as an activity for the young has been modified by contemporary demands for lifelong learning. How well will we equip the youth to assume the burden of learning for themselves (Zimmerman, Bonner, & Kovach, 1996).

If you give a man a fish, you feed him for a day. If you teach a man to fish, you feed him for a lifetime (Confucius, 551-479 B.C.). Self-regulated learning is an attempt to teach students how to feed their hunger for knowledge for a lifetime. Self-regulation is inherent when learning is guided by goals of any sort (Winne, 1995, 1996). As stated earlier, there are several characteristics of computer technology that make it a desirable vehicle for examining the concept of self-regulated learning. Appropriately configured, computing technologies can be efficient vehicles for academic instruction. However, today’s technologies provide more than this, as we are now able to structure systems students can use to design their own instructional activities. These designs for self-instruction are clear evidence of self-regulated learning (Winne, 1998).

Like conventional tools' students use to learn, Winne and Stockley (1998) indicate that now they will need to be taught how to use computing technologies. Ehley (1992) proposes that effective integration of technology as a learning/teaching tool requires present and future educators not only to be trained in computer use but also to have effective and practical model’s integration of useful learning strategies. Therefore, appropriate, fundamental learning strategies are the best approaches for developing educational material on the Internet. Furthermore, education on the Internet should emphasize self-regulated learning and capitalize on the strength of an inherent “free-choice” environment which the WWW supports.

**Definition of Selected Terms**

For the purpose of this study, the following terms are defined as follows:

**Cyberspace** is the nebulous "place" where humans interact over computer networks, synonymous with virtual space.

**Internet** is a worldwide network of networks that allows users to move files from one computer to another by File Transfer Protocol (FTP), an application program that uses Transmission Control Protocol (TCP/IP), a protocol which makes sure that packets of data are shipped and received in the intended order. It is used with Internet Protocol (IP), the underlying packet standard used to connect networks over the Internet. IP is half of a protocol suite that works and must work with TCP, a protocol to allow you to move files from a distant, host computer to a local computer. A host system is a network computer that can receive information from other computers. Files that are used on the Internet are typically in a HyperText Markup Language (HTML), the programming language used to create web pages. Hypertext Transfer Protocol (HTTP) is the protocol used to provide hypertext links between web pages on-line.
On-line is a buzzword that indicates access to a computer network. A network is a series of points connected by physical or virtual connects on the World Wide Web. World Wide Web (WWW) is a multitude of independent electronic servers (a computer with a special service function on a network, generally receiving and connecting incoming information traffic) which offers an interactive environment that reflects divergent perspectives and multiple constructions of reality. The WWW removes traditional barriers that isolate children and classrooms from the outside world and provide opportunities to build new networks of communities premised on shared interests rather than being constrained by geographical proximity. Web Homepages are the top-level hypertext document in a collection of pages or web site. Homepages often use index.htm as a file name. Internet Address is a set of numbers or letters know as the Internet Protocol (IP) address. The IP address enables you to search, locate, and connect to a specific computer. Self-regulated learning has been defined by Corno and Mandinach (1983) as an effort to deepen and manipulate the associative network in a particular area and to monitor and improve that deepening process. It refers to the deliberate planning and monitoring of the cognitive and affective processes that are involved in the successful completion of academic tasks. Strategies include self evaluation, organizing and transforming, goal-setting and planning, seeking information, keeping records and monitoring, environmental structuring, self-consequating, rehearsing and memorizing, seeking social assistance, and reviewing records (Zimmerman, 1989).

Informal Settings are typically places where learning takes place in museums, zoos, aquaria, science and technology centers, homes, and clubs. They are also characterized as places where motivation is internal, the content is variable and possibly unsequenced, attendance is voluntary, displays and objects are provided, learners are of all ages, and there is more diversity in the learners’ backgrounds (Koran & Koran, 1988). Attention is the focus on a stimulus. Gagne (1973), Keele (1973), and Bransford (1979) maintain that the first step in a sequence of learning and memory events is for the learner to attend to a stimulus.

Knowledge is an interaction between subject and object; a perpetual construction made by exchanges between thought and its object; a reconstitution of reality by the concepts of the subject, who, progressively and with all kinds of experimental probes, approaches the object without ever attaining it in itself (Bringuier, 1980). Retention requires coding and transforming modeled information for storage in memory, as well as cognitively organizing and rehearsing information. Retention is increased by rehearsing information to be learned, coding in visual and symbolic form, and relating new material to information previously stored in memory.

Free-Choice is a modified term used in informal setting environments that emphasizes the freedom which the learner has at choosing the particular exhibits in which to attend, engage, discover and incorporate. This term is often analogous to constructivism in a formal classroom setting. Constructivism is defined as instruction calibrated to the conceptual understanding of the student. The basic idea of constructivism is that the learner must construct knowledge, the teacher cannot supply it (Bringuier, 1980). Constructivism stresses the interaction between learner and the environment and learning is embedded in the context in which it occurs. Thereby learners are encouraged to develop their own understanding of knowledge. A true constructivist environment in Cyberspace would allow the user to access any and all areas of the Internet. However, for this study, a constructivist environment has been operationally defined as one which allows the user (participant) to access several internal links to build their knowledge of the subject.

Structure has been defined by Briggs (1967) as the description of the dependent and independent relationships among component competencies, arranged so as to imply when sequencing can be random or optional and when sequencing must be carefully planned, on the basis that transfer will be optimal in order to build up from simple skills to more complex ones. Objectivism holds that the world is completely and correctly structured in terms of entities, properties, and relations (Duffy & Jonassen, 1991), and that knowledge is stable, staying independent of the individual because the essential properties of objects are knowable and relatively unchanged. It assumes that people can
gain the same understanding, and this understanding can be completed when rational or “systematic rules are used to draw conclusions” (Winograd & Flores, 1986).

Museums are public places of interest for the purpose of conserving, studying, interpreting and exhibiting to the public for instruction and enjoyment. These places may include zoological parks, aquaria, and science centers (Ambrose & Paine, 1993).

Significance of the Study

The Internet is the fastest growing market in the world. IntelliQuest Information Group, Inc. (NASDAQ: IQST) have provided the following statistics:
(a) The use of the Internet and on-line services in the U.S. show 62 million adults or 30% of the population are on-line as of the fourth quarter of 1997. This represents a 32% growth from the 46.8 million users reported one year ago. Anticipated growth predicts the number of wired U.S. residents could approach 70 million by mid-year; (b) The majority of users (80%) are located in the U.S., with 10% from Europe, 5.5% from Canada & Mexico, and 1% Asia; (c) Approximately 57% of the Internet users are male, and the average age is 35; 88% have more education than a high school diploma; 66% of users have a college degree, 20% have a master’s degree, and 7% have a Ph.D.; approximately 50% of users have personal incomes of $50,000 or more and 65% have incomes greater than $35,000; (d) About 50% of the on-line population in the U.S. spend about 5 hours per week on-line, with most surfers sacrificing their television intake; (e) There is one person joining the Internet community every 1.89 seconds, 20-40,000 new users per day, 1,002,612 Web sites active as of April 97; (f) Over 80% of businesses in America have and use a computer for their business. Nearly half of the homes in America have a computer in them.

The increased use of computers and electronic information in society today is evident everywhere and the educational environment is no exception to that expansive growth and influence. Computer systems are extremely useful because of their ability to rearrange or summarize data for subsequent human analysis. However, they cannot turn bad data into truth anymore than humans can. Hence the old saying, "Garbage In, Garbage Out" (GIGO), is well known in the computer world. As quickly as electronic information was being processed, it was just as rapidly evaluated and sometimes discarded as garbage. Systems were not inherently effective; they require an organized plan, a quality process and follow through, but most importantly the type of input information had to be accurate. If the information or programming was not correct--or garbage, one could not magically expect to be provided with sound responses. The computer was hailed as the most advanced system and the most ignorant at the same time, because it could only know something if it was told what to know. The parallels between the field of education and computers are numerous. A teacher cannot expect to receive appropriate responses from the student if they are not first presented with the correct information initially. Therefore, when combining the flaws of a computerized system with learning, it becomes even more critical that educational programs and assessments incorporate quality input in order to produce reliable, quantifiable output. Curley and Strictland (1986) provided guidelines for understanding computer-assisted instruction (CAI) pedagogical designs and evaluating CAI software for its relevance to specific teaching and learning objectives keeping in mind the GIGO theory.

The Need for Internet Research and Evaluation

To date, there has been little or no quantitative evidence in research for examining self-regulated learning of different learning strategies in the informal setting of Cyberspace. With the threat of a massive influx of uses for advanced electronic media in the classroom, an abundance of qualitative research was performed, resulting in basic subjective conclusions on the possibilities of this technology. Much of this work has been performed in areas concerned with attitudes, gender, aesthetics, and the format of WebPages. In addition, other studies were directed toward hypermedia systems, including elements of presentation such as text structure, readability, fragmentation, and text displays (Oliver & Herington, 1995); or the effects of font size in a hypertext environment (Chen, 1996). Also, many technical journals described the ideologies of electronic mail, chatrooms, Listservices, and networks (Chau, 1997; Block, 1997; Wilson, 1997). However, the
next step in quantifying practical, functional usage of Internet technology as it specifically relates to educational objectives has not yet been performed. Winne (1993) admits that little is known about instructional design issues that affect student’s learning with technology. Weinstein (1996) agrees that relatively little is currently known about the development or acquisition of self-regulation and what can be done to facilitate its development with new technology. After illustrating how today’s computing technologies might support how students become self-regulated learners, Winne (1998) admits that these hypotheses need empirical study. Therefore the key to instructional power of computer technologies will be in the basic research.

In 1989, Zimmerman and Schunk edited the first book devoted to this topic in formal, traditional settings. They assembled key theorists offering a range of perspectives on how students self-regulate their academic functioning. One purpose of that volume was to provide theoretical direction to ongoing research as well as efforts to explore academic self-regulatory processes. The second volume edited by Schunk and Zimmerman (1998) offers the fruits of the first generation of research as well as how self-regulation differs from such related constructs as motivation and metacognition, and whether students can be taught self-regulatory skills. Winne and Stockley (1998) discuss computer technologies as sites for developing self-regulated learning, and although they use examples of computers involving Internet and WWW usage, there is not a direct approach concerning the importance of self-regulated learning on the Internet as an informal setting. In addition, the narrow balance between choice (constructivism) and structure (objectivism) in creating successful environments that encourage self-regulated learning is an area of needed professional development (Lebeau & O’Donnell, 1997).

Therefore, the combination of these inevitable resources--learning styles (constructivism versus objectivism), a learning strategy (self-regulation), and a learning environment (Cyberspace as an informal setting) appear to be a worthwhile venue for quantitative educational research.