

SELF-DIRECTED LEARNING ON THE
INFORMATION SUPERHIGHWAY

By

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CHAPTER I

INTRODUCTION

The Information Superhighway is making inroads into the American mainstream. Such things as electronic mail, the Internet, and the World Wide Web are being used by an increasing percentage of the population. Businesses, governmental agencies, educational institutions, and individuals are using this Information Superhighway for things as varied as marketing insurance, distance education courses, and "chatrooms" with conversational exchanges such as cancer survivors sharing their experiences, consolation, and hope (Hauben, 1999).

Undoubtedly this media is capable of carrying a tremendous amount of information, but bits of facts alone do not produce wisdom, understanding, or knowledge. With all of this information, is anyone learning anything? With this technology developing at breakneck speed, it is important to pause occasionally and ask, "To what end and for what purpose are we driving down this Superhighway?" Moreover, "Where will it lead us?"

In a rapidly changing society, there is a heightened need for lifelong or continuing education. Educational institutions from elementary schools to universities are becoming very involved in the Information Superhighway; however, institutions alone cannot provide for all of the learning needs of adults. Indeed, adults have always undertaken

most of their learning tasks outside of formal educational institutions (Tough, 1979b, p.1). Adults have typically gained knowledge about things such as hobbies, health concerns, and financial planning matters through their own efforts in an informal or self-directed manner.

The Information Superhighway may be well suited to this task of informal or self-directed learning. It can be accessed from the home at any time of the day or night. It carries information on a immense variety of subjects. Its paths lead to resources across town or around the world within seconds.

The Information Superhighway

The term Information Superhighway is a metaphor for a rapidly growing telecommunications and computer system. There are many aspects to this grid or web of technology which is springing up. These different aspects include the Internet, the World Wide Web, electronic mail, newsgroups, and chatrooms. Although the Internet is by far the most dominant feature, they all are part of this evolving Information Superhighway. In essence, the Information Superhighway is composed of computers, the cable or wire which connects these computers to one another, and most importantly, the people who use these systems (Hiltz & Wellman, 1997, p. 45).

The computers in the system include both personal home computers and large university mainframes. The cables or wires which connect these computers also vary in size and capacity. Most home computers are connected through the telephone wiring system while large universities use specialized high speed fiber-optic connections. Telecommunication has been developing for several decades and now appears to be in a phase of exponential growth. The most ubiquitous and flexible component of the

Information Superhighway is the Internet. The Internet was originally developed by the United States Department of Defense in the United States in the mid-1960s as a secure method of communication in the event of a nuclear strike. In the 1970s and 1980s, the National Science Foundation administered the Internet and allowed large research universities to use it. During this time the Internet was controlled or navigated with a rather complex command syntax.

In the 1990s, graphical user interfaces, which are called web browsers, were developed for the Internet. These web browsers are easy to use. They deliver the functionality of today's Internet without the need to learn the arcane computer commands of the original Internet. This ease of use has led to a much wider market and the current exponential growth.

Much of the information which is accessed through the Internet resides on larger centralized computers called hosts. These hosts are run by universities, businesses, and governmental agencies. There are methods to determine the number of hosts, and in 1996 there were 14 million hosts worldwide with a projected annual growth rate of 100% (Galbreath, 1997, p. 37). Each host can be accessed by any number of individuals. Because the Internet can be accessed through ordinary phone lines from home, it is difficult to determine exactly how many people are using it although in the United States there are currently estimated to be about 40 million users. The largest single Internet access provider is America Online with 11 million subscribers (Gunther, 1998).

Self-Directed Learning

Self-directed or informal learning is a major factor in the development of individuals and society. There are many different terms which have been used to describe the concept of self-directed learning; these include informal learning, self-study, and autodidacticism. Knowles' (1975) definition is one of the most widely used:

In its broadest meaning, "self-directed learning" describes a process in which individuals take the initiative, with or without the help of others, in diagnosing their learning needs, formulating learning goals, identifying human material resources for learning, choosing and implementing appropriate learning strategies, and evaluating learning outcomes. (p. 18)

Tough (1977) operationalized the concept by defining a self-planned learning project as "a major deliberate learning effort which the learner himself or herself is responsible for most of the day-to-day planning of what and how to learn" (p. 2). Such a project was delimited as:

A person's deliberate attempt to learn some specific knowledge and skill if (a) he spent at least eight hours doing so during the year prior to the interview and (b) he himself, rather than any profession teacher or organized group, assumed the primary responsibility for planning, controlling, and supervising the entire project. (p. 4)

Historically, self-directed learning has been one of the major modes for the assimilation of knowledge. Ancient Greek philosophers advocated the elevation of the mind through self-study. The origins of the adult education movement in the United States have strong elements of self-directedness such as Franklin's Juntos (Courtney, 1989, p. 20).

There are a variety of contemporary reasons for studying self-directed learning. Knowles constantly described it as one of the underlying principles of the field of adult

education. Candy (1991) listed commonly cited reasons for the importance of self-directed learning:

1. Learner-control responds to the inflexibility of conventional education.
2. Learner-control recognizes the way adults actually learn.
3. Learner-control reflects the primacy of learning over teaching and allows for different learning strategy preferences.
4. Learner-control leads to enhanced learning through increased motivation.
5. Learner-control models democratic principles and behavior.
6. Learner-control in instructional settings inculcates habits of curiosity and self-initiated inquiry and encourages the development of autodidacts. (pp. 51-73)

Self-directed learning is presently just as important as it has been historically. It is extremely important at the present time for at least three reasons. First, according to Humanistic philosophy and psychology, humans have an innate need to strive towards self-actualization (Maslow, 1970). This self-actualization is an individual act of self-creation. It is unique to each individual. Since the mind is such an important facet of the individual and since the mind is shaped and grows through education, education and learning are in general vital to human development. Second, formal education has constraints: financial, physical, and temporal. Self-directed learning mitigates many of these constraints. The individual is free to choose the level and scope of the learning activities. This individualization by the one most directly concerned with the outcomes

helps to maximize efficiency. Third, the base of knowledge is increasing exponentially. It is simply impossible to be an expert in all fields. Therefore, each individual in this act of self-creation can pick and chose those subject areas upon which to concentrate.

The modern study of self-directed learning began with Cyril Houle's The Inquiring Mind in 1961. Knowles' (1975) and Tough's (1977; 1978) latter work formed the foundation which launched a continuing debate into the nature, extent, and theoretical construct of the phenomena. Penland's (1977) work quantitatively established the prevalence of self-directed learning in the United States. Latter works by a variety of authors have explored and developed the conceptual basis of self-directed learning.

Learning Differences

Learning can occur in a variety of ways. In a structured formal educational institution the learning materials and resources are pre-selected for the students. In self-directed learning, it is the individual's responsibility to select the type of learning resources and how they will be used.

For instance, there are a variety of ways to learn about the popular hobby of rose gardening. One person might begin by reading a gardening book from the library. One might talk with friends and neighbors who also grow roses. Yet another might just buy some roses and start experimenting. The Information Superhighway has such a wide variety of resources that different approaches can be accommodated. In the case of the rose gardener, if the individual prefers to read a structured exposition of the basics of rose gardening to begin what could be a lifetime hobby, such texts are available from the web site of the American Rose Gardening Association. If the prospective rose gardener's

natural inclination is to talk with neighbors, friends, and other rose gardeners, such resources are available through newsgroups, listservers, and chatrooms. For the individual who prefers to just buy some roses, plant them, and see what happens, the Internet can be used for the ordering of roses and gardening supplies. This visceral example does reveal the limitations of the Information Superhighway. The essence of rose gardening is the rose itself. Cyberspace and the Information Superhighway could never be a substitute. However, the Internet as it presently exists has a wide variety of resources that can be of use to all types of people who wish to learn about roses.

These different approaches to learning can have a profound impact on the course of an informal self-directed learning project. Intrinsic autonomy is both the strength and the weakness of self-directed learning. It is the strength because the learners can follow their natural inclinations with passion. It is the weakness because their natural proclivities for only particular learning resources or situations may limit their possibilities for the acquisition of new knowledge, and this in turn may limit their worldview and diminish their opportunities for personal growth.

These different approaches to learning have been examined from a number of different perspectives. The terms cognitive style, learning style, and learning strategy preference focus on slightly different aspects of learning. Cognitive style examines learning, perception, and cognition from a psychological viewpoint. Learning styles focus on the application of cognitive and psychological sciences to education. Learning strategies are the selection, implementation, and execution of the various tactics used in learning. This is the most germane aspect of the phenomena of the differences in self-directed learning because the self-directed learner is truly autonomous.

There are a variety of ways to classify learning styles. Kolb (1976) developed a widely used model of learning as a cyclical process composed of (a) concrete experience, (b) observations and reflections, (c) formulation of abstract concepts and generalizations, and (d) the testing implications of concepts in new situations (Marshall, 1995, p. 28). The learner must process the newly learned information through all four stages to truly learn the subject. Differences in learning strategy preferences are based on individual preferences, capabilities, and aptitudes for the four stages (p. 3).

Understanding the learning strategy preferences of individuals and how they correlate with Internet usage can enlighten and serve as a framework for analysis. One recently developed tool for measuring learning strategy preferences is ATLAS (Assessing The Learning Strategies of Adults) (Conti & Kolody, 1998). It was derived from the widely disseminated SKILLS instrument (Conti & Kolody, 1998). However, the ATLAS instrument is more condensed and easier to use than SKILLS. It categorizes learning strategy preferences as Navigators, Problem Solvers, and Engagers (Conti & Kolody, 1998). "Navigators are focused learners who chart a course for learning and follow it" (Conti & Kolody, 1999c, p. 9).

Problem Solvers test assumptions to evaluate the specifics and generalizability within a learning situation; they generate alternatives to create additional learning options; and they are open to conditional acceptance of learning outcomes while keeping an open mind to other learning possibilities. (Conti & Kolody, 1999c, p. 12)

"Engagers are passionate learners who love to learn, learn with feeling, and learn best when they are actively engaged in a meaningful manner with the learning task" (Conti & Kolody, 1999c, p. 13).

Problem Statement

The use of the Internet is growing exponentially (Press, 1997). The Internet can and does serve many functions ranging from entertainment to data warehousing. As both a source of information and a method of communication, it can be an important educational resource. It is a distributed resource which is accessed at home, at work, and through libraries and has the potential to be an important mechanism for both formal and informal learning.

The Internet is rapidly becoming a major component of the way our society processes, shares, and distributes information and knowledge. From its origins as a tool only used by researchers at universities, it is now sufficiently widespread that it is changing the way we shop, work, play, and learn. The convergence of increased computing power with the point and click ease of the World Wide Web has brought this medium and tool to about half of all American households. As technological improvements and cost efficiencies continue, the percentage of households with Internet access will continue to rise. According to a recent survey of adults by Internet Week (October 25, 1999), 103 million people worldwide have used the Internet at least once. Ninety million have used it in the last three months. Twenty-five million have purchased something online. Twenty-eight percent feel the Internet has made them more efficient (www.internetwk.com, January 14, 2000).

The Information Superhighway is composed on many elements: e-mail, browsers, chatrooms, mail lists, and now even primordial types of virtual reality. The rate of change is so rapid that sociological and educational research is lagging on many of the newer

elements. Computer conferencing and e-mail have been in existence the longest and have a greater body of associated research. Some of the basic research associated with e-mail and computer conferencing are applicable to the Internet. This serves as a starting point for discussion and insight. However, the expansion of technological capabilities has been so great that this historical research in and of itself does not adequately capture this rapidly changing phenomena. Indeed in several years the now current version of two dimensional point and click browsers may well appear primitive and clumsy.

Informal self-directed learning is an important component of human development, self-actualization, and the democratic process.

By the most conservative estimates, a large part of what adults learn purposefully and systematically is acquired on an individual basis without benefit of organizational sponsorship . . . A fuller understanding of informal adult learning activities might help professional adult educators to facilitate learning more effectively both in natural social settings and in more structured environments. (Darkenwald & Merriam, 1982, p. 152)

Although informal self-directed learning has been studied for several decades, the impact of the Internet on such self-directed learning has not been researched. The Internet might well develop into the most important and accessible information source and communication media ever invented, yet its impact and potential for self-directed learning is not well understood. The preference for the utilization of different aspects or resources on the Internet may correlate with these learning strategy preferences and such an analysis may reveal patterns which might inform and guide learners, educators, and Internet users and developers as society barrels down this Information Superhighway.

Purpose

The purpose of this study was to describe the way in which a self-selected group of learners pursue self-directed learning projects utilizing the Internet. The study was prompted by the vast potential of the Internet, the prevalence of self-directed learning in all aspects of society, and the need to better understand their interaction.

Presently, no large studies have addressed the impact of the Information Superhighway in all its many forms on self-directed learning. The Internet through the World Wide Web has only been readily available since 1994. Without the constraints of formal institutional settings, individuals and small groups acting independently and essentially in isolation have created rich learning environments which are being used by millions of individuals in their pursuit of self-directed learning.

Research Questions

The research questions for this study fell into three broad areas. These include (a) the general process that is used in learning material on the Internet, (b) the relationship of the Internet learning to ongoing learning projects, and (c) the influences of learning strategy preferences in the process of learning on the Internet.

1. General
 - a) How is the Internet being utilized in self-directed learning projects?
 - b) What aspects of the Internet such as newsgroups, e-mail, mailing lists, and academic sites are being used?
 - c) What types of problems arise with the Internet's use?

- d) How has the home-based nature of the Internet increased informal learning?
2. Long-Term Learning Projects Initiated prior to Internet Access
- a) In what ways has the Internet expanded or benefitted any continuing or ongoing self-directed learning projects which had initially begun before their use of the Internet?
 - b) How are Internet resources being integrated with other types of resources?
3. Learning Strategy Preferences
- a) What are the learning strategy preferences of learners who gravitate towards the Internet?
 - b) How are particular learning strategy preferences associated with particular types of Internet usage?

Limitations and Delimitations

Respondents were solicited through a variety of newsgroups that dealt with education and learning. This was done so the request for participation would not be viewed as an unwarranted intrusion. This increased the likelihood that the respondents would indeed be involved in self-directed learning and may be cognizant of not only their projects but also their methodology and learning strategy. The limitation is that in some ways it mimics Houle's (1961) original study on learning orientations by focusing on educators. Further, since only newsgroup participants were available, nuances of people who fail to participate in newsgroups were missed.

The data were gathered by e-mail through a web interface. Most previous self-directed learning studies utilized in-depth interviews with probing questions. The depth and extent of responses could be significantly greater under these personal circumstances. Individuals who are disinclined to type, whether through poor typing skills, self-consciousness regarding writing skills, or time pressures may have given sparse responses. It can be assumed that the respondents were all English speaking.

Assumptions

It was assumed that the respondents would have a fairly clear recollection of their process of self-directed learning. Sample responses were presented and it was assumed that these would explain the concept of the questions while not unduly influencing them. Since the responses were completely anonymous, it was also assumed that individuals did not respond multiple times.

Definition of Terms

ATLAS (Assessing The Learning Strategies of AdultS) – An instrument which identifies the learning strategy group to which the respondent belongs. It categorizes learners as Navigators, Problems Solvers, or Engagers (Conti & Kolody, 1998).

E-Mail – Messages sent by people from computer to computer, often over the Internet.

Information Superhighway – A metaphorical expression used to describe the Internet.

Internet – The Internet is a worldwide system of computer networks which is a network of networks. It is a public facility accessible to hundreds of millions of people worldwide. Physically, most Internet traffic is carried on the existing public telecommunication networks (Muller, 1999, p. 168).

Learning Strategies –

Learning strategies are the techniques or skills that an individual elects to use in order to accomplish a learning task. They differ from learning styles in that they are techniques rather than stable traits and they are selected for a specific task . . . Often they are so customary to the learner that they are given little thought; at other times much deliberation occurs before a learning strategy is selected for a specific learning task. (Fellenz & Conti, 1993, pp. 7-8)

Self-Directed Learning – Learning where

the learner himself assumes most of the responsibility for planning his strategy, maintaining his motivation, and making certain throughout the learning process that everything necessary for success is done. The initiative, responsibility, and control reside in the learner, not in someone else. (Tough, 1967, p. 4)

Self-Directed Learning Project –

A series of related episodes, adding up to at least seven hours. In each episode, more than half of the person's total motivation is to gain and retain certain fairly clear knowledge and skill, or to produce some other lasting change in himself. (Tough, 1971, p. 6)

World Wide Web – The World Wide Web (WWW or Web) is a graphical system to access and navigate through the millions of computers connected to the Internet (Muller, 1999, p. 525).

CHAPTER II

REVIEW OF LITERATURE

Self-Directed Learning

Knowles' (1975) definition of self-directed learning highlights the fact that the entire process is driven by the individual.

In its broadest meaning, "self-directed learning" describes a process in which individuals take the initiative, with or without the help of others, in diagnosing their learning needs, formulating learning goals, identifying human material resources for learning, choosing and implementing appropriate learning strategies, and evaluating learning outcomes. (p. 18)

The term "initiative" is used and applies to each of the various steps of the learning process from the initial diagnosis of needs, through the implementation of learning strategies, and to the end with the evaluation of outcomes.

Historical Background

Historically, self-directed learning has been one of the major modes for the assimilation of knowledge. Ancient Greek philosophers, including Socrates, Plato, and Aristotle, advocated the elevation of the mind through self-study (Kulick, 1970). Four of the six major philosophical branches of adult education (Liberalism, Progressivism, Behaviorism, Radicalism, Humanism, and Analyticalism) have self-directedness as a major tenet or goal (Elias & Merriam, 1980; Gerstner, 1990). From a Humanistic perspective,

self-direction is an integral component of the epitomized human. Carl Rogers' fully-functioning adult and Abraham Maslow's self-actualizing person represent ideals of growth and development which can only be achieved through acts of self creation.

The origins of the adult education movement in the United States have strong elements of self-directedness. The prototypical self-made American, Benjamin Franklin, advocated self-education through reading and discussion (Kulick, 1970). Other notable examples of American icons created through self-education are Thomas Edison and the Wright Brothers (Cavaliere, 1990). One of the most famous and cherished popular images of self-education is Abraham Lincoln (Grattan, 1955, p. 140).

For the past 30 years, self-directed learning has been a prominent topic of investigation and discourse in the field of adult education. The cycles of inquiry have typically altered between theoretical conceptualization and empirical verification. Houle's 1961 classic The Inquiring Mind heralded the modern era of interest in self-directed learning. Houle proposed the first typology of self-directed learners as being goal-oriented, activity-oriented, and learning-oriented. This conceptual and qualitative work spawned a wave of verification studies. Houle's student, Allen Tough, published his doctoral dissertation The Teaching Tasks Performed by Adult Self-Teacher in 1966. In the same time-frame, Johnstone and Rivera published their comprehensive survey of adult education in the United States. This work's title, Volunteers for Learning: A Study of the Educational Pursuits of American Adults (1965), evokes images of self-direction and independence. Johnstone and Rivera estimated that nine million American adults were engaged in self-directed learning and described it as "the most overlooked avenue of activity in the whole field of adult education" (p. 37). The empirical verification studies of

the existence and extent of self-directed learning in the United States culminated in Penland's 1979 Self-Planned Learning in America, which definitively established the prevalence of self-directed learning in all major segments of American society through the use of rigorous statistical population sampling.

Knowles' concept of andragogy is premised upon the ability and even the need for adults to be self-directed. His work "legitimized" self-directedness in adult education. The earlier studies had exclusively focused on the learner. Knowles' embracement of self-directedness established that there was a place for the adult educator in this newly discovered and apparently vast field. Rather than being simply an educational fad, self-directed learning is a "basic human competence—the ability to learn on one's own" (Knowles, 1975, p. 17).

The modern theoretical basis of the field has been developed, challenged, and refined by researchers such as Brookfield (1984, 1986), Candy (1991), Heimstra (1975), and Long (1990). With the existence, importance, and extent of self-directed learning firmly established, the past 15 years have seen research interests focus on specific principles and sub-components. Lively debates have raged over such issues as Gugliemino's Self-Directed Learning Readiness Scale (1977) and Spear and Mocker's Organizing Circumstance Theory (1984). Such research has served to broaden the understanding of the subject.

Allen Tough

Allen Tough's work on self-directed learning began with his doctoral dissertation. This seminal work showed the universality of continuing self-directed learning in his

sample of 20 educators. It verified the findings of his mentor, Houle. The second stage of the study dealt with the mechanics of the learning process. The participants recorded their activities. Tough found that they tended to structure their projects into discrete time segments ranging from 30 minutes to two hours. Later these were described as learning “episodes.” This term was refined and explicitly defined and came to be utilized in much of the subsequent research in the field.

From the University of Chicago, Tough accepted a position at the Ontario Institute for Studies in Education. The Institute was an important center for the study of self-directed learning in the late 1960s. There he produced Learning Without a Teacher (1967) which was more quantitatively focused. It examined the self-directed learning projects of 40 local area college graduates. The most important and lasting result of this study was his list of 12 common self-teaching tasks:

1. Deciding on a suitable place for learning
2. Considering or obtaining money
3. Deciding when to learn, and for how long
4. Choosing the learning goal
5. Deciding how to achieve the goal
6. Obtaining or reaching people, books and other resources
7. Dealing with lack of desire for achieving the goal
8. Dealing with the dislike of necessary activities
9. Dealing with doubts about success
10. Estimating level of knowledge or skill
11. Dealing with difficulty in understanding some part

12. Deciding whether to continue after reaching some goal. (pp. 22-28)

All of the respondents had spent at least eight hours in the previous year on some learning project and many spent much more time. During their projects, each respondent utilized at least four other people as guides, mentors, subject-matter experts, or fellow learners. The average number of such “helpers” was 10. Although not everyone received positive feedback from the helpers, the negative comments were not sufficient to dissuade any of the respondents from their projects.

Tough’s next research resulted in Why Adults Learn (1968). Thirty-five respondents were queried regarding the various factors that influenced their decision to begin their learning projects. A four-point scale was used to rate the strength of the various reasons. Most respondents had at least four strong reasons for beginning a learning project. In keeping with Knowles’ assumptions of andragogy, the most cited reason was that the knowledge or skill could be applied. This study solidified the concept and definition of a learning “project.” This definition was used in his further studies as well as by the preponderance of researchers in the field. Although the definition refers to “self-teaching,” it includes elements of Knowles’ latter definition of self-directed learning and also delineates elements such as length of time:

The term self-teaching project refers to a person’s deliberate attempt to learn some specific knowledge and skill if (a) he spent at least eight hours doing so during the year prior to the interview and (b) he himself, rather than any professional teacher or organized group, assumed the primary responsibility for planning, controlling, and supervising the entire project. In each self-teaching project, the learner himself assumes most of the responsibility for planning his strategy, maintaining his motivation, and making certain throughout the learning process that everything necessary for success is done. The initiative, responsibility, and control reside in the learner, not in someone else. (Tough, 1967, p. 4)

Tough's final work of this prolific period was The Adult's Learning Projects (1979). By this stage, the concept of a learning project being composed of learning episodes was firmly established. The population included was vastly expanded to seven groups: blue collar workers, lower-level white collar workers, elementary school teachers, municipal politicians, social science professors, and upper middle-class women with pre-school children. All but one of the participants were engaged in learning projects in the previous year. The greatest number of projects was conducted by the professors and teachers while the smallest number was conducted by the factory workers and politicians.

Tough's work during this five-year period shaped the research on self-directed learning for the next two decades. He produced important contributions in terminology, definition, and scope. Although his early studies focused on classically trained educators, his later studies corrected this limitation. One assumption which followed from the initial population of professional educators was the result that self-directed learners in general meticulously planned and charted their learning project. Although this result was first debated by Spear and Mocker in 1984, at present it is still the prevailing view in the field of adult education.

Patrick Penland

Penland's thorough quantitative study Self-Planned Learning in America (1977) firmly established the broad prevalence of self-directed learning in America. Johnstone and Rivera's (1966) study produced serendipitous hints as to its extent. Houle's (1961) and Tough's (1967, 1971, 1979) studies of selected populations provided the qualitative

theoretical foundation. Penland's survey, which was based on a national probability sample of 1,051 adults, definitively established the extent of the phenomena.

Penland's study was commissioned by the Graduate School of Library and Information Sciences at the University of Pennsylvania. Libraries in the United States have a long history of fostering and being major resources for self-directed learning. They tend to bridge the gap between formal institutional learning and clearly self-directed, independent learning. Even before the current wave of awareness, librarians were helping patrons locate learning resources. Without a theoretical or explicit conceptual framework, American librarians knew from experience that people informally studied and learned about everyday topics that affected their lives as well as about esoteric topics that peaked their intellects (Candy, 1991, pp. 191-193).

It was found that over three-fourths (76.1%) of the respondents identified one or more learning projects during the previous year (Penland, 1977, p. 27). Only 2.9% of the population engaged only in formal courses under the auspices of an educational institution. About one-sixth of the population engaged in both self-directed and formal learning. The number of identified projects ranged from 1 to 18. The study showed 1,142 individuals reported 4,571 self-directed learning projects. About 16% of the projects were less than seven hours in length. Using this criteria, the average number of self-directed learning projects was 3.3 per person.

The topics included such things as healthcare, hobbies, mathematics, religion, and sports (Penland, 1977, p. 29). Penland's quantitative study did not analyze the nature or humanist importance of the various learnings. He did note that "predominant among these topics are those which resemble the transactional negotiations of everyday life.

Knowledge-oriented topics appear to occur with less frequency” (p.30). Hobbies and crafts was the most cited topic area (14.6%) followed by homemaking (11.5%), home repairs (8.6%), sports and games (8.6), and gardening (6.4%) (p.31).

Although it was commonly assumed that cost and lack of transportation were the primary reasons that a person would choose a self-directed learning project, these were reported to be the least important. The primary reasons cited were:

1. Desire to set my own learning pace.
2. Desire to use my own style of learning.
3. I wanted to keep the learning strategy flexible and easy to change.
4. Desire to put my own structure on the learning project.
5. I wanted to learn this right away and couldn't wait until a class might start.
6. I didn't know of any class that taught what I wanted to know.
7. I don't like a formal classroom situation with a teacher.
8. Lack of time to engage in a group learning program. (p. 32)

Details of resources, setting, and methods were recorded. Home was the preferred place for learning, closely followed by the workplace. Outdoors, discussion groups, classrooms, libraries, and public events were also mentioned as important learning locations (p. 36). One of the least preferred methods of learning was by making notes and writing. In descending order the preferred methods were seeing or observing, reading, talking with someone, hearing or listening, and practice or trial-and-error (p. 38). The sources of finding out about learning opportunities in this 1979 study were newspapers, word of mouth, television, radio, and libraries (p. 38).

Earlier studies had emphasized that self-directed projects were planned and coordinated much as a professional educator might develop a course. However, Penland recognized that there was some element of randomness in many people's self-directed learning projects.

It appears that some individuals at least initially become involved with a great deal of random activity. Several respondents to this study "found themselves" (discovered patterns) in terms of reacting to perceived chance occurrences in serendipitous activity. (p. 33)

The Modern Era

The evidence that self-directed learning is an established area of research includes (a) studies on numerous populations in replication of Tough's original work, (b) a validated instrument to measure self-directed learning readiness (Guglielmino, 1989), and (c) the recognition of the Commission of Professors of Adult Education by establishing a task force on self-directed learning. The effect of this has been to move the focus of many adult educators' attention to adult learning rather than just refining program planning skills. The analysis of self-directed learning challenges the assumption that learning can only occur in the presence of a fully certified instructor and questions the prevalent thought that institutional learning is purposeful or deliberate while self-directed learning is haphazard.

Brookfield (1984), writing in the Adult Education Quarterly, states that "the propensity and capacity of many adults to conduct self-directed learning projects is now well proven" (p. 59). However he critiques "the almost exclusive use of quantitative or quasi-quantitative measures in assessing the extent of learning and the concomitant lack of

attention to its quality” (p. 59). He also criticizes the “absence of any extended discussion of the considerable implications raised by these studies for questions of social and political change” (p. 59).

Malcolm Knowles’ (1970) ground breaking work, The Modern Practice of Adult Education: Andragogy vs Pedagogy, galvanized the field of adult education around the concept that adults have a natural tendency for self-direction. His work was aimed at adult educators, people who taught in traditional adult education settings and designed and developed programs. While he largely spoke of incorporating self-directedness into lesson plans, he also realized that the ultimate goal was an internalization of the quality of self-directedness. The logical progression of the process of internalization is lifelong learners who are equally at ease in the classroom as they are in diving into a learning project purely of their own creation.

Thus, the existence of independent or self-directed learning was well established by Tough and the ensuing verification studies, and the conceptual importance of the principle was codified by Knowles. What still remained lacking through the 1980s and to some extent even to the present, is an unambiguous definition and clear understanding of the process. Part of this confusion arises from the large number of terms that can be applied to the concept and their subtle differences. Candy (1987/1988) found more than 30 phrases which refer to the concept, including self-teaching, self-education, self-instruction, self-initiated learning, independent study, and autodidactic learning (p. 21). Thus “while the area of ‘self-direction’ is held to be central to the field of adult education, it is plagued by terminological imprecision” (p. 5). Likewise, Long (1988) stated “adult self-directed

learning remains weakly conceptualized ill-defined, inadequately studied and tentatively comprehended” (p. 2).

Spear and Mocker (1982) developed a categorization scheme for the different types of educational settings: formal, nonformal, informal, and self-directed. Their typology deals with the what and how of learning. In formal learning, both what is learned and how it is learned is controlled by someone other than the learner. At the other end of the continuum is self-directed learning. Here the learner decides both what and how to learn. Informal learning leaves how the subject is learned to the student, but what is learned is controlled by the institution. Finally in nonformal learning, the learner controls what is learned, but the institution or teacher decides how it is learned.

In 1992, Garrison declared self-directed learning and critical thinking as the two dominant constructs in adult education. In 1997, he proposed a self-directed learning model which integrated self-management (contextual control), self-monitoring (cognitive responsibility), and motivational (entering and task) dimensions. Self-direction that is simply focused on task control neglects the critical issues of setting goals that are relevant. Self-management is concerned with task control issues--the enactment of learning goals and the management of learning resources and support. External management dynamics (task control) are determined by balancing the factors of proficiency, resources, and interdependence (Garrison, 1993). Self-monitoring is the process whereby the learner takes responsibility for the construction of personal meaning by integrating new ideas and concepts with previous knowledge.

Garrison believes that an adult learner who is fully self-directed has moved beyond simple task control and has learned to think critically and construct meaning through ill-

defined problems. The learner assumes personal responsibility and collaborative control of these processes in constructing and confirming meaningful and worthwhile learning outcomes. “Meaning and knowledge are both personally and socially constructed” (p. 19). Garrison’s theory has foundations in both Malcolm Knowles’ and Jack Mezirow’s work. Self-directed learning is not an educational fad but is a “basic human competence—the ability to learn on one’s own” (Knowles, 1975, p. 17). Mezirow (1997) suggested that a critical awareness of meaning and self-knowledge is a key dimension to self-directedness. To “freely and fully participate in discourse and to overcome constraints to taking reflection action,” learners must “negotiate their own purposes, values and meanings rather than to simply accept those of others” (p. 8).

Long (1989) identified three dimensions of self-directed learning: sociological, pedagogical, and psychological. Brockett and Hiemstra (1991) include a personality disposition. Their framework is based on the “distinction between the process of self-directed learning and the notion of self-direction as a personality construct” (p. 23). The two dimensions in the framework correspond to transactional or instructional methods and learner personality characteristics. In fact, it is suggested that personality factors, as utilized by the Oddi Continuing Learning Inventory (Oddi, 1986), may be better interpreted as motivational disposition. Hammond and Colins (1991) assumed a more comprehensive perspective by including critical awareness including larger social and emancipatory perspectives.

Bandura (1986) suggests that there are three self-regulated learning processes: self-observation, self-judgment, and self-reaction. When a self-directed learning project is initiated, the learner must understand whether the task requires understanding the state of

current knowledge, searching for additional information, exploring new concepts, or creating new meaning through action and experience. Perceived value produces the drive and motivation to learn. The possibility of success creates the initial entering motivation and acts as a persistent force in task motivation. This task motivation is integral to task control and self-management. Because these are internal psychological processes, meaningful learning outcomes would be very difficult to achieve if the learners were not self-directed in their learning. Self-direction is seen as essential if individuals are to achieve Dewey's (1916) ultimate educational goal of becoming continuous learners and possessing the capacity for further educational growth.

Callender (1992) argues that adult education is self-education. He disputes Knowles' definition of adult educators as people who help adults learning. He refocuses on the individual. While Knowles acknowledges societal and institutional goals, Callender states,

In all classical formulations it is always and only the individual who can and is to be educated. The value of education to institutions and societies is strictly derivative. By educating persons, institutions and society are thereby sustained, continued, and rejuvenated through their citizenship. (p. 153)

Knowles' concept of adult education

becomes a "we" providing services to a "they," and thus subtly hierarchical . . . Yet the opposite is truer: intense private study is one of the oldest, most honored, and productive historical forms of adult education. (p. 154)

Callender introduces the concept of "willful self-education" and "stillful self-education" (p. 158). Willful self-education is "closer to the executive role in an educational system, the principal, superintendent, dean, or provost" (p. 156).

Dealing initially with anecdotal material as suggested by Schatzman and Strauss (1973), Spear and Mocker (1984) noted that self-directed learners in general did not select resources from a variety of alternatives. Rather, they were more likely to use a single resource that was available within their environment. Curriculum development and instructional planning is not an innate skill. It is an art and science that has developed over years and is socially and institutionally grounded. Thus, when solitary and novice self-learners are presented with a learning challenge, they do not draw upon the wisdom of educational theorists.

Spear and Mocker's "Organizing Circumstance" postulates that self-directed learners do not preplan their learning projects. Rather, they tend to select a course of limited alternatives which occur fortuitously within their environment and which structures their learning projects. The Organizing Circumstance, rather than preplanning by the individual, is the directing force behind most self-directed learning. The factors which determine this Organizing Circumstance are "(1) the expectation of the learner, (2) the individual's inventory of skills and knowledge, and (3) the particular resources present within the environment" (p. 4).

Rather than the meticulously detailed learning plans of Tough, Penland, and Houle, a very free form process was described. The process appears to be largely driven by chance and circumstance.

1. The impetus or triggering event for a learning project or episode proceeds from some change in the life circumstances. The change may be positive or negative, may happen to the individual or to someone who affects a person's life, or may be an event which simply occurs and is observed within the life space of the individual. Life space is defined as the physical, social and psychological environment in which the individual lives and functions.

2. The changed circumstance tends to provide a single or at best, very few resources opportunities for learning that are seasonable or attractive offer the learner to pursue.
3. The structure, methods, resources and conditions for learning are provided or dictated most frequently by the circumstance.
4. Learning sequences progress, not necessarily in linear fashion, but rather as the circumstance created during one episode become the circumstances for the next necessary and logical step in the process. (pp. 4-5)

The Information Superhighway

Any learning occurs within an environment or context. Self-directed learning occurs within a societal context. Societal factors such as economic well-being, political climate, and even technological development shape and guide the reality of self-directed learning. Economic and political waves slowly alter the landscape from liberal to conservative, from prosperity to paucity, from political activism to neglect, and from religious revivalism to nihilism. These complex factors influence both positively and negatively the extent and nature of self-directed learning in society. One factor which has had an increasing and even accelerating influence in society has been technology. Most recently this has been in the form of the Internet. Given that there is a well-developed conceptual and theoretical framework for self-directed learning, it is a propitious time to examine this new and powerful media and its influence on the practice of self-directed learning.

Socrates recognized the limitations of the written word. Particularly the written word forces one to follow an argument rather than participate. In choosing a mode of

communication, there is the inherent balancing of convenience versus quality. Just as a personally owned book was one of the main forces and expedients to the Renaissance, the development of massively interconnected personal computers will shape and transform human society. The Internet is on the verge of becoming a universal library. However, media and information, if extracted from its original context, is subject to misinterpretation and superficiality (Groper, 1996).

The World Wide Web (WWW) has grown faster than the research community's ability to investigate it. Some basic research in closely related fields is applicable to self-directed learning on the WWW. In particular a great deal of research has been done on computer mediated communication (CMC). This includes such things as computer conferencing, e-mail, electronic chatrooms, message boards, and mailing lists. Computer mediated communication is any communication which flows through or is regulated, stored, or manipulated by computers (Berge & Collins, 1995).

Computer conferencing has four characteristics with implications for learning on the Internet. These are the ability for communication, time independence, place independence, mediation by a computer (Tuckey, 1993, p. 63). Prior to the development of the WWW, computer conferencing was text based. One of the primary concerns had been the lack of visual clues. The initial systems also provided primitive navigation tools to move about the conference (Tuckey, 1993, p. 64). These limitations have been overcome with recent developments such as the graphical WWW.

Interactivity is one of the more important components of the WWW. Some of the factors in interactivity are the immediacy of response, the ability for non-sequential access, adaptability, and bi-directionality. The immediacy of response is important in keeping

people engaged. With the WWW, navigating from one web site to another is accomplished in seconds or fractions of seconds. Non-sequential access allows the users to jump about on any web site or to bookmark specific sites which they can then immediately jump to. One aspect of adaptability is the ability of the WWW to be displayed on many different types and brands of computers. Bi-directionality is a primary facet of interactivity and means that information and responses flow from and to both parties that are communicating. Some of the benefits of interactivity are increased interest, higher cognitive processing, and the development of cooperative environments (Milheim, 1996).

Current Usage Patterns

The use of the Internet has been growing both worldwide and in the United States. At the end of 1999, there were about 75 million individuals in the United States with online access. This has grown from the approximately 25 million with access in 1996 and is projected to grow to 110 million in 2003 when a majority of Americans will have online access (Peterson, 1999, p. R6).

Essentially all (96%) of the people online use e-mail while a small percentage (2%) gamble. In between these extremes there is a large variety of activities (Peterson, 1999, p. R6). While self-directed learning is not listed as a discrete activity, nonetheless, a large number of activities are listed which could well be part of a self-directed learning project including using a search engine (88%), researching products or services (72%), reading the daily news (51%), researching travel (47%), researching work related topics (40%), doing homework and research for school (35%), and gathering investment and financial news and advice (17%) (Peterson, 1999, p. R6).

The average number of hours online was 7.1 hours per week. Men (7.4 hours) spent slightly more time online than women (6.7 hours) while older adults (8.3 hours) spend more time online than middle-aged or younger adults (7.7 hours). People who have been using the Internet for more than two years tended to use it more per week (8.2 hours) than people who had been using the Internet than less than six months (5.4 hours) (Peterson, 1999, p. R6).

In the early 1990s the majority of Internet users were men. By 1999 the gender distribution had equalized (2000 internet.com Corp, 1999).

Women.com recently commissioned a study which found:

1. The average woman who is online is more likely to be married than single, to be in her thirties, and to have a generally high household income,
2. Women find micro-site marketing the most engaging and effective form of Internet advertising,
3. 73% percent of women regularly access product and service information online—more than any other kind of information. (2000 internet.com Corp, 1999)

Nearly 90% of women surveyed are the primary healthcare decision-makers in their families (2000 internet.com Corp, 1999).

According to Gina Garrubbo, executive VP of Women.com,

Women have created an online revolution that has closed the Web's gender gap, and have become the dominant force on the Internet today . . . Women make the majority of online health-care decisions, retail purchases, and financial choices for the household. (Tracy, 1999)

A study by BWN found that essentially all (96%) of the female Internet users have researched products online while 64% have made purchases via the Internet (2000 internet.com Corp, 1999).

Working women average about 14 hours per week online, and more than half go online more than once a day. Nearly three-quarters (72%) of working women said that if given a choice, they would rather have a computer with Internet access on their desk than a telephone. About half of those surveyed used the Internet for work purposes while two-thirds have used the Internet to learn about careers and career advancement (2000 internet.com Corp, 1999).

The greatest complaint concerning Internet usage was the connection speed which 65% felt should be greater. Additional concerns were security (40%), speed of first establishing a connection (40%), reliability of the technology (33%), and ease of navigation (32%) (Peterson, 1999, p. R6).

Brief History

The Advanced Research Projects Agency Network (ARPANET) which began in 1969 was the seminal project from which the Internet and later the World Wide Web grew. It was developed so that government and university researchers could exchange electronic data and launch remote programs. In the 1960s, the U.S. Defense Department's Advanced Research Projects Agency funded the ARPANET, a 56 kilobits per second backbone network. One of the primary motivations for this was that during an armed conflict involving domestic damage the military required a robust and survivable communication capability. This was accomplished by developing a system which allowed electronic data to be routed to its destination by a variety of pathways so if one path was destroyed or blocked, the message would automatically be routed around the damaged area (Muller, 1999, p. 9). This characteristic is inherent to the structure of the Internet and

has widespread implications. Specifically, it makes censorship and control more difficult (Kay, 1991).

The first ARPANET node was built at the University of California at Los Angeles in 1969; and by 1971, 20 different computer systems at about 30 universities had been connected. In the mid 1970s, network protocols solidified around TCP/IP (transmission control protocol/Internet protocol) standards which allowed the linking of LANs (local area networks) and workstations to the ARPANET backbone (Muller, 1999, p. 170). This was the beginning of the Internet although by 1983 only a few hundred computers were connected. The number of networks connected through the Internet grew. In 1985 supercomputing facilities were linked to the Internet (Muller, 1999, p. 171).

After 20 years of existence, in 1989 the ARPANET was decommissioned and succeeded by its descendant, the NSFNET. As of 1994, the Internet has grown to over 2 million host computers in 61 countries with an estimated 15 million users. This number has been and will continue to quickly grow. This system will continue to evolve (Kay, 1991).

In 1970 Raymond Tomlinson, an Arpanet contractor, wrote a program which utilized Arpanet's file transfer protocol to connect local mail systems with other Arpanet sites. This first electronic mail (e-mail) system quickly became the primary means of communication on the Arpanet. The development of the WWW, consumer-oriented access providers such as America Online, and graphical user interfaces have greatly expanded the consumer base (Peterson, 1999, p. R6). While comparatively user friendly, the earlier e-mail systems such as PINE and Z-Mail were sufficiently complex to inhibit deployment to the general population. The new graphical user interfaces such as Pegasus

Mail, CC Mail, Microsoft's Explorer, and Netscape's Navigator are sufficiently robust and intuitive to be usable by the average person without guidance or even printed manuals. A number of initiatives are currently being undertaken which will improve access to electronic communication; one is the high-speed National Research and Education Network (NREN) (Galbreath, 1997; Gilder, 1997).

Two technologies may exponentially expand interconnectivity—cable modems and Asynchronous Digital Subscriber Lines (ADSL). Cable modems are designed to carry Internet traffic over the television cable lines installed in a large percentage of American homes. ADSL is a technique to fully utilize the normal copper telephone lines which enter essentially all American homes. Either of those techniques will enable full and inexpensive Internet access to the majority of Americans (Metcalf, 1996).

The introduction of graphical web browsers has greatly expanded the Internet's audience. Two-way voice and video conferencing will likely become feasible on a widespread scale through increases in bandwidth and data compression techniques. This will vastly expand the capabilities of the Internet. Despite these changes, the written word as expressed through e-mail will continue to be a vital aspect of communication. Just as the telephone did not make the written letter obsolete, video conferencing will not make e-mail obsolete. Because of its static nature, the written word will continue to be the medium of choice for business agreements and thoughts and expression of lasting value (Hiltz, 1986).

E-Mail

The earliest electronic mail systems were developed through computer time-sharing in the 1960s. With many people using the same computer, informal systems evolved to categorize and leave messages to other users. These were weekend type projects developed secondarily to the primary use of the mainframe computers. They proved popular and useful. Many mainframe systems integrated different types of e-mail facilities into their operating systems. The most widespread example is the mail facility which is a part of every UNIX system (Huang, 1995).

There are four components to e-mail: a computer, a network connection, a network, and communication software. Some systems such as UNIX have communication protocols built into the operating system. Others require modems, network cards, or Internet connections.

Electronic mail has become an integral part of American culture. Business cards and stationary frequently contain such addresses. This is due to an influx of inexpensive powerful computers, the development of network software and hardware, and the awareness of the benefit to all employees (D'Souza, 1992, p. 22). Five advantages of e-mail over traditional types of communication are (a) an overall cost reduction, (b) reduced paper handling, (c) faster communications, (d) improved communication effectiveness, (e) integration of data communication with records management.

There are disadvantages also. The primary disadvantage is the relative newness of the media means that large numbers of people are unfamiliar and perhaps uncomfortable using the communication software. Being a new media, it is in a state of flux. Thus, the

hardware and software configurations change rapidly, causing disruptions and lost or misrouted messages (Davis, 1989; Wagner, 1994).

Until about 1993 and the advent of the WWW, e-mail use on colleges and universities was limited to research and communication at the graduate and professional level. The mid 1990's has seen the widespread introduction of the use of e-mail at all levels. According to Marshall H. McLuhan (1962), the media shapes the message. It both limits it and defines the parameters under which the symbols contained in the message can be manipulated (Chayko, 1993).

Learning Differences

Learning strategies are the techniques and methods used by learners to accomplish specific learning tasks. Learning styles describe the underlying psychological and cognitive orientations of the learner. Thus one's learning strategies are influenced and in some degree derived from one's learning style.

The classification of learning styles is to some extent derived from the study of personality types. The investigation and classification of different personality types began with the ancient Greeks and continued through Jung, and Myers and Briggs. Kolb built upon this foundation to develop the widely used Learning Styles Inventory. Conti and Kolody have refined, expanded, and focused these concepts on the field of learning strategies and developed the learning strategies instrument ATLAS.

Individual adults have preferences, strengths, and weaknesses in the ways in which they process information and learn (Conti & Kolody, 1999a). Many adults learn actively and interactively. Others prefer facts, theories, and models. Some learn best in group or

social settings while others prefer introspection and reflection. Although it could be argued that peak learning efficiency would require a mastery of a wide variety of learning modes, in self-directed learning the adult is perfectly free to choose the type, place, and mode of resource to utilize. Thus, an understanding of the individual's preferences is of particular importance in true self-directed learning.

The concept of learning strategy preferences is rooted in the classification of psychological types. Current learning strategy preference theory is based on psychological research demonstrating that as the result of heredity, upbringing, and current environmental demands, different individuals have a tendency to both perceive and process information differently (Marshall, 1995).

Cognitive style is a related concept that refers to the preferred way an individual processes information. Cognitive style relates to modes of thinking, remembering, or problem solving. Most cognitive theories consider styles to be bipolar dimensions of a person's personality which influence attitudes, value systems, social interaction, and the internal learning process (Fellenz & Conti, 1989).

A number of cognitive styles have been identified and studied over the years (Fellenz & Conti, 1989). Field independence versus field dependence (Witkin, 1976) is one of the most well known. It refers to a tendency to approach the environment in either a linear or holistic fashion. Field independent personalities are able to identify individual figures as discrete from their backgrounds compared to field dependent individuals who experience events in a conglomerated undifferentiated way. Field dependence tends to be correlated with a greater social orientation.

Personality Types

There is a rough correlation between the four quadrants of many psychological typing systems and the Four Temperaments of Hippocrates (400 to 300 BC) (Marshall, 1995). Hippocrates theorized that the human body was comprised of four fluids or humors (blood, yellow bile, black bile, and phlegm). The balance or imbalance of these determined the physical health and mental attitude of the individual. This theory was further expanded by Aristotle's conceptualization of four primal qualities (dry, wet, cold, and warm) and four elements (earth, fire, air, and water) (Bonser, 1963).

One psychological corollary of the Four Humors is that a personality type (Melancholic-gloomy, Sanguine-cheerful, Phlegmatic-unemotional, and Choleric-irascible) is associated with each fluid. Recently, there have been more modern and refined "Four Temperament" models, such as one by Keirsey and Bates (1984), who found that the various personality types can be summarized into four temperaments which parallel the four Hippocratic humors. Keirsey and Bates (1984) named each temperament after a Greek god who personified the personality attributes of that temperament: Epimetheus, Dionysius, Prometheus, and Apollo. In the current version of their theory, Keirsey labels the four groups as Guardians, Artisans, Rationals, and Idealists (<http://www.keirsey.com/>).

Jung (1921) proposed two basic kinds of "functions" which humans used in their lives: how information is taken in or perceived, and how decisions are made (Green, 1999). Within these two categories, there are two opposite ways of functioning. People can perceive information through either the senses or through intuition. People can make decisions based on either objective logic or subjective feelings. People use all of these four

functions in their lives, but each individual uses the different functions with a varying amount of success and frequency. The order of preference for these functions can be identified within individuals. The function which someone uses most frequently is their “dominant” function. The dominant function is supported by a secondary, tertiary, and inferior function. Individuals are either “extraverted” or “introverted” in their dominant function. The dominant function is so important that it overshadows all of the other functions in terms of defining personality type. Therefore, Jung defined eight personality types. introversion and extroversion combined with each of the functions of thinking, feeling, intuition, and sensing. (Green, 1999)

Myers-Briggs

Katharine Briggs developed Jung’s theories further. Her daughter, Isabel, noted the importance of the auxiliary function in defining Personality Type and developed Jung’s model into a working instrument. The primary mode of operation within each category is used more easily and more frequently. The combination of these four “preferences” (Extroverted/Introverted, Sensing/Intuitive, Thinking/Feel-ing, Judging/Perceiving) defines personality type (<http://www.personalitypathways.com/intro.html>).

Extroverts focus on the outer world of people and tend to try things out while introverts prefer to think things through and focus on the inner world of ideas. Sensors are practical and detail-oriented while intuitors are imaginative and focus on meanings and possibilities. Thinkers make decisions based on logic and rules while feelers make decisions based on personal and humanistic considerations. Judgers set and follow agendas while perceivers adapt to changing circumstances (<http://www.personalitypage.com/info.html>).

Kolb

Kolb's (1984) theory of experiential learning classifies students along the perceptual and processing dimensions. The perceptual axis is often described as "prehension grasping" while the processing axis is one of "transformation." The prehension dimension is comprised of two opposite modes of learning: concrete experience (CE) or abstract conceptualization (AC). Concrete perceivers absorb information through direct experience and by doing, acting, sensing, and feeling. Abstract perceivers take in information through analysis, observation, and thinking. Once the learner has perceived the situation it must be "transformed" into personal meaning through active experimentation (AE) or reflective observation (RO). Active processors make sense of an experience by immediately using the new information. Reflective processors make sense of an experience by reflecting on and thinking about it (Marshall, 1995, pp. 27-31).

The preferences for perception and transformation are placed on a two dimensional grid, resulting in a typology of four learning "styles": (a) Accommodator, (b) Diverger, (c) Assimilator, or (d) Converger. Kolb maintains that movement through each style results in the most effective learning.

The CE/AC and AE/RO dimensions are polar opposites and produce four quadrants which represent four types of learners (divergers, assimilators, convergers, and accommodators). For example, an accommodator prefers concrete experiences and active experimentation (AE, CE).

The four types of learners in this classification scheme are:

Divergers–Type 1 (CE-RO). Such an individual might ask "Why?" They are interested in how the subject relates to their experience and interests. In

formal educational settings the instructor is counseled to act as a motivator with this type of individual.

Assimilators–Type 2 (AC, RO). Such an individual might ask “What?” They prefer information presented in an organized, logical fashion and require time for reflection. In formal educational settings the instructor is counseled to act as an expert with this type of individual.

Convergers–Type 3 (AC, AE). Such an individual might ask “How?” They prefer to work actively on well-defined tasks and to learn by trial-and-error. In formal educational settings the instructor is counseled to act as a coach with this type of individual.

Accommodators–Type 4 (CE,AE). Such an individual might ask “What if?” They like to apply what they’ve learned to real world problems. In formal educational settings the instructor is counseled to allow the student to make explore the possibilities at will. (Kolb, 1976)

Kolb (1976) has created a Learning Style Inventory (LSI). It is a survey consisting of 12 items where the respondent rank orders four possible responses for each item. The LSI has been shown to be both reliable and valid and provides insight into psychological orientation. The LSI continues to be widely used in adult education.

Learning Strategies

Unfortunately, the concept of learning style has met with limited success in practical applications. Bonham (1989) states that studies have consistently failed to validate differences attributable to learning styles. Thus, the concept of learning strategies is increasingly being utilized.

Learning strategies are “the techniques and skills that an individual elects to use in order to accomplish a specific learning task . . . Such strategies vary by individual and by learning objective” (Fellenz & Conti, 1989, pp. 7-8). These differences in learners result in clusters or groups that can be distinguished (Conti & Kolodi, 1995; Strakal, 1995).

SKILLS (the Self-Knowledge Inventory of Lifelong Learning Strategies), developed by

Fellenz and Conti (1991), is an instrument which identifies five areas of learning strategies that are used in real-life learning. "The phrase real-life learning has been used to distinguish typical adult learning from the academic learning of formal situations that is usually spoken of as studying or educating" (Fellenz & Conti, 1993, p. 4).

The five areas of SKILLS are Metacognition, Metamotivation, Memory, Critical Thinking, and Resource Management. Metacognition is the learner's own active analysis, assessment, and management of the learning activities. Metamotivation is the learner's awareness and management of the confidence, rewards, and discipline necessary to complete the learning task. Memory involves the various techniques and practices the learner uses to process information so that it is stored in memory. Critical Thinking includes testing assumptions, generating alternatives, and conditional acceptance of general knowledge. Resource Management strategies are important for the effective use and reflective examination of the resources used in learning. Qualitative and quantitative analysis revealed three groups of learners; Navigators, Problem Solvers and Engagers (Fellenz & Conti, 1993).

Navigators are meticulous learners who plan and develop a course of study and then follow it. They tend to be high achievers who utilize learning strategies involving planning, attention control, identification and critical use of resources, and the testing assumptions. Problem Solvers are focused on real world problems in an experimental way. They are willing to try what works and would utilize memory and to-do lists. The Engager enjoys sustained learning activities involving self-development and growth.

Conti and Kolody have developed ATLAS (Assessing The Learning Strategies of AdultS) to quickly and accurately classify learners according to the typology developed by

SKILLS. The first question of the instrument separates Engagers from Problem Solvers and Navigators. These groups are separated by the Engagers focus on internal reflection regarding the worth of the learning project, versus Navigators and Problem Solvers external focus on resources. While both are externally focused, Navigators are concerned with planning out the learning process, while Problem Solvers focus on solutions. Thus with just two questions the three primary groups are differentiated.

Summary

Different people have different styles, strategies, and techniques for learning. In a pure self-directed learning project, the learner is perfectly autonomous. Certainly the direction of formal adult education has been towards self-directed andragogy. In formal adult education, the presence of a teacher and a structured curriculum have two important implications for learning strategies. First the instructor can guide the learner to new and perhaps more effective learning strategies. Secondly, other learners and the curriculum can lead a learner to explore or at least be exposed to different techniques and learning concepts. These two forces can bring the learner out of his “comfort zone” and perhaps encourage growth and development.

In the pure self-directed learning project, these two forces are missing. There is nothing inherent in the educational process which would impel or entice a learner to try anything unpleasant, frightening, or disturbing. Certainly the original motivation to undertake the learning project could be considered an unsettling or propelling force, but during the process of learning this original motivation may not be in the immediate consciousness or preview of the learner. Thus in purely self-directed learning projects the

force of resistance to new learning strategies must be overcome by the original impetus of the project.

The Internet offers a variety of tools for learning that fit a variety of learning strategies. From chatrooms to books-online, a wide variety of resources are freely available. The vastness of the resources available may serve to mitigate the natural inclination to remain with a comfortable familiar learning strategy.

CHAPTER III

METHODOLOGY

This was a descriptive case study which utilized both qualitative and quantitative data gathering techniques. Qualitative data were obtained through open-ended e-mail questionnaires. Quantitative data were obtained from the participants through a brief questionnaire on Internet usage, a basic demographic questionnaire, and the administration of the ATLAS instrument. The qualitative questionnaire provided data on the nature of the participants' use of the Internet in their informal learning projects. The learning strategies inventory and demographic data triangulated and bounded the qualitative data. It was triangulated in that the same data were viewed from several different perspectives. It was bounded in that the field of inquiry was limited to certain questions and issues.

Research Design

This investigation utilized a descriptive case study methodology which is "an intensive, holistic description and analysis of a single entity" (Merriam, 1988, p. 16). It is "bounded" (p. 11) in that it refers to a single situation allowing the researcher to focus on the particular phenomena under investigation. The qualitative elements of description and narration "illuminate the reader's understanding of the phenomena"

(p. 13). The quantitative elements serve to bound the system and can assist in the development of a framework of analysis.

Caffarella's (1988) review of the literature revealed eight major studies of self-directed learning which were quantitative and have provided a great deal of information regarding the number and type of learning projects undertaken, resources utilized, and learner satisfaction. Numerous researchers (Caffarella & O'Donnell, 1987, 1989; Candy, 1987/1988; Danis & Tremblay, 1988; Spear, 1988) have recognized the need for more qualitative studies which would elucidate "a more in-depth picture of how individual learners go about organizing, doing and evaluating their own learning" (Caffarella, 1988, p. 5). Given the newness of the Internet, a holistic naturalistic approach is warranted. "Naturalistic modes of inquiry seem to be most appropriate to gaining a full understanding of the phenomenon" (Candy 1987/1988, p. 127). The qualitative approach is "a holistic, hermeneutically devised, empathetic, inductive, emic, interpretive understanding of the what and they why of human behavior" (Pohland & Bova, 1985, p. 290).

The study of self-directed learning projects requires . . . a naturalistic or qualitative approach based on interviews with learners. Such projects are inherently individualistic and can be understood primarily in terms significance to the learner. (Spear, 1988, p. 218)

Further benefits of this type of study are that

research focused on discovery, insight and understanding from the perspectives of those being studied offers the greatest promise of making significant contributions to the knowledge base and practice of education. (Merriam, 1988, p. 3)

There were also quantitative elements to the study. These quantitative elements are not meant to be statistically representative of the population studied.

Rather, they were included to aid in hypothesis formation. Ultimately qualitative research “leads to an increased understanding of the phenomenon by clarifying concepts, generating hypotheses, or constructing explanatory frameworks” (Merriam, 1983, p. 261). To that end, even data which is derived from a sample that may not be representative of a broad population, can aid in initial theory formulation. The development of the Internet has been so rapid that it is difficult to obtain accurate, timely statistics on usage patterns. This difficulty is compounded by an as yet incomplete understanding of the basic phenomena of self-directed learning as it relates to the Internet.

Population

A population is a “group of interest” to which the results and conclusions of a study should be applicable (Gay, 1987, p. 102). In particular, “the defined population has at least one characteristic that differentiates it from other groups” (Gay, 1987, p. 102). The population for this study was English speaking Internet users who had access to the various widely available newsgroups to which the request for participation was posted. Newsgroups are similar to electronic bulletin boards available on the Internet.

Requests for participants were posted on 20 newsgroups that dealt in some way with education or learning. By advertising through these groups, there was an increased likelihood that lifelong learners or professional educators would be reached. As in Houles’ original study, targeting this group ensures that participants have a

greater likelihood of being continuing learners, that participants are aware of their learning activities, and that they are more likely to be able to describe them in detail.

The 75 respondents were almost evenly divided between male (50.33%) and female (49.33%). The respondent's incomes were higher than national averages. Using the broad groupings of under \$25,000, \$25,000 to \$50,000, and over \$50,000, slightly over 50% had a household income of greater than \$50,000. About 10% had incomes under \$25,000, and 38% were between \$25,000-50,000. One recent study found the median income for online households to be \$58,000, which is 57% higher than the average American household of \$37,005 (eUser and Usage Report, 1999).

The age categories and the percentage of respondents in each group were 18-24 (2.67%), 25-34 (14.67%), 35-44 (28.0%), 45-54 (40.0%), 55-64 (10.67%), and 65 or greater (4.0%). Two-thirds of the respondents were in the middle-aged 35-54 group with about one-sixth older and one-sixth younger. The 18-24 age group was underrepresented amongst the respondents. One recent study (O'Reilly, 1995) found that this group represented about one-quarter of the general online population, while only 2.67% of the respondents were in this age group. Thus, the average age of the respondents was slightly greater than that found for the online population at large.

The educational level was significantly higher than the norm. About three fourths of the respondents were college graduates, where in the general population only about one-quarter were college graduates (Rachal, 1989, p. 11). This higher than average rate could be expected because of the correlation between continued education and past education, and because the sample for this study drew from newsgroups that appealed to groups interested in education (Rachal, 1989, p. 11).

The Instruments

Three instruments were used in this study; two were quantitative and one was qualitative. All of the instruments were designed to be quick and user-friendly. This was critical since they were anonymous. Those people who chose to participate in the study were directed to a web-site which contained ATLAS, the demographic survey, and the in-depth survey. As they answered each section, their responses were sent with no identifying return address to an e-mail address previously set up to receive the responses. There was no opportunity to provide assistance to the participants as they filled them out. Both ATLAS and the demographic survey could be answered in one or two minutes. The in-depth qualitative survey was open-ended and encouraged greater input. The directions suggested to the participants that 20 minutes or more might be required to complete it.

The first page presented to the respondents gave a brief overview of the project, provided contact information, and gave assurances of anonymity. From the opening screen the respondents were guided through ATLAS, the survey, and the questionnaire. The web pages were designed so that each page was about one screen in length. The user did not need to scroll down the page. At the bottom of each page, there was a “next” on the informational pages or “submit” button on those pages where the respondent provided information. Having many short pages as opposed to one, long, scrollable page kept the forms readable, but it also meant that the user had to click the next button after each screen. Besides readability, the advantage to this

was it kept the user engaged and active, and if the connection was dropped, all the information would not be lost.

In prototyping the system, there was a time lag of anywhere from two to ten seconds between pressing the “submit” and seeing the next page. Some test users had the perception that the program was broken or was not responding because of this delay. In the final version of the web-site, the users were alerted to this time lag, and it seemed to be fairly well accepted as no significant complaints were registered in the comments section.

Demographic Data Collection

The short survey was composed of nine questions. Five of them were basic demographic information regarding age, education, gender, education, and income. These variables were used to describe the sample and allowed a comparison to existing large scale surveys of Internet users. Four of the questions dealt specifically with Internet usage, first Internet use, amount of time online, amount of time online on self-directed learning, type of Internet resource used, and location of Internet access. These questions were used to determine if the respondents were unusual in respect to their Internet usage.

Qualitative Questions

Ten qualitative questions were asked. They dealt with types of learning projects, types and location of resources, and perceived advantages and disadvantages

of using the Internet in self-directed learning projects. Each question was accompanied by a sample response. The ten questions were:

1. Briefly describe the three or four of the most important self-directed learning projects that you have undertaken in the last year which used the Internet as a learning resource.
2. Please describe what parts of the Internet you use in your learning projects; i.e., do you use newsgroups, chatrooms, mailing lists, e-mail, or just browsing web pages.
3. Has the Internet expanded the resources available for your learning projects?
4. How are these resources different than “traditional resources”?
5. Has your use of the Internet led to the location of “traditional” learning resources, and how would you compare “traditional” and Internet resources?
6. Does the Internet act as an additional source of information or does it replace other sources of information, and what effect has this had on your learning?
7. What parts of the use of the Internet do you find the most difficult?
8. How do you find or locate resources on the web?
9. When you are planning or figuring out how to go about a self-directed learning project, do you plan out the steps to the learning project, or do you just begin with one resource and see where that leads? How does the Internet effect the level of structure or planning of your projects?

10. When you are involved in a learning projects, different ideas and opinions come up. How do you decide which ideas are correct?
11. Please add any additional information.

ATLAS

ATLAS (Assessing The Learning Strategies of AdultS) (Conti & Kolody, 1998) was the first instrument presented. It is an instrument for identifying the learning strategies of adults. It utilizes a flow chart design which questions and directs the respondents through the instrument and can be completed in one or two minutes. The original flash-card format adapted easily to a web format.

ATLAS categorizes learners as Problem Solvers, Engagers, and Navigators (Conti & Kolody, 1998). Problem Solvers think of a variety of ways to “solve the problem” at hand and then dive in with experimentation. Engagers wish to view the learning project within the total context of their lives and the people around them. Navigators prefer to structure the information to be learned.

The construct, content, and criterion-related validity of ATLAS has been established (Conti & Kolody, 1998). ATLAS was developed through the synthesis and consolidation of the many research studies performed with the Self-Knowledge Inventory of Lifelong Learning Strategies (SKILLS) instrument. It is based on powerful multivariate statistical procedures. ATLAS quickly identified the learning strategy preference group membership.

Construct validity is an assessment of the degree to which a test or instrument measures human behaviors as conceptualized through the underlying theoretical

hypothesis and theories (Van Dalen, 1973, p. 137). ATLAS's construct validity was determined through the synthesis and consolidation of various studies which utilized SKILLS. Using cluster analysis and a database of 3,070 cases from various studies using SKILLS, three distinct groups of learners were identified. They were Navigators (36.5%), Problem Solvers (31.7%), and Engagers (31.8%) (Conti & Kolody, 1999c, p. 18).

Content validity is a measure of the adequacy of the sampling of the instrument (Kerlinger, 1973, p. 458). In the case of ATLAS this refers to the degree to which the choices in ATLAS represent the learning strategies of the Engagers, Navigators, and Problem Solvers. This was done using discriminate analysis. Originally the groups were identified through the multivariate analysis technique of cluster analysis. In the further development of the instrument, the items or choices were only presented one at a time to the respondents, and they were then channeled or tracked through the instrument. Each succeeding question is determined by the preceding question. Thus, rather than aggregating or averaging many items to identify a particular preferred learning strategy, ATLAS precisely describes the learning strategy associated with each item. The content validity of this methodology was determined by multivariate analysis.

Criterion validity is the degree to which an instrument produces results which are comparable to other instruments, characteristics, or attributes which are generally believed to measure the underlying behavior or phenomena under consideration (Kerlinger, 1973, p. 459). For ATLAS, this was determined by administering both ATLAS and SKILLS to various groups of adult learners. About 70% of the

respondents were identified by ATLAS as being in the same group that SKILLS had placed them in. The great advantage using ATLAS rather than SKILLS is that it is quicker and easier for the respondents to complete. In addition its simple flow-chart format was easy to web-enable.

Pilot Study

A pilot study was conducted to test the instruments and the methodology for their delivery. In particular, studies of self-directed learning have typically involved personal in-depth interviews. It was not known if a written web-based questionnaire format would produce the quantity or quality of response required for analysis.

There were two phases to this pilot study. The first phase involved volunteers completing and critiquing the questionnaire in the traditional verbal format. The second phase of the pilot was a test run of the web-based questionnaire. The results of these two phases were then compared to determine if the web-based questionnaire produced results of similar quantity and quality as that of the verbally-administered questionnaire.

In the first phase of the pilot study, the three instruments (ATLAS, demographic questionnaire, and in-depth questionnaire) were examined, critiqued, and taken by six educators. This was done verbally over the telephone, and the responses were tape recorded and transcribed. This acted as a basis for comparison against the subsequent written questionnaires. This was done for two reasons. First, many people are uncomfortable with typing, and it was possible that oral responses would be orders

of magnitude more thorough and complete. Second, feedback from knowledgeable colleagues in the field of education would help refine the wording of the instruments.

The second phase of the pilot was a real trial run of the instruments in an actual web setting. The perfected instruments were made available on the Internet at www.digizen.net/member/spencer/intro1.htm. An e-mail posting to the following newsgroups was made at about 3:30pm on February 21, 1999:

- alt.education
- alt.education.adult
- misc.education
- alt.education.alternative
- alt.education.maryland.collaborative
- alt.education.cooperative
- aus.education
- aus.education.open-learning
- misc.education.adult
- misc.education

Sixteen completed responses were received within 48 hours. Eight partially completed surveys were not included. In general, the partially completed surveys consisted of the ATLAS and the short questionnaire.

The written responses completed via the web appeared to be of similar quality and depth to the previously obtained verbal responses. The written/e-mailed responses averaged about 30 lines or approximately 375 words. The transcribed verbal interviews were about 550 words or about 50% longer. However, there tended to be greater redundancy in the verbal responses. Thus, the amount of usable content was roughly comparable.

Web-based data gathering is relatively new. The literature does not currently contain many examples of scholarly research utilizing web-based data gathering. Thus,

without other examples to guide the research, the primary concern here was the quantity and quality of the responses, and this concern was adequately addressed by the pilot study.

While the pilot study demonstrated the viability of the process, a number of questions remain regarding the use of the technology for data-gathering. For example, there are no good estimates of the number of readers of each newsgroup. Further confounding the situation is that the web is still growing and evolving. Over the three month period of the study, new types and versions of newsreaders were released. Not only is the technology changing, but the population is changing. The Internet is in a phase of rapid exponential growth. Thus, those in the Internet user population are becoming more familiar and comfortable with the medium.

It is difficult to estimate the number of readers of each newsgroup. The roughest estimate is that there are 1,000 subscribers per newsgroup. This yields a total of 10,000 for a response ratio of 1 in 625.

Other venues of notification could have different response rates. For instance, there are listservers on subjects such as distance learning and adult education. These might well have a higher response rate because they would be more likely to have readers specifically interested in distance and self-directed learning. The difficulty with using them for a study such as this is that they have a narrower audience than was sought in this study. The solicitation for this study had to be to a broad audience, yet the newsgroup or mailing list could not be so far removed from education that the posting of it was off-topic or an inappropriate intrusion into the focused newsgroup or mailing list. For instance, the readers of newsgroups on topics such as automobiles

might find a request for respondents to a survey of learning to be an unwarranted intrusion into their forum. Even though many automobile aficionados engage in self-directed learning about their hobby, the wording and solicitation of a request for respondents would require some consideration.

Another factor which influenced the response rate to the survey was the title or subject line of the e-mail which requested participation in the study. All of the 10,000 or so potential viewers of the solicitation e-mail did not even open the e-mail. The subject line, though, could have been seen at least in passing. The primary subject line for the e-mail was "Find out your Learning Strategy Preference!!!" and "Are you a Navigator, Problem Solver, or Engager?" Perhaps this attracted a certain type of individual. Other subject lines might be utilized to increase the variety of respondent. For example, the following might have been used: Learning on the Internet, What's the Internet Good For?, or How do you use the Internet for Learning. Each of these might appeal to slightly different groups of learners. Another line that could have been used is a simple appeal for help because occasionally on these groups will be the straight forward: "Please fill out this survey for my dissertation."

One difficulty with any type of request for information on the Internet using a response form is that these responses are truly anonymous. When a response arrives, it cannot be determined from whom or from where it came. On this survey, each complete response for an individual consisted of 12 anonymous e-mail messages to the address rgspencer@my-dejanews.com.

Because of the limitations of the current technology that was available for this research, an individual's response could not be contained in one e-mail message.

Rather, there was one message for the ATLAS categorization, one for the demographic questionnaire, and one for each of the 10 descriptive in depth questions. One potential problem that this presented was that theoretically two people could begin the learning strategy instrument at the same time and mail in their responses at about the same time. In that case, there would be no way of telling which demographic questionnaire went with which ATLAS response. Fortunately this did not occur. The most overlap that occurred in the responses was that one participant was at the third in-depth question when another respondent's initial ATLAS response arrived. Thus, although they were overlapping, it was easy to discern how to group the responses. However, in a situation such as this if the second respondent had started five minutes earlier, the two respondents' e-mails would have been hopeless entangled. Given the present technology and monetary restraints, the possibility of such invalidating occurrences was deemed to be acceptable. On the basis of this pilot study, it was determined that this might occur once or twice during the larger study. Therefore this situation was ameliorated by posting to one newsgroup at a time. It was anticipated that all of the responses from any one posting would occur within 72 hours. The systems which distribute and store the newsgroup posting generally only keep the most recent posting available for ready access. Also, spreading out the posting could give information regarding which respondents came from which newsgroups.

Data Analysis

The pilot study methodology was then used for a larger posting to the following 20 newsgroups:

- alt.education
- alt.education.adult
- misc.education
- alt.education.alternative
- alt.education.maryland.collaborative
- alt.education.cooperative
- aus.education
- aus.education.open-learning
- misc.education.adult
- misc.education
- alt.education.business
- relcom.education
- misc.education.science
- misc.education.language
- alt.education.research
- alt.education.non-trad.degree
- alt.education.bangkok
- alt.education.management
- alt.education.student
- misc.education.medical

The responses were received over a period of six weeks. In all, 75 responses were collected. The responses were transferred from the e-mail mailbox to a PC. The responses from ATLAS and the demographic survey were coded and these codes were appended to the corresponding in depth survey questions. For instance the code p2mh6m15c3e had the following characteristics: problems solver type 2, male, primary Internet use from home, online more than 5 hours per week, uses mailing lists, income under \$25,000 per year, age 45-54, a college graduate, has used the Internet for more than one year, uses the Internet every day for self-directed learning.

During the initial collection of the data and in subsequent review, certain themes and categories became apparent. Codes for the major themes, such as the beneficial aspects of Internet use, were then appended to the corresponding responses. The responses from each of the major themes were then grouped and analyzed. From this analysis certain sub-themes arose. For example, the beneficial aspects were divided into the sub-categories of convenience, amount of information, interactivity, and cost. This resulted in the qualitative data being sorted by category with the demographic and learning strategy code appended to each response.

CHAPTER IV

RESEARCH FINDINGS

The research findings fell into three categories. The first category concerned the general usage patterns and characteristics of self-directed learning projects on the Internet. Many factors including such things as convenience and diversity and depth of resources have made the Internet a primary tool for many self-directed learners. Other factors such as slow connection speeds and information overload were found to negatively impact the learning experience.

The second category dealt with the interaction of the Internet with traditional types of learning resources. It was found that traditional learning resources such as books, articles, and the suggestions of friends and experts often led to germane Internet sites and resources.

The third and perhaps most important category concerned learning strategy preferences. It was found that Problem Solvers were over-represented while Engagers were under-represented. Additionally learning strategy preferences influenced and shaped Internet usage patterns and characteristics.

Demographic Data

Learning Strategy Preferences

The distribution of learning strategy preferences as defined by ATLAS among the 75 participants was 12 Engagers (16%), 25 Navigators (33.33%), and 38 Problem Solvers (50.66%). Previously, a large study of 553 educators and students had shown a distribution of 38.3% Engagers, 36% Navigators, and 25.7% Problems Solvers (Conti & Kolody, 1999). Engagers were clearly in the minority in this study using the Internet and the following Chi-squared statistic shows that this difference was statistically significant.

N1

	Observed N	Expected N	Residual
N	25	27.4	-2.4
P	38	23.8	14.2
E	12	23.8	-11.
Total	75		

N=Navigators, P= Problem Solvers, E=Engagers

Test Statistics

	N1
Chi-Square ^a	14.605
df	2
Asymp. Sig.	.001

a. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 23.8.

This result could be an indication that Engagers are not prone to use the Internet as it presently exists. Engagers want and need feedback and human interaction. The distance and inherent lack of connectedness could be factors which will inhibit their use of the Internet until such time as more fully interactive protocols are available. For Engagers, "interaction and collaboration are major motivators for entering into the learning task" (Conti & Kolody, 1999b, p. 14). While e-mail, newsgroups, chatrooms, and mailing lists provide some interaction, it is of a limited nature and at a distance.

Over 50% of the respondents were Problem Solvers.

Problem Solvers test assumptions to evaluate the specifics and generalizability within a learning situations; they generate alternatives to create additional learning options; and they are open to conditional acceptance of learning outcomes while keeping an open mind to other learning possibilities. (Conti & Kolody, 1999b, p. 12)

The hyperlinked nature and immediacy of the Internet are some of the appealing factors to action-oriented individuals. The variety of material, opinions, facts, and even falsehoods on the Internet do not dissuade or impede the Problem Solvers. They are able to conditionally accept a course of action or line of reasoning and revise or replace it as necessary. Another factor which may lead Problem Solvers to the Internet is that setting up an Internet browser and finding and navigating to the various resources is somewhat of a technical challenge. Thus, the Internet is well-suited to the learning strategy preferences of Problem Solvers, and a disproportionately large number of Problem Solvers responded to this survey.

The percentage of Navigators (33.33%) was very close to that found (36%) by the previous study which was used to establish ATLAS (Conti & Kolody, 1998). The negative factors which discouraged Engagers and the positive factors which encouraged

Problem Solvers did not have a net effect on Navigators' use of this medium. "Navigators are focused learners who chart a course for learning and follow it" (Conti & Kolody, 1999b, p. 9). Navigators accepted the number and quality of resources available on the Internet positively while not being dissuaded by the distance and lack of engagement.

Internet Usage Data

In keeping with Penland's (1977) finding that the majority of people (66.4%) prefer to engage in self-directed learning from home, the majority of respondents used the Internet from home for their self-directed learning projects (62.67%). The second most common place was the office or workplace (37.33%). Both access from the library and school were listed as options, and yet no one checked these as the primary location from which they accessed the Internet. In the qualitative responses, these locations were not mentioned either.

Respondents were asked as to the number of hours they spent online per week. The choices were less than two hours per week, two to five hours per week, and more than five hours per week. About three-fourths of the respondents reported spending more than five hours on line each week. This is comparable to another large study which found the average online user was online 7.1 hours per week (Peterson, 1999, p. R6). This is clearly a major pastime in and of itself. While not as much time as the average citizen spends watching television (15.6 hours), it is greater than the time spent reading newspapers (4.0 hours) or magazines (3.4 hours) (p. R6).

The Internet is composed of a number of resources and tools. The most prevalent is the World Wide Web with its web pages containing text, graphics, and hyperlinks.

However, there are a number of other components such as e-mail, newsgroups, mailing lists, chatrooms, File Transfer Protocol (FTP), and Telnet. FTP and Telnet were two of the primary methods of navigating the Internet before the World Wide Web.

When asked what the primary resource was that they used while on the Internet, about two-thirds of the respondents used web-based viewing as their primary resource. It is certainly the easiest to initiate and the first thing that comes up when a browser is started.

Both mailing lists and newsgroups were the primary resource for about one-seventh of the respondents. Chatrooms were the primary resource for three respondents, and FTP was the major resource for one respondent. These figures roughly correspond to the difficulty of use and set up of these resources. Mailing lists and newsgroups require a few steps to join, open, and read. They tend to be more focused and concentrate on one topic. Chatrooms are becoming easier to join and set up. While they are ostensibly on a specific topic, they tend to be cluttered by casual and often extraneous comments.

File Transfer Protocol (FTP) is one of the original Internet tools that even predates the World Wide Web. It requires arcane syntax to utilize. It is used to download files from distant computers. It was listed as the primary resource used by one only respondent.

No respondents listed Telnet as their primary resource. Telnet is also one of the original Internet tools that predates the World Wide Web. In the 1970s and 1980s, it was one of the most valuable tools on the original Internet. It is now mainly used by computer technicians.

A vast majority (85%) of the respondents had been using the Internet for more than 12 months. No one reported having been connected to the Internet and then having

it disconnected or inaccessible for any length of time. This suggests that no one examined the Internet, tried it on a self-directed learning project, and then rejected it as a viable resource.

Two-thirds of the respondents used the Internet daily for self-directed learning projects. This figure fits in well with previously published studies (Peterson, 1999, p. R6). This implies not only were the respondents online daily but, also, that some significant proportion of their online time was involved with self-directed learning.

Beneficial Aspects

Four major themes emerged regarding the benefits of the Internet over traditional resources: convenience, amount of information, interactivity, and cost. The convenience has the potential to increase the amount of time spent on self-directed learning projects. The breadth of information has the potential to expand the quality of the learning experience. The relatively low cost holds the promise of democratizing access to information. The ability to interact with others has the potential to enable constructivist transforming learning. One Problem Solver summarized many of the positive aspects of the Internet:

Yes, the net has been fabulously rich in its offerings. Traditionally I would have to go to the local library (community one) to see what they had on their shelves—limited. To seek more specific info would require getting access to specialized sources of info: big University libraries charge to use their services (that's if you're not a student). Beyond this is to go to places (physical) to seek info from whomever. The net has overcome these obstacles in that I can now search and get articles that would otherwise not be available. I can talk to people all over the world and get immediate answers. I can get connected to multitudes of constant streams of information (mailing lists). Managing all this information overload is the tricky bit!

Convenience

The ease and convenience of the Internet were mentioned by the vast majority of respondents. Twenty-four hour availability along with access from home or work meant literally fingertip availability for them to a rich resource of learning materials. The two factors of time and distance were interrelated; that is, to travel to a learning resource takes time. In a world of increasingly hectic schedules, time is a precious commodity. Driving to a class or library could easily consume 50% or more of the total time available for the learning project.

In addition to time, a second factor is the effort and stress of traveling. After a hectic work day, an additional commute is an added burden. For parents and caregivers, travel meant the additional burden of arranging alternate care. One Engager stated that it was now possible to:

Access information from all over the world. Very easy to access—from own home at an hour that suits (after children in bed) and immediate findings. Also in a relaxing atmosphere (as opposed to a library where one can feel threatened from lack of knowledge).

In a similar vein, a Problem Solver wrote:

The Internet has opened an endless amount of resources for whatever I want to learn. It's much better than "traditional resources" because you can access material anytime day or night. With a small child and going to school full time, I just don't have the time or the baby-sitters to go to the library or the school or anywhere else. I wouldn't have done so well in school so far if it hadn't been for owning a computer and having Internet access.

Another aspect of time benefits is that not only is the Internet fast and easy to get to, but once one is logged on, the retrieval of information is also fast. For instance, in a library there is a multi-step process to retrieve information. With the Internet, a few

keystrokes brings the information to the screen. “Traditional sources are often more difficult to find. With the Internet, I can find information very quickly. Also, without a great deal of searching.” In the hectic post-Modern world, expectations for the rate of change and the time for delivery of goods and services has changed. The Internet is part of that phenomena. It is changing expectations.

I have access to vast arrays of data, from commercial and educational sources. The speed at which I can browse at work spoils me in terms of how quickly I want my information. I can use search techniques to hone in on a topic and a particular area of that topic. (Navigator)

Once one has become efficient using the Internet a great deal of time can be saved in procuring the necessary information. My time is worth money and therefore it becomes cost effective as well. (Problem Solver)

I can post a question to a newsgroup and get sources from around the country. Traditionally, I would have had to call my friends and relatives to find people—it would have been a time-consuming process. (Problem Solver)

Instead of having to go to the library, I can access it at home. This means that I can spend more time researching my topic, because I can fit the researching into smaller blocks of time, and on days/times that the library isn't open. (Problem Solver)

The Internet is more up to date, easier to access from home or work, any time of the day or night . . . even from distant locations when traveling. (Problem Solver)

It gets me articles and papers in faster time and from my office which otherwise would have taken me much more time to access. (Engager)

A lot of the resources I chose are based on time and convenience, so I tend to use the Internet more for shorter term, “just-in-time” types of learning and more “traditional” sources for longer term projects. (Problem Solver)

I am always short of time and it allows me to put together materials that otherwise I would never be able to find. The traditional methods can be slow or not effective. For example I taught in Bolivia in March. I ordered some of my texts over the Internet and received 45 copies in five days

instead of the six weeks if I had gotten them by ordering from the University. (Engager)

The Amount of Information

The wealth of information available is consistently mentioned as being one of the primary allures of the Internet. This wealth of information largely comes in the form of web pages created by individuals, universities, companies, and government agencies. Newsgroups and mailing lists also provide information. Although this vast collection of knowledge can be and is difficult to navigate, its availability is widely appreciated.

The amount of information on the web is simply staggering, which leaves one short of adjectives to describe what will be there in the future. I have a multitude of interests, and cannot think of anything that I have been unable to find useful information about on the web. (Navigator)

For me the Internet acts as additional source of more academic, general and worldwide information. Local findings, I access elsewhere. I think the effect is that I feel more informed. (Engager)

The Web does have the most up to date information about tours and directions to the houses. On the other hand the accompanying information about the houses is usually less accurate and comprehensive than traditional resources. The exception has been online listings of materials in university archives--this is material that is not normally available without travel to the actual archive. (Problem Solver)

Some resources are absolutely unique to the Internet. One such aspect is the world-wide reach.

Of course, I wouldn't have examples of Spanish newspapers w/o the Internet. Also, I have recently accessed Spanish radio and Television in various countries using Real Player, resources not very available w/o the net. I view the net as an almost limitless resource for any project I wish to undertake. (Problem Solver)

The Internet also represents more of the “real-world.” Current events are discussed, and contemporary research in progress is available. Thoughts and opinions which have not been rigorously tested or evaluated are available. Some respondents find this to be a benefit.

I have a “terminal” degree, so, I generally am not looking for courses or “traditional” resources. Traditional resources generally have the locus of control with the teacher or institution. By retaining the LOC with myself, I use any resource, including “traditional” resources when I want. I can also drop them when I think they have served their usefulness or become too teacher centered. (Problem Solver)

Interactivity

The third primary benefit of the Internet in self-directed learning projects is its interactivity. In chatrooms and with e-mail, newsgroups, and mailing lists, it is possible to get feedback to specific questions. While it does not appear that the majority of individuals utilize these resources, those that do derive great benefit.

On the net, I can even find kind souls willing to answer newbie questions in almost real time when I run into a programming snag. Some of them know what they’re talking about and some don’t, but all mean well. (Problem Solver)

While some conversation is purely information gathering, some is actual discourse that can shape thought and foster growth.

Being able to interact with others broadens my understanding especially when compared to reading a reference and solitarily thinking about the information. Discussion is much more likely to lead to action in the form of changes and improvements in my methods of instruction and interaction with students. In sharing information I learn from the Internet I am able to foster better relationships with the educators I work with. I don’t think the Internet has replaced anything, but merely enhanced almost everything. (Problem Solver)

Since conversation and exposure to a range of ideas is beneficial, the Internet is valuable in that it connects you with a wide variety of people and ideas. Conversations thus tend to focus one's thinking and helps to create insights into others' points of view. (Navigator)

There are tens of thousand of mail lists, newsgroups, and chatrooms. They range in content from the sublime to the profane. The relative distance and anonymity of the Internet does lead to a loss of inhibition regarding style and forcefulness of speech. There is no lack of give and take of opinions. Despite these caveats, a number of respondents found benefits in these unmoderated settings:

I like to use chatrooms to meet people in the areas of interest to me and will sometimes get great leads here. (Problem Solver)

Most of the information I get is from web sites, chatrooms and e-mail from friends I met on the net. Most of the time I visit a lot of websites that are closely related to my interest. (Problem Solver)

Chatrooms let me learn new and different things. I have sent and received e-mail from friends I have met. (Problem Solver)

Although I mostly use search engines to find what I'm looking for I like to use chatrooms to meet people in my areas of interest and will sometimes get great leads here. (Problem Solver)

Studying newsgroups for financial info is beneficial as are chatrooms on related subjects. (Engager)

Cost

Low cost is often seen as a benefit of Internet over traditional resources. Most Internet service providers charge a flat monthly rate for unlimited access, so there is no incremental cost. Few current web sites charge for access and those that do generally have competition which does not charge. For example, the Wall Street Journal is one of the

few online newspapers which charges for access. The current essentially free system is well liked, as demonstrated by the following comments:

Since I have unlimited access for a fixed charge to the Internet, if I can find some free resources on the web I would rather use them than paying for books or magazines. (Problem Solver)

It's cheaper so in some cases it replaces other resources. (Problem Solver)

For me it replaces books and courses. This has not only made it possible for me to learn at my own pace, but also because of the cost. (Engager)

One of the great advantages is that it's readily available and at no cost (disregard connection time and ISP charges). (Problem Solver)

The Internet has easier access and cheaper. (Navigator)

Detrimental Aspects

There were a variety of complaints about the Internet. Many were technical in nature but other complaints and concerns addressed information management issues. Technical considerations such as speed and reliability will eventually be solved as the media matures (Thurm, 1999, p. R12).

Technical Issues

By far the greatest number of complaints dealt with the speed and reliability of the connection of the home Internet user dialing into a Internet Service Provider using a modem.

Sometimes my Internet provider seems to be bogged down, and things take forever. At other times, Windows seems to just lock itself up and cause problems. Since I tend to follow things down long paths, it is often difficult to get back to my starting point. When things are copied to my computer,

it is frustrating not knowing where they are located. For example, Explorer stores my e-mail messages, but where are they located inside the computer? (Problem Solver)

Actually our Internet connections are so slow and cumbersome that time is our most frustrating aspect of Internet searching. In addition, we have had to upgrade equipment repeatedly to keep up to speed. (Problem Solver)

When I have a slow modem, speed is an issue. (Problem Solver)

All the advertisements are annoying, and my machine is slower. I don't know which advertisements are true but it's nice to have all that available. (Problem Solver)

Sites with excessive pictures and little content can be aggravating and slow the connection process. (Problem Solver)

The speed of a connection can be trying. (Navigator)

Slow connection speed and web sites that have moved or changed URLs are frustrating. (Engager)

Another frequently mentioned technical difficult was involuntary disconnection.

The Internet runs through the phone lines, the telecommunications network, and servers around the world. Particularly frustrating is the experience of being involuntarily disconnected.

Trying to log on at different times of the day is very frustrating, aggravating, and difficult. Everyone is trying to log on at once, and when I do get through, it isn't for very long, AOL will cut me off. (Problem Solver)

What I find most difficult is you are kicked off-line and then it takes 15 minutes to get back online. (Navigator)

There were some software-related technical complaints. There are a variety of software modules ("plug-ins") such as audio sound players that can enhance the Internet.

The variety and complexity of these can be trying at times. A typical comment was:

When you try to access a file & it tells you that you don't have the software to use this type of file, would you like to download it? By the time you download the software, install it, navigate back to the web page you started from...it's an hour later. (Problem Solver)

A Navigator expressed similar sentiments:

Overcoming cutesy graphics and gizmos on web pages that confuse my elderly browser. I'm literate, so why can't those who create web sites present stuff in simple text so I can get it quickly and search the text for keywords to zoom in on. There is plenty of richness just with color, font sizes, bold, underlining etc.

Additionally the mechanism, procedures, and directions for joining, managing, and un-joining newsgroups and listservers are not as intuitive or as user friendly as expected by a number of respondents. To join or un-join a newsgroup might require a dozen separate steps. While no individual step might be difficult, if any one step is not followed properly the procedure will fail. Additionally newsgroups which are unmoderated allow anyone to send anything to newsgroup. Oftentimes unwanted advertisements are posted.

Newsgroups can also be frustrating, for people post messages that have no relevancy with the newsgroup. (Problem Solver)

The newsgroups . . . it seems that mostly they don't function very well and are often spammed. (Engager)

I hate some of the listservs. Like the mailing lists they are so difficult to unsubscribe from. (Navigator)

The blithering idiots that sometimes use the newsgroups and chat rooms! Sometimes overly ornate web sites are a problem also...too busy, bad links, slow loading. (Navigator)

I think the newsgroup is the most difficult for me. I still haven't subscribed to any newsgroup or joined any newsgroups. (Problem Solver)

The Internet is less useable than more traditional learning resources in a number of situations. From an ergonomic standpoint, the video monitor, mouse and keyboard

design, and seating all can cause problems. The video monitor can cause eyestrain. Most people find reading large volumes of text on line tiresome and difficult. The mouse and keyboard can cause repetitive stress injury (RSI). The seating combined with the static position of the monitor and keyboard can become tiring.

My mouse because of RSI, I'm often sitting for too long a time behind the computer . . . The main handicap is the whole electronic apparatus: its not easy to move. (Problem Solver)

Trying to read a lengthy article gets very tiresome for both my eyes and my butt. (Navigator)

It is also much easier to curl up on the couch with papyrus. (Navigator)

Information Management Issues

From an informational standpoint, the most significant complaint was the sheer quantity of information available. Most respondents expressed a sense of bewilderment on the staggering amount of information and choices returned from even a simple search. Not only is finding what was originally sought difficult, but there are so many possible sidetracks that distraction is possible.

The sheer scope of the topics and ideas of the Internet make finding particular pieces of information, or web sites somewhat difficult. Simple searches may lead to such a huge number of "hits" as to make it impossible to proceed (or to keep track of where one has been). (Navigator)

The Internet makes information readily available...sometimes an OVERWHELMING amount of information. I used to go to the public library to do my research, now I just sit down at the computer. By the way, I still access the public library, only with Telnet! (Navigator)

Sometimes searches can be frustrating because there is such an abundance of material to search through. Small inconvenience for the amount of knowledge gleaned. (Problem Solver)

The net is just another source of information. It does in places replace traditional sources such as where information that was provided in say book form is now available on-line. As for changes to learning there are key skills developing: Research & Searching techniques - There's so much info to pour through and so much simply difficult to find. Information Management: with so much information coming in the skills are in organizing, collating, determining relevance, analyzing. This area is the biggest skills area indeed. (Problem Solver)

It's too easy to get sidetracked among all the possible links, also there seems to be a lot of bait and switch, offering information which just comes down to subscribe or order here. There should be something like National Public Internet where standard and widely disseminated items like 1st through 12th grade textbooks in use at local schools would be "online."
(Navigator)

Sites that are not well-organized so that I waste a lot of time trying to find what I want. I don't stay long at these sites; I move on to something else.
(Navigator)

This confusing profusion of choices and quantity can have a significant negative impact on the learning experience. To some extent resource management is a concern and problem for all types of self-directed learning projects. By definition, the learner does not have an expert in the self-directed learning project to sort through and present the curriculum. In more traditional settings, a librarian would act as a guide for sorting, screening, and presenting information to the self-directed learner. Previous studies of self-directed learning report that mentors, guides, and knowledgeable friends assist the learner with resource guidance and acquisition (Tough, 1967, p. 31).

In this profusion of information, there are irrelevant, annoying, and useless elements. Several respondents expressed frustration dealing with these:

Knowing that the web represents a wonderful opportunity for social and political reform, for people of common interests to interact regardless of geographical location, it is so aggravating seeing that kind of promise used mainly for selling useless articles, sexual activity, and boring chat.
(Problem Solver)

The blithering idiots that sometimes use the newsgroups and chat rooms!
(Navigator)

The Internet and the Learning Process

When learning online, the learning process is molded and shaped by the Internet. Some things such as the subject chosen to study are only incidentally affected. Other things such as the planning and path of the learning process can be more profoundly affected.

Subjects

The variety of subjects studied was similar to that found by previous studies on self-directed learning (Penland, 1977). Projects which were work-related were prominent. Web development and computer-related subjects predominated. In the work-related category, technology subjects predominated. Health was also noted by a number of respondents. About half of the people researching health subjects were investigating conditions they themselves had while the other half were researching conditions of family members.

Computer Certification: I obtained certification in Cisco products through newsgroups, specialty web sites, and vendor information. (Navigator)

Computer certification: an on-line course Gathering information on current political affairs Seeking information re: specific health problems
(Navigator)

I needed to learn more about Technical Training certification. Used the Internet to find out more about Certified Technical Trainer (CTT) program, Microsoft/Novell certification, etc. (Problem Solver)

I wanted to learn about color for my job. I am personally very interested in the physical properties (wavelength of light, etc.) of color versus the way the eye/brain perceives color. But, all we really need at work is a way to match colors. (Engager)

Attention deficit information—My son displays symptoms. Physics demonstrations and info—I teach physics and am looking for Internet resources. Astronomy information—hobby computer hardware information—computer upgrading background. (Navigator)

Health: I'm learning about nutrition and sports and how to eat to support my sporting endeavors. (Problem Solver)

I needed medical information and I was able to find many sites that were helpful to me. (Engager)

Medical questions—seeking info on rare diseases & symptoms for relatives and friends. Also I seek educational resources for my grandchildren. (Problem Solver)

My sister was diagnosed with a certain type of cancer and I wanted to know more information about it so I could help explain the situation to her. Once I found the information on the Internet I e-mailed those in the family who were out of town and took copies for her to read. (Problem Solver)

Learning about age-related dementia illnesses. Learning about timber flooring. Learning about a childhood illness. (Engager)

Updating my knowledge base in oral cancer. I lecture on this subject and have found that oral and skin cancer have become hot topics in the literature all over the world. The Internet has proven to be the best tool to keep up to date. (Problem Solver)

There were a great number of less prevalent topics for the respondents self-directed learning projects. A number of hobbies were mentioned. Web page creation was the most prevalent skill which was being learned. Genealogy and guitar playing also received multiple references. A number of people undertook geographical learning projects in anticipation of travel. Many subject were mentioned just once, which includes such diverse topics as cross stitching and optics.

Learning to make a web page. I observed what others were doing on the net, and sought out pages with information on such as HTML and graphics design. In addition, I talked with people via e-mail regarding problems and finding cgi support. (Problem Solver)

Learning computer skills. (Navigator)

Learning HTML and building Webpages. (Problem Solver)

Stock investment. (Yea, I finally jumped in. Missed out on amazon though) Painting. (Got bored, took up oil painting.) (Navigator)

The first one is cross stitching. I was looking for cross stitching pages, browsing, looking for house brands. Reading about news and stocks and consumer reports. Like when we were trying to buy a new camera we were looking for the best brand. I went to a search engine and I searched on camera and that led me to stores that sold cameras on the Internet and I used that information for comparison. I'm still just looking and haven't bought one. (Problem Solver)

I have researched vehicles in preparation for buying a new SUV. I've also dabbled in researching our family history. (Navigator)

I have also used the net for genealogy, researching archeological questions, planning vacations, researching stock information, finding information for my daughter's school projects, etc. (Problem Solver)

Genealogy has become a major interest in my life and I have spent many hours on the Internet and reading and asking questions in news groups. I am also doing a language and literacy course and have found help on the Internet. (Navigator)

Bread baking: I developed a recipe for sourdough bread, also using the Internet as an information resource. (Engager)

Resources

The four primary resources utilized by participants in this study were browsing web pages, e-mail, newsgroups, and chatrooms. Browsing web pages was the method used by all respondents. Although the Internet can be accessed through other means, (i.e.,

FTP or Telnet) using the http browsing capability is the method used by the vast majority of home users. For example, Telnet requires series of steps and commands with precise syntax. These other means of access are mainly used by computer experts.

For my ongoing learning I usually use browsing as my primary source, followed by mailing lists and newsgroups (Problem Solver)

For the most part, I use the world wide web and the e-mail section. The web has so many different sites to go to for information on learning projects. I also e-mail my friends to see how they are doing in their classes. The web is very helpful and informative; it also keeps you on top of the latest news related items.(Problem Solver)

Just browsing web pages. (Navigator)

70% Web 25% newsgroups, 5% for the rest. (Engager)

Mostly browsing web pages, followed by e-mail Problem Solver)

Mostly web pages and e-mail, but some chatrooms. (Navigator)

E-mail was the next most-used resource and fulfilled several functions. It was used to communicate with friends and with people with whom the respondent was already acquainted. Some respondents used e-mail to correspond with various experts which they had become aware of through newsgroups or chatrooms. A number of respondents listed e-mail first when queried as to the types of Internet resources they used:

E-mail and browsing web pages. (Problem Solver)

E-mail browsing. (Problem Solver)

E-mail, browsing, web pages, chat, mailing lists. (Navigator)

E-mail, some mailing lists, certain WWW pages if handled well. (Navigator)

For the most part, I use the world wide web and the e-mail section. The web has so many different sites to go to for information on learning projects. I also e-mail my friends to see how they are doing in their classes.

The web is very helpful and informative; it also keeps you on top of the latest news related items. (Problem Solver)

I browse web sites, e-mail, and also use newsgroups. (Navigator)

I use listservs, e-mail, browsing, ftp, forums, tutorials. I often go to the W3 consortium pages for help on programming and to learn about the evolution and emergence the Internet. I use search engines on a regular basis to target on-line resources on specific areas of interest. Example: Perl 52; institutional research and assessment. (Problem Solver)

I do a combination—web pages, newsgroups, and e-mail. (Engager)

Newsgroups were used by about half the respondents. They were found to be of benefit for learning the latest information and current events.

Newsgroups, e-mail browsing, chat rooms. (Problem Solver)

Newsgroups, E-Mail, Web Browsing. (Navigator)

Newsgroups, e-mail and browsing web pages. These are for me the most important aspect of the Internet better than anything else. (Engager)

Newsgroups, mailing lists, e-mail and browsing web pages. (Navigator)

Web pages, lists and sometimes newsgroups. (Problem Solver)

Webpages & newsgroups & e-newsletters (Problem Solver)

WWW, mailing lists, newsgroups, e-mail (Navigator)

One of the great unknowns about newsgroups is their readership. It is easy to count the number of news items that are contributed to a particular newsgroup, but no accurate estimate exists regarding the number of readers in relationship to the number of contributors. A number of respondents mentioned that they did not feel comfortable posting and just read the materials posted on the newsgroups.

I don't feel knowledgeable enough to contribute to them. (Engager)

Newsgroups (I have not contributed much yet). The issues I feel strongly about mostly receive responses far more eloquent and, apparently, better informed than I could prepare. Groups such as UK.LEGAL, UK.POLITICS, and Civil Liberties.

Chatrooms appear to be a resource which is not well focused for learning. The hope or promise of chatrooms is that there could be a real-time sharing and collaboration of thoughts and ideas. If someone had a question or concern, a focused chatroom would seem to be the perfect solution. The bulk of chatrooms do not appear to have lived up to this promise. The majority of respondents viewed chatrooms negatively; they felt they were just idle chatter.

I really dislike chatrooms and newsgroups and get off them immediately when I arrive there in error. (Problem Solver)

I find browsing web pages to be most efficient. I sometime pick up some resources from lists, but I find chatrooms and lists increasingly inane. (Problem Solver)

I use every aspect that is available to me for a research based. I do not use chatrooms. They take up too much time. (Engager)

Chatrooms have the potential to unite many different people with a common interest. This real-time communication media has the potential to bring together people with varying viewpoints. A few respondents had such experiences with chatrooms.

I use a variety: I do basic searches for info on the web - background info. For explanations of concepts etc I will use chat or message boards to seek ideas and answers. I have joined mailing lists to keep connected with events to find more avenues to explore. (Problem Solver)

I will use chat or message boards to seek ideas and answers. (Problem Solver)

I like to use chatrooms to meet people in the areas of interest to me and will sometimes get great leads here. (Problem Solver)

Initial Resource

The most commonly cited method for beginning a self-directed learning project utilizing the Internet was to use a search engine. This would return a list of web sites. Then generally the first web site on the list was selected and from there the hyperlinked nature of the web allowed the respondents to explore and branch out.

I have a starting point, usually the subject of what I want to learn, and then I use a search engine to check out the web and see what's out there. I normally don't have any kind of a plan. I like to see what's out there and play it by ear. The Internet improves my learning projects because I usually don't know what step to take next until I check out what else has been done. (Problem Solver)

Usually use a search engine to locate one site and use links from that site to explore from there. (Problem Solver)

Some individuals locate resources not through search engines but through reading newsgroups and mail lists. In many newsgroups and mailing lists, various web sites of interest to the reader will be mentioned. Also, some people mentioned visiting sites based on the recommendation of magazines, newspapers, and friends.

Frequently, a URL is provided by someone, either at work or in a listserv. Often times, I find a site through a search engine such as Yahoo!, Excite, etc. (Navigator)

I do one of three things; Use search engines, link up directly to webpages through newsgroup postings and/or through suggestions in newsgroups. (Problem Solver)

I use all available methods: I see addresses in magazines, books, ask people, people tell me, from mailing lists, web sites with links, search engines: meta and others. There's more and still looking. (Problem Solver)

It depends on what I'm interested in. From the listservs I might visit references. From chatgroups might visit references. From search engine hits, might visit references. (Problem Solver)

Newsgroups are a good source of links. Primarily though, I rely on search engines. Yahoo is of limited use, especially for category type searches. Mainly I rely on Infoseek, AltaVista, and the new one, Google, which is proving to be extremely good. Infoseek has been bought out and appears to have been dumbed down to some extent. (Navigator)

The initial web page visited for a learning project is suggested from search engines, newsgroups, mailing lists, chatrooms, personal recommendation, magazines, and newspapers. Generally, newsgroups and mailing lists provide a higher quality suggestions. This seems reasonable because it avoids the need to learn search syntax and because the person suggesting a resource on a mailing list would be more likely to have the same narrowly defined interest.

Navigation

Much of the navigation of the web is just through following the hyperlinks. One common metaphor is “surfing the web.” This is an apt metaphor for several reasons. Surfing is done on the ocean, and the web represents a vast ocean of knowledge. Surfing is done at the edge of the ocean; it is only through the skillful guidance of the surfer that the direction is set. Surfers have in their control the ability to harness the vast power of the ocean and to rapidly change direction and speed with just the skillful twist of the body. Also, it is difficult to surf backwards.

Many of these facets are applicable to Internet “surfing.” As one respondent stated:

I tend to surf from one source to the next. The linking nature of the web is conducive to that. My only complain would be that it is sometimes difficult to get back to previous sources...you become lost in the links. The affect is that I often waste too much time on interesting, but irrelevant information.

In that way, using the Internet for research can be counterproductive.
(Navigator)

This respondent felt the activity was enjoyable. When one is engaged in an outdoor event, one feels in awe of the outdoors, of its vastness, and of its power. That same feeling is common to new Internet users. The themes of exploration are suggested by the following respondents:

I will usually pick one or two resources at a time and see where they lead. I think the Internet is pretty unstructured, but I also think that if I learn more about how to use it that I may begin to feel differently. (Navigator)

I go searching for a specific subject, and follow that up with links to the area of my interest or need. (Navigator)

The currency of resources on the Web cannot normally be matched by traditional resources. Additionally, there are countless “ephemeral” resources available on the Web that are simply not accessible in print. E-commerce has contributed numerous sites that provide service-related information as well. (Navigator)

I tend to begin with a search of a general topic and see where it leads. I find that planning is easy for me . . . I am an iNtuitive Thinker according to Myers-Briggs. I love puzzles and processes and so I like finding patterns, etc. I lay out all the pieces and then put the project together. (Problem Solver)

We are in the middle of a revolution. It is great to be in one instead of just reading about it! Once you get used to using the web as a source of information, it is hard to remember what it was like before you started to use it. Information is now immediately available. Call it up, assess the source, then take action. Oh yes, be prepared to spend countless hours learning. (Problem Solver)

Searches

There is a large level of frustration with the currently available search engines.

There are a variety of popular web search engines such as Yahoo, AltaVista, and Ask

Jeeves. Yahoo and AltaVista require the end users to refine their search by combining the keywords using the logical operators “and,” “or,” and “not.” Unless one is very skilled at crafting search strings, the basic search can return a bewildering array of returns or “hits.” At this point, the typical user has no way to judge which one is the most suitable for the learning task at hand. At best a title and one sentence description are returned. Most users at this point simply pick one and see where it leads. Hopefully in the page selected, other leads or hyperlinks will be available.

Doing searches can be extremely time consuming. I find it difficult to word my searches so I get neither too many nor too few sites. (Problem Solver)

Each search engine works differently, but it's next to impossible to find out how to search them quickly, as you might with a commercial database where instruction and help screens are plentiful. (Problem Solver)

I am impatient and can't stand the load times. Sometimes searches can be frustrating because there is such an abundance of material to search through. Small inconvenience for the amount of knowledge gleaned. (Problem Solver)

I find limiting my searches on the Internet to be the most aggravating, for at times hits show up that have nothing to do with what I am researching. (Problem Solver)

Trying to refine search qualifiers. Everybody does it a different way. (Problem Solver)

Sometimes, finding the right combination of words for a search engine gets very frustrating. (Navigator)

Learning how to make successful searches. I waste a lot of time phrasing and rephrasing questions to narrow down the scope of a search. (Navigator)

Initially, learning to search. Now it is a matter of keeping up. (Engager)

Internet as a Segue

For many respondents, the Internet has led to the location and acquisition of more traditional resources. The primary resource located was books. These were located through online bookstores such as Amazon.com and through browsing online library catalogues. "I have used such to order books for classes that I teach, information for new class curriculum and even for a new set of golf clubs." (Navigator)

Some learning projects are inherently experiential or "hands-on." Other learning projects mainly involve discourse and conversation.

I hope "other" sources of information will always be available and I expect the Internet will point me to these sources. Increased awareness I suppose. For example, I am interested in Radio controlled aircraft. A list of local clubs and interaction on newsgroups (perhaps even simulated tutoring) is welcome but the thrill and skill needed to learn to fly my models needs face to face interaction to develop the practical skill needed. My other interests include sub-aqua. Other sports and activities can have training and acquisition of best equipment by interaction with more experienced people. Some activities (Chess/Bridge/Gambling) could, eventually, be replaced entirely by Internet but more physical activities will only be enhanced (by promotion of clubs etc.) by net, never replaced. (Problem Solver)

The availability of the Internet had been a God's send for a person living far from professional libraries and with a limited number of professional educators with similar interests. It is wonderful to query highly educated, experienced, respected people about immediate questions. I appreciate being able to observe others discuss events and circumstances related to the field of adult education and knowing I can choose to contribute or merely observe. The availability of interaction is extremely helpful to be able to understand our own problems and look for solutions. (Problem Solver)

Planning

One of the primary differences in people's learning strategy preferences is the amount of planning and coordination of the learning project. Navigators are very meticulous in their planning while Problem Solvers and Engagers are not as inclined to develop detailed learning plans. These general tendencies carry through into web-based learning projects.

Some people report that the hyperlinked free-formed structure of the Internet has a tendency to override their well thought out plans. As one Navigator said, "I am a structured person and like to plan ahead. However, the Web often lends the opportunity to just see where you land. I think I do both when using the Web." Another Navigator further explained,

Generally the Internet completely upsets the structure and planning of my projects. I generally get an idea and go looking. What I find will concretize my thinking and lead me in a focused direction which may or may not be what I had originally planned.

Other Navigators accept the free form nature of the Internet and seem to adapt without consternation. "I begin with one source and see where it leads. I believe it allows the structure and planning of my projects to be done more loosely. (I can get whatever I need, whenever I need it.)" One Navigator stated:

I'm new to the Internet, and I have found I don't use my usual planning strategies. I tend to start from a search engine inquiry and if I find a site that looks like it might be of benefit to me I look through it and usually venture on to other sites recommended. Sometimes though this branching out slows me down and I have occasionally gone right off track. So the structure I would normally abide by does get affected!

On the other hand, the Problem Solvers do not seem to even notice that the Internet is a hyper-linked maze. They are not upset that the web is a free-form media. As one Problem Solver stated:

Usually I need to learn something in order to accomplish a specific task so I approach the project from a "How" point of view. I try to find out how others have done it and determine the variety of ways available and explore my options. Then I choose one, or a combination and dive in. I try to find answers to specific questions as I go along. Forums are very valuable for this.

The tendency of the Problem Solvers to jump right in is aided by use of the web.

This Problem Solver was aware of his learning strategies:

My approach, while being a problem solver, is to wade into the exercise and see where it takes me, for a while. I suppose I have learnt very quickly how to rate the value of info. I like to gather lots of info and distill it down to see where its all going.

This is not to say that Problem Solvers do not plan. They do plan, but their plans are action-oriented and designed to get some resources to start the project. The web helps them do this. As one Problem Solver stated:

I suppose my first thoughts are on what am I looking for, where might it be found, how might I find it, who knows all about it, what tools will get me what I want, have I been here before and what did I do, where can I get access, what time of day do I need to be online. Think out the start and do all initial planning up front and then wander into the resources.

The Engagers tend to jump in also but definitely require confirmation. Engagers very much have a need to get along. "I go with the flow. I'll start with a broad topic, and as I find useful sites, I go there. Then the related sites pop up and I explore them too. I only plan the initial topic." They engage other people, but they are also engaged with the world and their learning project.

It depends: if it is purely personal I may “see where it leads,” but if it is for a paper I’m writing or preparation for a class, I plan my steps more carefully. The Internet does make it easier to discover “different” sources that would never have been found otherwise.

Engagers want to discover things. They want to discover new things and the web is great for that. However, they also want to share it with other people. Many of these classic Engaging techniques are illustrated by the following quotes:

I just begin, without too much planning. Internet makes it easier to get a quick overview.

Most of my projects are group projects and have a working base. I can follow on these and hopefully find beneficial information to the group as a whole.

Quality of the Resource

Internet resources were judged for credibility. This was not without difficulty. Sites which were clearly “official” were rated very credible. A number of respondents gravitated to web sites of recognized authority:

Authentic and actual source e.g. Data information from Ministry of Education or other government bodies. (Problem Solver)

My approach is generally to find a comprehensive, authoritative site dealing with the subject, from which there are multiple links to further resources. This is often supplemented with search engine queries. In general, one has to evaluate the source, and if necessary I’ll backtrack until I satisfy myself of its credibility. As much of my research relates to college work, I prefer sources that are on college servers, or are linked or recommended from them. (Navigator)

As was noted previously, there is ambivalence and even mistrust of chatrooms.

For example, ClearStation has a chat room type service in which others can give advice on how their investment portfolios are doing. However, since you don’t know anything about them, why would you want to waste valuable time tracking their investment record or taking their advice? Lots

of opinions are available on the web; as a user you have to be careful in deciding which are credible. (Problem Solver)

Most web resources fall between the two extremes of government sources and chatrooms.

Web sites usually give themselves away with domain names...but that's not entirely reliable with edu sites where bizarre personal pages can be attached to perfectly responsible university settings! I look for authoritative sources on the web, just as I do with books. I hope for an MD if it's a medical question, and an ag agent if it's a gardening question. (Problem Solver)

Any print media has an inherent time lag involved with printing and distribution.

These steps are eliminated when distributing information via the Internet.

What is on print is never the latest and most accurate. (Problem Solver)

The Internet is invaluable to me. My library's books are often outdated. In some cases a book has been revised once or twice since the one the library has in its collection. The Internet allows me to get the most up-to-date information available. I can easily get phone numbers or addresses through the Net. As a writer, I belong to a critique group; that's something I don't even have access to in the "real world"—and even if I did belong to a writers' group, it would consist of far fewer members, narrowing the view I get on my work (Problem Solver)

Yes. Its immediate feedback whenever and where ever you need it. Its (*usually*) more up-to-date than any references you could get at a library. (Navigator)

Truth

The traditional methods of determining truth were cited: authority, common sense, experience, majority rule, and intuition. One element that was common to all the methods except intuition was the process of gathering as much information as possible and looking at as much relevant material as possible. Those people who used intuition to gauge truth

seldom mentioned the need to examine voluminous data. The rationalist approach is explained as:

Get as much information as possible, eliminate those obviously wrong or unreliable, then either decide by logical deduction or leave the question unresolved. If there are conflicting ideas decide what facts are correct by independent corroboration. There is no need to dismiss any “opinion” outright unless it is based on incorrect FACTS. Facts and ideas may need further research or experiment to prove or disprove. I hope I am objective. I would welcome interaction that tests my objectivity. I hope I can remain open minded at all times. I hope I do not draw conclusions where data is incomplete. (Problem Solver)

About half of the respondents utilized traditional critical thinking strategies and processes. When asked how they determined which ideas were true and which ideas were false the following responses were representative:

At first I’ve my personal map of reference, together with some experience, a healthy amount of criticism and an academic education. This mix and the fact I’m not easily satisfied with one answer helps me in making decisions about what is correct and incorrect. (Problem Solver)

By analyzing them carefully and comparing pros and cons. (Navigator)

By brainstorming and performing the needs assessment or feasibility studies. (Navigator)

I always try to look at both sides or different perspectives of an issue and then come to some conclusion later on...probably after trying out that idea myself. I also use other colleagues to bounce off ideas and get feedback. Sometimes also students will give me insight if I use a Web resource with them. (Navigator)

For people who do rely on multiple data sources, the Internet is a rich source. In fact it is so rich that the issue of credibility arises. Most people have an inherent wariness regarding web sources. When asked how they judged truth, these respondents generally expressed what might be described as a healthy skepticism of unverified opinions statements and data.

Well, in building webpages and learning HTML tricks some websites that I visited will say that they are the best or that their sites are the most informative but I don't rely on just one sites. I simply visit more websites and compared it to the other one and sometime I'll just pick out one that I like and combined it to another one that I also like. On another hand like e-mail, some people says they like yahoo or hotmail e-mail because you can retrieved your mail from anywhere. Instead of just using one I tried using different e-mails and see which one I like best and feel comfortable using. So really I just don't follow other people's ideas without checking my own. (Problem Solver)

With a little common sense and intuition. Its the old adage, "Do you believe everything you read and hear on the news?" No, of course not. So you must take the information from the web with a grain of salt as well. (Navigator)

The one that I feel is closest to what I believe. (Navigator)

For Web stuff the W3 consortium is a very reliable resource. In the world of Web design there are several generally recognized authorities like Lynda Weinman for example or andyart.com. I am always wary of websites run by companies trying to sell something. I tend to trust experience over opinion and value an individuals opinion over a corporate opinion. (Problem Solver)

This is exactly what I have been talking about. You need to look at the credentials of the people presenting the ideas. For example, my first source for learning about stock options was Wade Cook with his book Wall Street Money Machine. My brother had heard of Cook and had some materials from workshops presented by Cook. Wade Cook is a very controversial figure because he presents ideas that challenge the status quo in the investment community. However, his books are clear and make the concepts very easy to understand. I found that I could apply his ideas in a very profitable way so I ordered more of his books and some written by those associated with him. I also ordered some books by other authors who present a more traditional view. In the review in Amazon, the reviews are either very favorable by people who have a similar experience as mine or they are extremely negative by people who are strongly opposed to what Cook stands for. Because Cook seems to be such a treat to the establishment and because my experience using the ideas from his books were so positive, I wrote two reviews for Amazon. I also have bought copies of Cook's books for my son and a friend. Thus, it comes down to looking at the source of the material and evaluating the material in relationship to your own experiences. Once this is done, do something with it! (Problem Solver)

The information over the Internet is really just secondary information. I really don't use it as my final source. (Problem Solver)

Of course the reliability of the source, that is the professional background, etc. would definitely need to be considered. I feel it is important to compare several sources if possible and then experiment when possible using the new methods in small ways and looking at results. I generally discuss methods with students and fellow educators to get their reactions also. (Problem Solver)

Good question. I tend to see different ways of looking at something rather easily, and have a tough time choosing the best approach. And some people post things on the Internet or user groups that are just false, and I wish I had a good enough crap detector in my brain to realize just which ones they were. (Engager)

By their usefulness, primarily. I also base my decisions on my personal experiences and belief system, which includes my "need" to know the source of the information. Is it backed by an educational institution, what sort of research was done and is documented, etc.? (Problem Solver)

Intuition was mentioned by three Navigators and two Problem Solvers. A significant number of respondents took the pragmatic experiential approach and responded that truth was what worked. Common sense was frequently mentioned.

I can usually select the ideas and opinions which fit in the base of work on hand. (Engager)

I check more than one resource, then use common sense and past experience. (Problem Solver)

Common sense. (Navigator)

Commonsense is a big one. Knowing the source and their credibility. Being able to quickly pose it to others: e-mail, forums, chat to get their thoughts. (Problem Solver)

Therefore, the notion of workable makes more sense to me than "correctness." I settle on strategies—or make decisions—based on whether it makes sense to me and the people with whom I collaborate. A frequent question is, "are you comfortable that this approach is the best for now?" While "comfort" level may seem an amorphous standard, it is the one on which I run my life. I make decisions based on what I know now. I don't

like to sit and rethink decisions. You can rethink on the next round if what you do is not the best course or presents unanticipated problems. (Problem Solver)

Interaction of the Internet with Traditional Resources

For many people the Internet has replaced traditional learning resources. This seems to be particularly true for Problem Solvers. In response to the question about whether the Internet acts as an additional source of information or as a replacement one Problems Solver stated “Yes, it has replaced traditional resources. Books and magazines have poor indexes that limit the usefulness of the library.” While in many cases it has replaced traditional sources, there seems to be a lingering hesitancy concerning the accuracy or veracity of the Internet. People do not quite trust it. One Problem Solver explained this ambivalence:

It’s an additional source of info, but in many ways it’s superior to traditional sources. For example, if I need to write an article using real-life anecdotes, I can post a question to a newsgroup and get sources from around the country. Traditionally, I would have had to call my friends and relatives to find people—it would have been a time-consuming process. I never rely only on information I get on the Internet, however; it’s often unreliable, biased, or wrong.

Clearly for this one respondent, the library and bookstores are not as frequently used as the Internet. One Navigator summed up the fact that the Internet is on the cusp of being “mainstream”:

It may not have replaced other sources, yet, but it comes close. I use the Internet to pull up journal articles, data, and so forth for my research. I really believe that it’s made my educational process easier, in that it’s transferred the locus of my education away from the university/library, into my home. Very convenient!

There is a dichotomy of opinions regarding the depth and quality of information available on the Internet. As one respondent put it, “there is a lot of junk out there.” There is an inherent credibility associated with references from a library. “If I need to learn something I go to the library or other source of credible references.” There is a realization that the Internet excels in certain areas. It is recognized as being dynamic and evolving. “I still use the library, but it is far more static. The Internet is dynamic and changing.” Many newspapers are now online at no charge. As one Navigator stated, “I don’t use the Internet as a learning tool except from news sources.” Similarly this Problem Solver has found a niche use for another Internet resource, “Mailing lists are good for gathering opinions, especially on hypothetical real life situations requiring judgment.”

Some people find the depth and availability of material on the Internet to be far superior to that of any other source.

I rely heavily on the Internet for material. The library where I live is fine but limited. Usually I have a tough time finding enough material to satisfy my needs. The web gives me access and leads to resources otherwise unavailable to me. (Problem Solver)

The Internet can and does act as a conduit to traditional resources. The most common method is to locate and purchase books. For some people the web acts synergistically. One Engager used multiple sources by “cross-referencing web sources with another source. I often make the other source a traditional medium (a printed book).” Other items such as brochures and video tapes are ordered as by this Problem Solver: “I ordered some video tapes which are tutorials on a 3D design program.”

Given the relative newness of the Internet there is naturally some hesitancy to using it to transmit financial information. As one Navigator stated:

I have ordered through the Internet some brochures on a topic I was researching. I would not have been aware of the existence of said brochures had it not been for the Internet. As for buying over the Internet, I would be reluctant to buy if it meant having to give out credit card details.

Books and the Internet intersect in a number of ways. The most prevalent connection is that many respondents use the Internet to order books. Amazon (www.amazon.com) and Barnes and Noble (www.barnesandnoble.com) were the two sites mentioned. The availability of reader reviews were appreciated as was the option to view additional books ordered by people who happened to have ordered the book under review. The main negative factor was the inability to actually glance through the book before purchasing it. A number of respondents ordered all of the books for their college courses through the Internet. For college courses, the texts are generally required and so glancing through the book before purchase is not as critical. Several respondents used the various online books stores to research various titles but then would complete their purchase at a bricks and mortar store. The following quotes illustrate various respondents use and relationships with online book sellers:

Yes—I have combined the two. As I mentioned, I wanted certain books that had been recommended to me by my brother. I was not able to get them quickly in town but was able to order them immediately from Amazon. However, in addition to the books, I was able to get valuable reviews and links to other related books. (Problem Solver)

Amazon.com's database is wonderful, and I've used it hundreds of times, and ordered dozens of books. My distance learning program is through an external degree college into which I must import all of my credits. Extensive research on distance learning has resulted in the acquisition of traditional materials, e.g., books, and hundreds of hours spent looking through the websites of colleges and universities for courses delivered via all forms of distance learning. (Navigator)

I don't buy very many books at Barnes & Noble anymore, that's for sure. I probably spend \$50/month at Amazon. My college textbooks are purchased through MBS Books and shipped to me. I only go to a traditional library when I am looking for ancillary resources . . . and primarily only information that doesn't become dated. (Navigator)

I have used the internet mainly for two sources. One is using Amazon.com to get the books that I need. They are not only a great source for ordering the books but have great reviews by both the publishers and by users who have purchased the books. The other source has been tapping into webpages for various providers who have information related to trading in the stock market. Some of these are free services while others have a product to sell or are trying to get you to subscribe to their service. In either case, they are a great source of useful information. (Problem Solver)

The Internet is one more tool. I do order from amazon.com (which I prefer over Barnes & Noble.com) because they tell you what others have purchased, and they include reader reviews. Amazon's linking resources (e.g., other readers have bought . . .) makes identifying related reading much easier than a traditional library. "Browsing" the bookshelf at Barnes & Noble can give a "real time" introduction to key concepts and help jumpstart the resource finding process. Since I tend to look just until I am happy I know enough, it is important to me to find the most appropriate information most quickly. (Problem Solver)

For most people, the Internet has replaced a significant portion of their library patronage. Although the time spent in travel to the library was the most mentioned concern, the rigors of inclement weather was a significant factor for a number of respondents. As two respondents stated, "It has replaced going to the library on rainy nights," and "Before you had to spend long hours in the library or go to the school computer lab. Now I do it all in the comfort of my home."

Rather than being an either-or situation, some people use both libraries and the Internet. Some people use the Internet to suggest books. Some people actually connect to the library and browse the library card catalogue through the Internet.

I order many books over the Internet. I also get outlines and brief summaries of new publications in a variety of fields from the listservers, then order them through our library. (Engager)

Being a lifelong library user, I find the connection to libraries most useful to start me on my choice of borrowing. (Engager)

The printed word still has a number of distinct advantages. It is easier to read, it's portable, and it can be marked.

I still print anything I want to read and order books as needed. I much prefer reading, underlining and re-reading a book wherever I'm most comfortable. I always have a book with me in case I have an opportunity to read at lunch or waiting at a train crossing (a frequent occurrence on my daily route!). I want the feel and permanence of the paper--I'm most fearful that the web site will be gone or relocated the next time I want that information and paper solves that anxiety for me. When I was doing the homeless paper I did lose several references temporarily. They were re-organized and shuffled around at more than one site between the time I first researched the site and was double-checking my reference list at the course end!! (Problem Solver)

A sizable minority of respondents have taken formal online courses. The majority of these were college courses. A large variety of college courses were represented including art, writing (technical and creative), history, astronomy, mathematics, psychology, and sociology. One respondent was currently enrolled in a bachelor's degree program that was entirely Internet based. One respondent summarized the advantage on Internet for current and specific topics:

My research for the homeless paper last fall (Oct 1998) was the first time I had used the web for "real" research. I was desperate . . . the univ. library has no money and no current books on the topic and it's a fairly new field of interest for educators. I was amazed at the quality of the papers I found there, prepared by small welfare agencies and governmental offices from all over the country. The web solves the problem of finding "small topics" not yet covered in large texts and for finding current topics where the literature is still very gray!! (Problem Solver)

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

The Internet is rapidly becoming a major means of communication, entertainment, and education. Any means of communication has the potential to be used for self-directed learning. The extent and nature of self-directed learning on the Internet is not well understood.

The purpose of this study was to describe the way in which a self-selected group of learners pursue self-directed learning projects utilizing the Internet. In accomplishing this purpose, two web-based data instruments were developed, and ATLAS, a learning strategy preference assessment tool, was web enabled. The two web-based data instruments were a nine question multiple choice demographic questionnaire and a 12 question in-depth questionnaire. Technically all instruments functioned properly and expedited the research process.

The research questions fell into three broad categories. First was the general subject of the usage, benefits, and problems with the use of the Internet for self-directed learning. Second, was the question of how the Internet had changed the learning process for the individual and the Internet's interaction with traditional learning resources. Third was the question of the interrelation of Internet usage and learning strategy preferences.

In summary the findings to these questions are:

1. General

- a) How Is the Internet Being Utilized in Self-Directed Learning Projects? The Internet is being extensively used by the respondents for their self-directed learning projects. For many respondents it has supplemented and in some cases replaced their reliance on libraries. The Internet is being used as a medium to gather information, to contact experts, and to communicate with friends and other learners.
- b) What Aspects of the Internet, Such as Newsgroups, E-Mail, Mailing Lists, and Academic Sites Are Being Used? The primary method of using the Internet for most respondents was basic World Wide Web viewing. Additionally e-mail, mailing lists, and newsgroups were used at least occasionally by most respondents. A small number of respondents used FTP and Telnet.
- c) What Types of Problems Arise with the Internet's Use? The large amount of information available made locating the proper resource difficult for many respondents. Technically, the speed of the connection was cited as a problem for many respondents.
- d) How Has the Home-Based Nature of the Internet Increased Informal Learning? The ease of access to information and learning resources has expanded the opportunities for the respondents to pursue their self-directed learning projects.

2. Long Term Learning Projects Initiated Prior to Internet Access

- a) In What Ways Has the Internet Expanded or Benefitted Any Continuing or Ongoing Self-directed Learning Projects Which Had Initially Begun Before Their Use of the Internet? Some

respondents specifically mentioned long-term learning projects which had benefitted by the use of the Internet. The research design did not include follow-up questions to differentiate between long-term and new projects.

- b) How Are Internet Resources Being Integrated with Other Types of Resources? The Internet is being used to locate, review, and order books. Other traditional resources such as magazines, newspapers, and special interests groups are occasionally located by using the Internet. Additionally these resources occasionally mention Internet resources; thus, there is an interplay between traditional resources, such as books, magazines, and the recommendations of friends, and Internet resources, such as web pages, newsgroups, and mailing lists.

3. Learning Strategy Preferences

- a) What Are the Learning Strategy Preferences of Learners Who Gravitate Towards the Internet? Problem Solvers (50.66%) were over-represented in the population in comparison to previous studies which showed Problems Solvers represented 25.7%. Engagers (16%) were under-represented in comparison to previous

studies showing 36%. Navigators (25.7%) were slightly under-represented in comparison to the norm of 36.5% (Conti & Kolody, 1998).

- b) Are Particular Learning Strategy Preferences Associated with Particular Types of Internet Usage? There were qualitative indications that the learning strategy preferences of the three groups manifested themselves in their use of the Internet.

The demographic make-up of the respondents was generally congruent with previous research. Previous studies have addressed the issue of self-directed learning on the Internet peripherally; for example, several studies have shown that a high percentage of individuals use the Internet to research health issues. This study directly addressed self-directed learning, and it was found that two-thirds of the respondents used the Internet daily for self-directed learning projects. The variety of learning topics was similar to that found by Penland (1977).

Summary of Qualitative Findings

The beneficial aspects of using the Internet for self-directed learning fell into four areas: time and ease of use, the amount of information, interactivity, and cost. Penland's study cited distance and inconvenience as two of the major factors which inhibited participation in adult education. Interactivity is often cited as one of the problems with any type of distance education. Through e-mail and chatrooms, some interactivity is provided through the Internet. Although in person interaction is not possible, the number and variety of contacts of users is greatly increased. The vastness of information, in

general, was cited as a primary advantage in the use of the Internet. Finally the low cost of generally unlimited access was found to be advantageous. There was no cost associated with access through work, and home access was by modem for a fixed fee.

The primary problems with using the Internet for self-directed learning were technical and information management issues. Technical issues were related to line speed and maintaining a good connection. Information issues dealt with managing the abundance of information. In particular, many respondents were frustrated with the difficulty in locating appropriate resources through the available search engines.

The Internet interacted with traditional resources. Some people located web sites through articles and the recommendations of friends. The Internet served to inform respondents of printed resources. In particular, many respondents used the Internet to review and purchase books.

The vast profusion of all types and levels of information available instilled a certain skepticism in many respondents. Web resources vary in credibility from university sites to intentionally deceitful sites. Many people judged the credibility of information based on the origin or author. Governmental sites and sites directly connected to libraries and school had the highest credibility.

The hyperlinked features of the Internet made the process of learning less methodical. A number of respondents said that they performed a simple search and followed the hyperlinks. Danis and Tremblay (1985) found that "self-taught adults proceed in a heuristic manner, within a learning approach which they organize around intentions, redefine and specify without following any predetermined patterns" (p. 178).

Slightly more than half of the respondents were Problem Solvers, about one third were Navigators, and about one sixth were Engagers. The hyperlinked nature of the Web fit in well with Problem Solvers' natural tendency to immediately begin exploring solutions. The Engagers and Navigators did not seem to be as well served. The Engagers utilized newsgroups, chatrooms, and mailing lists to gain a sense of connectedness. Still these methods lack the connectedness of a personal encounter. The Navigators used the Internet as an additional resource. Although the Internet is largely unstructured, the sense and order which Navigators require was supplied by external pre-planning.

Areas of Concern

The Internet is beginning to realize its potential as an important medium for communication, commerce, and learning. From its initial origins as a tool for researchers and scientist, it has become a mass media. Until the 1990s, commercial activity was not allowed on the Internet. It has only been in the last five years that commercial sites have proliferated. There are important social, culture, and legal questions involved with this media that has grown so rapidly. The questions are as diverse as taxation and morality, and privacy and equality.

Access

During the Information Superhighway debate, universal access is frequently mentioned. There is a need in a democracy to have equal access to media that are significant modes of communication and information. Free access through libraries and schools are often mentioned as being the preferred method for assuring that universal

access. Currently a number of libraries have free Internet access and many schools do so, also, for their students. Yet, these were not a mechanism of access used by the participants in this study. It is possible that respondents did not represent those people who may use such access; yet, it is also possible that the Internet is so important and so resource rich that the pledge of universal access is meaningless without universal home access.

Two other media are postal letters and the telephone. There is universal access with postal letters because it is delivered to essentially every residence or post office box and the media (paper and pen) can be worked with and composed while not connected to the transportation media. The Internet is more similar to phone service. It is real time. Could a nation claim that it had universal phone service if it was primarily only available at libraries?

Commercialization

The vast majority of Internet resources are currently free, but that paradigm is changing. Initially the Internet was a government and educational project and so, by law, was free to the end users. Pay sites are increasingly prevalent. Currently most newspaper sites are free. The Washington Post is online for free while the same information on newsprint paper costs a quarter at the newsstand. Although this is true of most online newspapers, The Wall Street Journal has taken a different paradigm and charges for online access. Business Week has taken a slightly different approach with current issues freely available, but with archive articles generally requiring a small payment. Some predictions are that as online commerce becomes perfected and available, there will be small “micro”

payments for visiting web sites. For instance, presently the Yahoo site is free with a search engine, news, and hundreds of other features. It is supported through advertising. If an online commerce procedure were perfected for micro payments, it might be able to economically bill an individual a couple of cents per search.

Bandwidth

Bandwidth determines the speed or rate at which information, graphics, and text can be downloaded from the Internet and presented to the user's screen. One of the main complaints of users is that when flipping between pages, there is a noticeable time lag after clicking on the next hyperlink. Although there have been tremendous gains in bandwidth, the demand for that bandwidth has increased at a greater rate. In the last seven years bandwidth has increase by a factor of 10, and in the next seven years it should increase by another factor of 10 (Peterson, 1999, p. R6). This increase in capacity has enabled the development of the graphical World Wide Web as it is presently known. Seven years ago when bandwidth speeds were only one-tenth of today's rates, Internet access for home use consisted largely of text files and a simple teletype like display. Today the bandwidth is sufficient for the graphical displays to which users have become accustomed. Additional graphics, videos, and programs are constantly being developed which test the limits of the current infrastructure. The ten-fold increase in the coming years will be easily consumed by multiple lines of streaming video. However, mitigating this is the fact that the majority of web sites will not consume so much bandwidth that the majority of users have significant problems. There is an inherent duality from the web developers perspective. On the one hand, the site should have as many of the latest accouterments of style,

fashion, and technological wizardry as possible. On the other hand, if the site is really not practically accessible by a significant proportion of the population, then the entire purpose of the site is defeated. Thus, for the foreseeable future, this will continue to be an annoyance.

Information Overload

There are two aspects to information: its breath and depth. Both are appreciated but the breath of information does not have the negative or obfuscating character of the depth of knowledge. Having a great breath of information just means that all conceivable topics are available through the media. It is the depth or granularity that the learners find confusing. A simple search can turn up 500 or 5000 references to the subject. How does the learner know where to begin? For example, on any health topic there might be hundreds of references ranging from support groups to medical treatises. This profusion of resources can be confusing to the learner just embarking on a learning project. Once the learner has a basic grasp of the subject matter, the cornucopia of resources is less confusing.

There are two types of information overload. One type is where a profusion of information is returned that is largely irrelevant to the subject matter. The learner knows what they are looking for, but a search or newsgroup will contain hundreds of matches which are at best peripherally applicable to the topic. This type of confusion is fairly amenable to improved search engines and techniques. Indeed most search engines have capabilities and refinement techniques that are only rarely if ever used by the average user. Currently there is a great deal of improvement and innovation occurring in the science and

implementation of search engines from Boolean logical operators to the current wave of whole-language search engines.

A second problem with the profusion of information is concerned with the learner in the initial stages of the learning project. As a novice to the subject, it is difficult to find resources with exactly the proper level and orientation. It would be as if a librarian would overwhelm a library patron with books, periodicals, pamphlets on the first visit to begin a new learning project. The job of the librarian is to assess the learners' needs and to present a few but not overwhelming assortments of books, pamphlets, and information. The librarian is acting as the gatekeeper of knowledge. On the one hand, it could be considered presumptuous of librarians to impose their worldview or opinion or assessment on the learner. Yet when using the Internet, the respondents have generally expressed bewilderment and aggravation at being presented with an overabundance of information.

These problems have been exacerbated by the commercialization of the Internet. Search engines are designed to examine certain "header" information available but hidden on every web page. It is from an examination of this header information that the search engine determines the relevance of the web page. If someone is searching on rose gardening, a nursery might craft their hidden "header" to have the word rose gardening and various synonyms dozens of times. This causes the search engine to give that particular page a high score and be more likely to be the first page returned from such a search. In some cases, a commercial venture is less likely to direct a user to free or alternate sources of information. Thus rather than exploiting the strength of hyperlinks, the commercial business "captures" the potential client. In practice what happens is that learners more or less at random choose resources from those returned by the search

engine until they happen onto a site which unbiasedly lists all the current resources, which are both free and commercial. Then the users can bookmark that site so they have a good reference list. In general these unbiased lists of resources are found on educational, hobbyist, and governmental sites although some commercial sites do have unbiased lists of resources.

There is a new generation of search engines gaining rapid acceptance called meta search engines; examples of these are Hotbot and Dogpile. These are search engines which submit the search request to other search engines and then compile the results from those. Since different search engines have different criteria for rating the relevance of web sites, the exact same search string submitted to different search engines will return different results. Thus, these meta-search engines return a greater variety of responses and are less likely to be dominated by commercial responses. Even though these meta search sites are relatively new and poorly advertised, they are receiving a large amount of usage (Peterson, 1999, p. R6).

Conclusions

Conclusion One

The Internet Will Be an Increasingly Important Resource for Self-Directed Learning

There was a prediction some years ago that by the year 2010 the contents of the Library of Congress would fit on a hand held device. That prediction is being fulfilled through the Internet. The trend towards utilizing electronic media is increasing so that an

increasing amount of the information being generated worldwide is accessible through the Internet.

The invention of the printing press is often cited as a key turning point in the history of civilization. It is credited with generally contributing to the prosperity and development of Europe as well as democratizing knowledge by making it available by reducing the cost of the printed word by a significant factor (Dewar, 1998).

Similarly, the Internet has and will decrease the cost and increase the ease with which vast amounts of information are available. Some of the changes this produces will be an extension of the changes wrought by the printing press. For example the “language” of the Internet is English, and this adoption of a lingua franca will no doubt influence culture and society in many ways which are not readily apparent. The Internet can be seen as the information branch of the globalization of the economy. Such international discourse can inform, empower, and shape humanity.

Conclusion Two

The Structure of the Internet Is Not Inherently Conducive to the Rigorous Pre-Planning of Self-Directed Learning Projects and in its Present Form the Internet Is More Appealing to People Who Utilize Learning Strategies Characteristic of Problem Solvers

The lack of planning in the respondents’ self-directed learning projects was in contrast to the process suggested by Tough (1976) and Knowles (1975). Their viewpoints suggest an approach to learning similar to that found in formal educational

institutions. Knowles' (1975) model holds that self-directed learning projects begin with the development of objectives and plans. Similarly, Tough (1976) accentuated the importance of planning. In contrast, Spear (1988) questioned the planning ability of novices. The novice is unaware of even the basic skills and knowledge of the subject matter and, thus, would be unable to formulate a plan for their acquisition. Some basic information is required before a detailed plan can be formulated. "Self-directed learners cannot state their learning goals until they have mastered certain knowledge or skills" (Danis & Tremblay, 1985, p. 180), and the learners "do not seem to discover their learning needs and objectives until their process is already under way" (p. 180).

Spear and Mocker (1984) explored the influence of chance and circumstance on the learning process. Spear (1988) stated that "self-directed learning occurs partly by chance and partly by intent depending upon the available environment and the knowledge and actions of the learner. The learner acts as an integrator but not always as a director of the process" (p. 219).

Conclusion Three

Learning Strategies Influence a Person's Internet Usage Patterns

There are noticeable differences in the usage patterns of the three learning strategy preference groups identified by ATLAS. The unique styles of Navigators and Problem Solvers are evidenced in the way they "surf the web," and in the way they find, organize, and utilize Internet based resources for their self-directed learning projects. This is most clearly evidenced in the two groups' utilization of search engines. The Problem Solvers

used the search engine results to jump into the most promising lead. The Navigators tended to organize, analyze and sort the search engine results.

Conclusion Four

Gender Equity Has Been Achieved in Internet Usage Patterns

Although there may well exist subtle gender differences in Internet usage patterns, in the macroscopic consideration of this study, no significant differences were found. The number of male (38) and female (37) respondents were essentially equally divided. During the data review no obvious gender patterns emerged although there may well exist more subtle distinctions. For instance, both genders reported convenience as a primary benefit to utilizing the Internet. Factors such as the difficulty of driving to the library and the need to care and be present for dependent family members were cited.

Conclusion Five

Self-Directed Learning Projects Which Utilize the Internet Are as Varied in Subject Matter as Traditional Self-Directed Learning Projects

The variety and scope of Internet resources are so great that self-directed learners are not constrained by their choice of subject matter. Being technologically based, the Internet does have a profusion of information on computers, software, and hardware. As the Internet has matured, resources are available which cover the spectrum of human interests.

Suggestions for Further Research

At the end of the 1990s the Internet has just reached the point of being considered a mass media. The first decade of the new millennium will bring the majority of people in the industrialized nations online (Peterson, 1999, p. R6). The changes which have been wrought by computer technology are so profound that the term "industrialized" is no longer appropriate to describe those nations at the forefront of the economy.

A number of areas of investigation have been highlighted by the present study. One area of inquiry relates to the process and planning of self-directed learning on the Internet. A second area relates to means and methods of improving the experience of self-directed learning for persons with various learning strategy preferences.

Many of the original studies on self-directed learning highlight the planning process. This study revealed that the planning process was not as rigid when undertaken on the Internet. This could be attributed to the preponderance of Problem Solvers who replied. It also could be a manifestation of the nature, layout, and organization of the Internet. One of the primary functions of an adult educator is to bring some planning and coherence to the learning process. This vast resource, tool, and media is being used in a variety of ways for adult learning and the challenge to adult educators is to find ways to facilitate the utilization of this resource. The Internet is still in an evolutionary stage. Policy and procedures are still being developed. During the developmental stage, adult educators have an opportunity to have input how the new media is used.

A second area of promising research is a qualitative determination of Engagers and Navigators interactions through the Internet. Problem Solvers have adapted well, but the media has not been as utilized by Engagers and Navigators.

REFERENCES

2000 internet.com Corp (1999). Women Taking the Internet Lead in CyberAtlas: The Web Marketer's Guide to Online Facts downloaded 1/14/00 from http://cyberatlas.internet.com/big_picture/demographics/print/0,1323,5901_221541.00.html

Bandura, A. (1986). Social foundations of thought and action. Englewood Cliffs, NJ: Prentice-Hall.

Berge, Z. & Collins, M. (1995). Computer mediated communication and the online classroom in distance learning. In Berge, Z. & Collins, M. (Eds.), Computer-mediated communication and the online classroom. Cresskill, NJ: Hampton Press.

Bonser, W. (1963). The medical background of Anglo-Saxon England: A study in history psychology, and folklore. London, UK: The Wellcome Historical Medical Library.

Brockett, R. G., & Hiemstra R. (1991). Self-direction in adult learning: Perspectives on theory, research and practice. New York, NY: Routledge Series on Theory and Practice of Adult education in North America.

Brookfield, S. D. (1984). Self-directed adult learning: A critical paradigm. Adult Education Quarterly, 35(2), 59-71.

Brookfield, S. D. (1986). Understanding and facilitating adult learning: A comprehensive analysis of principles and effective practices. San Francisco, CA: Jossey-Bass.

Brookfield, S. D. (1993). Self-directed learning, political clarity, and the critical practice of adult education. Adult Education Quarterly, 43(4), 227-242.

Brookfield, S. D. (1985). A critical definition of adult education. Adult Education Quarterly, 36(1), 44-49.

Brookfield, S. D. (1985). Self-directed learning: A critical review of research. In G. G. Darkenwald, and A. B. Knox, (Eds.), Self-directed learning: From theory to practice. San Francisco, CA: Jossey-Bass.

Callender, W. D., Jr. (1992). Adult education as self education. Adult Education Quarterly, 42(3), 149-163.

Candy, P. C. (1988). Reframing research into 'self-direction' in adult education: A constructivist perspective (Doctoral Dissertation, University of British Columbia, 1987). Dissertation Abstracts International, 49, 1033A.

Candy, P. C. (1991) Self-direction for lifelong learning. San Francisco, CA: Jossey-Bass.

Cavaliere, L. A. (1990). The Wright Brothers as self-directed learners: The role and relation of goal setting, feedback and motivation during the process of their self-directed learning project. In H. B. Long and Assoc. (Eds.), Advances in research and practice in self-directed learning (pp. 221-234). Athens, GA: University of Georgia.

Chayko, M. (1993). What is real in the age of virtual reality? "Reframing" frame analysis for a technological world. Symbolic Interaction, 16(2), 171-181.

Conti, G. J. (1978). The collaborative mode in adult education: A literature review. Reprint of Chapter 2 of Conti, G. J., Principles of adult learning scale: An instrument for measuring teacher behavior related to the collaborative teaching-learning mode. Unpublished doctoral dissertation, Northern Illinois University. (ERIC Document Reproduction Service No. ED 229 534).

Conti, G. J., & Fellenz, R.A. (1991). Assessing adult learning strategies. Proceedings of the 32nd annual adult education research conference. University of Oklahoma, Norman, OK.

Conti, G. J., & Kolody, R. (1995). The use of learning strategies: An international perspective. The Proceedings of 36th annual adult education research conference (pp. 77-82). University of Alberta, Edmonton, Ontario.

Conti, G. J., & Kolody, R. (1996). The use of learning strategies: Do distinctive groups of learners exist? Proceedings of the 37th annual adult education research conference. (pp. 199-204). University of South Florida, Tampa, Florida.

Conti, G. J., & Kolody, R. (1999a). The relationship of learning strategy preference and personality type. Unpublished paper.

Conti, G. J., & Kolody, R. (1999b). Development of an instrument for identifying groups of learners. Unpublished paper.

Conti, G. J., & Kolody, R. (1999c). Guide for using ATLAS: Assessing the learning strategies of adults. Stillwater, OK: Oklahoma State University.

Conti, G. J., Kolody, R.C., & Lockwood, S. (1997). Identifying groups of learners through the use of learning strategies. In Proceedings of the 27th Annual SCUTREA Conference. On line at <http://www.leeds.ac.uk/educol/documents/000000254.htm>.

Courtney, S. (1989). Defining adult and continuing education. In S. B. Merriam, and P. M. Cunningham, (Eds.), Handbook of adult and continuing education (pp. 15-25). San Francisco, CA: Jossey-Bass.

Danis, C., & Tremblay, N. (1988). Autodidactic learning experiences: Questioning established adult learning principles. In H.B. Long & Assoc. (Eds.), Self-directed learning: Application and theory. (pp. 171-197). Athens, GA: University of Georgia.

Darkenwald, G. G., & Merriam, S. B. (1982). Adult education: foundations of practice. New York, NY: Harper & Row.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS Quarterly, September, 319-339.

Dewar, J. A. (1998). The information age and the printing press: Looking backward to see ahead. Rand Abstracts. Online at <http://www.rand.org/publications/P/P8014/>

Dewey, J. (1916). Democracy and education. New York, NY: Macmillan.

D'Souza, P. V. (1992). Electronic mail in academic settings: A multipurpose communications tool. Educational Technology, March, 22-25.

Elias, J. L., & Merriam, S. (1980). Philosophical foundations of adult education. Malabar, FL: Krieger.

eUser and Usage Report (1999). downloaded on 1/14/00 from http://cyberatlas.internet.com/big_picture/demographics/article/0,1323,5901_221541,00.html.

Fellenz, R. A., & Conti, G. J. (1989). Learning and reality: Reflections on trends in adult learning (Information Series No. 336). Columbus, OH: ERIC Clearinghouse on Adult, Career, and Vocational Education.

Galbreath, J. (1997). The Internet: past, present, and future. Educational Technology, November-December, 39-45.

Garrison, D. R. (1992). Critical thinking and self-directed learning in adult education: An analysis of responsibility and control issues. Adult Education Quarterly, 42(3), 136-148.

Garrison, D. R. (1993). An analysis of the control construct in self-directed learning. In H.B. Long and Assoc. (Eds.), Emerging perspectives of self-directed learning. (pp. 27-44). Norman, OK: Research Center Continuing Professional and Higher Education of the University of Oklahoma.

Garrison, D. R. (1997). Self-directed learning: Toward a comprehensive model. Adult Education Quarterly, 48(1), 18-33.

Gay, L. R. (1987). Educational research: Competencies for analysis and application (3rd. ed.). Columbus, OH: Merrill Publishing Co.

Gilder, G. (1997). Inventing the Internet again. Forbes ASAP, June 2, 107-120.

Gerstner, L. S. (1990). On the theme and variations of self-directed learning. In H. B. Long and Assoc. (Eds.), Advances in research and practice in self-directed learning.

Grattan, C. H. (1955). In quest of knowledge. New York, NY: Association Press.

Green C. D. (1999). Classics in the history of psychology. Downloaded <http://www.yorku.ca/dept/psych/classics/> on February 14, 2000. Toronto, Ontario: York University

Groper, R. (1996). Electronic mail and the reinvigoration of American democracy. Social Science Computer Review, 14(2), 157-168.

Guglielmino, L. M. (1978). Development of the self-directed learning readiness scale. (Doctoral dissertation, University of Georgia, 1977). Dissertation Abstracts International, 38, 6467.

Guglielmino, L. M. (1989). Guglielmino responds to Field's investigation. Adult Education Quarterly, 39(4), 235-240.

Gunther, M. (1998). The Internet is Mr. Case's neighborhood. Fortune, March 30, 69-80.

Hammond M., & Collins R. (1991). Self-directed learning: Critical practice. London, UK: Kogan Page.

He, P. W., & Knapp, S. D. (1995). Electronic reserve with WWW: A promising way to enhance classroom instruction. Journal of Educational Technology Systems, 24(2), 119-125.

Hiemstra, R. (1975). The older adult and learning. Lincoln: Department of Adult and Continuing Education, University of Nebraska. (ERIC Document reproduction Service No. ED 117-317).

Hiltz, S. R. (1986). The "virtual classroom": Using computer-mediated communication for university teaching. Journal of Communication, Spring, 95-104.

- Hiltz, S. R. (1990). User satisfaction with computer-mediated communication systems. Management Science, 36(6), June, 739-764.
- Hiltz, S. R., & Wellman, B. (1997). Asynchronous learning networks as a virtual classroom. Communications of the ACM, 40(9), 44-49.
- Houle, C. O. (1961). The inquiring mind. Madison, WI: The University of Wisconsin Press.
- Huang, C. M. (1995). An enhanced computer networks course. IEEE Transactions on Education, 38(3), 279-290.
- Ivey, B. E. (1992). A case study of student learning in a microcomputer-based chemistry laboratory. Unpublished doctoral dissertation Montana State University, Bozeman, MT.
- Johnstone, J., & Rivera, R. (1965). Volunteers for learning. Hawthorne, N.Y.: Aldine.
- Jonassen, D., Davidson, M., Collins, M., Campbell, J., & Haag, B.B. (1995). Constructivism and computer-mediated communication in distance education. The American Journal of Distance Education, 9(2), 7-26.
- Jung, C. G. (1921). Psychological types. Princeton, NJ: Princeton University Press.
- Kay, A. C. (1991). Computers, networks and education. Scientific American, Sept., 138-148.
- Knowles, M. S. (1970). The modern practice of adult education: Andragogy versus pedagogy. Chicago, IL: Follett.
- Knowles, M. S. (1975). Self-directed learning: A guide for learners and teachers. New York, NY: Association Press.
- Knowles, M. S. (1980). The modern practice of adult education: From pedagogy to andragogy (Rev. ed.). Chicago, IL: Follett.
- Kolb, D. A. (1976). Learning style inventory technical manual. Boston, MA: McBer.
- Kruger, L. J., Cohen, S., Marca, D., & Mathews, L. (1996). Using the Internet to extend training in team problem solving. Behavior Research Methods, Instruments, and Computers, 28(2), 248-252.

Kulick, J. (1970). An historical overview of the adult self-learner. (ERIC Document Reproduction Service No. ED 037 648).

Long, H. B. (1976). Continuing education of adults in colonial America. Syracuse University: Publications in Continuing Education.

Marshall, L. C. (1995). Computers and learning. Unpublished doctoral dissertation, Montana State University, Bozeman, MT.

Maslow, A. H. (1970). Motivation and personality (2nd. Ed.). New York, NY: Harper and Row.

McLuhan, M. M. (1962). The gutenber galaxy: The making of typographic man. Toronto: University of Toronto Press.

Merriam, S. B. (1988). Case study research in education: A qualitative approach. San Francisco, CA: Jossey-Bass.

Messick, S., & Associates. (1976). Individuality in learning. San Francisco, CA: Jossey-Bass.

Metcalf, B. (1996). You really think that the Internet isn't collapsing? Universities are bailing out. Infoworld, November 11, 1996, 48.

Milheim, W. D. (1996). Interactivity and computer-based instruction. Journal of Educational Technology Systems, 24(3), 225-233.

Muller, N.J. (1999). Desktop encyclopedia of the Internet. Norwood, MA: Artech House, Inc.

Newman, D. R., Webb, Brian and Cochrane, C. (1995). A content analysis method to measure critical thinking in face-to-face and computer supported group learning. Interpersonal Computing and Technology: An Electronic Journal for the 21st Century, 3(2), 56-77.

Oddi, L. F. (1986). Development and validation of an instrument to identify self-directed continuing learners. Adult Education Quarterly, 36(2), 97-107.

O'Reilly & Associates (1995). Defining the Internet opportunity: A multiclient study. Downloaded 1/14/00 from <http://boardwatch.internet.com/mag/95/dec/bwm1.html>

Penland, P. R. (1977). Self-planned learning in America. Final report of project no. 475AH60058, Office of Libraries and Learning Resources, U.S. Department of Health, Education, and Welfare. Pittsburgh, Pa.: Graduate School of Library and Information Sciences, University of Pittsburgh. (ERIC Document Reproduction Service No. ED 183 589)

Penland, P. R. (1979). Self-initiated learning. Adult Education, 39(3), 170-179.

Press, L. (1997). Tracking the global diffusion of the Internet. Communications of the ACM, November, 11-17.

Peterssen, A. (December 6, 1999). Lost in the maze. The Wall Street Journal, "The Internet" supplement.

Rachal, J. R. (1989). The social context of adult and continuing education. In S. B. Merriam, and P. M. Cunningham, (Eds.), Handbook of adult and continuing education (pp. 3-14-25). San Francisco, CA: Jossey-Bass.

Rice, R. E. (1987). Computer-mediated communication and organizational innovation. Journal of Communications, 37(4), 65-94.

Rice, R. E., & Love G. (1987). Electronic emotion: Socioemotional content in a computer-mediated communication network. Communication Research, 14(1), 85-108.

Rice, R. E. (1993). Media appropriateness: Using social presence theory to compare traditional and new organizational media. Human Communication Research, 19(4), 451-484.

Rice, R. P. (1997). An analysis of stylistic variables in electronic mail. Journal of Business and Technical Communication, 11(1), 5-23.

Riel, M. (1990). Cooperative learning across classrooms in electronic Learning Circles. Instructional Science, 19, 445-466.

Riel, M., & Levin, J. (1990). Building electronic communities: Success and failure in computer networking. Instructional Science, 19, 145-169.

Schatzman, L., & Strauss, A. L. (1973). Field research: Strategies for a natural sociology. Englewood Cliffs, N.J.: Prentice-Hall, Inc.

Schmitz, J., & Fulk, J. (1991). Organizational colleagues, media richness, and electronic mail: A test of the social influence model of technology use. Communication Research, 18(4), 487-523.

Spear, G. G. (1988). Beyond the organizing circumstance: A search for methodology for the study of self-directed learning. In H. B. Long & Assoc. (Eds.), Self-directed learning: Application & theory (pp. 199-221). Athens, GA: University of Georgia.

Spear, G. E., & Mocker, D. W. (1984). The organizing circumstance: Environmental determinants in self-directed learning. Adult Education Quarterly, 35(1), 1-10.

Strakal, D. (1995). The use of real-life learning strategies in personal and career development situations by students at Eastern Idaho Technical College. Unpublished doctoral dissertation, Montana State University, Bozeman, MT.

Tough, A. M. (1966). The teaching tasks performed by adult self-teacher. (Doctoral Dissertation, University of Chicago, 1966). Dissertation Abstracts International, 1861-1972, 58, X1966.

Tough, A. M. (1967). Learning without a teacher: A study of tasks and assistance during adult self-teaching projects. Educational Research Series No. 3. Toronto: Ontario Institute for Studies in Education.

Tough, A. M. (1971). The adult's learning projects. Toronto: Ontario Institute for Studies in Education.

Tough, A. M. (1969). Why adults learn: A study of the major reasons for beginning and continuing a learning project. Paper presented at the National Seminar on Adult Education Research. (ERIC Document Reproduction Service No. ED 025 688).

Tough, A. M. (1978). Major learning efforts: Recent research and future directions. Adult Education, 28(4), 250-263.

Tough, A. M. (1979a). The adult's learning projects: A fresh approach to theory and practice in adult learning (Rev. ed.) Toronto: Ontario Institute for Studies in Education.

Tough, A. M. (1979b). Self-guided learning and change. In S. Gregory Bowes (Ed.), Distinguished Adult Educators Explore Issues/Trends/Strategies in Adult/Continuing Education. Albuquerque, NM: University of New Mexico. (ERIC Document Reproduction Service No. ED 193 421).

Tough, A. M. (1979c). Choosing to learn. Toronto: Ontario Institute For Studies in Education, Toronto (ERIC Document Reproduction Service No. ED 190 741)

Tracey, B. (1999). Summary of "What makes women click." Downloaded on 1/14/00 from <http://www.netsmartamerica.com/report3.html>.

Tuckey, C. J. (1993). Computer conferencing and the electronic white board in the United Kingdom: A comparative analysis. The American Journal of Distance Education, 7(2), 58-72.

Van Dalen, D. B. (1973). Understanding educational research: An introduction. (3rd ed). New York, NY: McGraw Hill.

Wagner, E. D. (1994). In support of a functional definition of interaction. The American Journal of Distance Education, 8(2). 6-29.

Witkin, H. A. (1976). Cognitive style in academic performance and in teacher-student relations. In S. Messick and Associates (Eds.), Individuality in Learning. San Francisco, CA: Jossey-Bass.

APPENDIXES

APPENDIX A

IN DEPTH QUALITATIVE QUESTIONNAIRE

1. Briefly describe the three or four of the most important self-directed learning projects that you have undertaken in the last year which used the Internet as a learning resource.
2. Please describe what parts of the Internet you use in your learning projects, i.e. do you use newsgroups, chatrooms, mailing lists, e-mail, or just browsing web pages.
3. Has the Internet expanded the resources available for your learning projects?
4. How are these resources different than "traditional resources"?
5. Has your use of the Internet led to the location of "traditional" learning resources, and how would you compare "traditional" and Internet resources?
6. Does the Internet act as an additional source of information or does it replace other sources of information, and what effect has this had on your learning?
7. What parts of the use of the Internet do you find the most difficult?
8. How do you find or locate resources on the web?
9. When you are planning or figuring out how to go about a self-directed learning project, do you plan out the steps to the learning project, or do you just begin with one resource and see where that leads? How does the Internet effect the level of structure or planning of your projects?
10. When you are involved in a learning projects, different ideas and opinions come up. How do you decide which ideas are correct?
11. Please add any additional information.

APPENDIX B

DEMOGRAPHIC QUESTIONNAIRE

1. *How old are you? Choose any one of the following:*

1. *65+.*
2. *55-64.*
3. *45-54.*
4. *35-44.*
5. *25-34.*
6. *18-24.*
7. *less than 18.*

2. *Your gender?*

1. *Male.*
2. *Female.*

3. *Your yearly household income? Choose any one of the following:*

1. *Under \$25,000.*
2. *25-50 thousand.*
3. *Over 50 thousand.*

4. *Your educational level? Choose any one of the following:*

1. *Not High School Graduate.*
2. *High School Graduate.*
3. *Some College.*
4. *College Graduate*

5. *How long they've been using the Internet? Choose any one of the following:*

1. *Less than 6 months.*
2. *6-12 months.*
3. *Over 12 months.*

6. *How often are you on-line in an average week? Choose any one of the following:*

1. *Less than 2 hours.*
2. *2 to 5 hours.*
3. *More than 5 hours.*

7. About how often do you use the Web for Informal Learning? Choose any one of the following:

- 1. Every Day.*
- 2. Once per week.*
- 3. Once per month.*
- 4. Never.*

8. What is your main Internet resource?

- 1. Basic WWW viewing.*
- 2. Mailing lists.*
- 3. Newsgroups.*
- 4. Chatrooms.*
- 5. FTP.*
- 6. Telnet.*

9. Do you access the Internet mainly from?

- 1. home.*
- 2. office.*
- 3. school.*
- 4. library.*

APPENDIX C

**RELATION OF RESEARCH QUESTIONS
TO INSTRUMENTS**

1. General

- a) How is the Internet being utilized in self-directed learning projects? (In-Depth #1,2,3,4,5,6,7,8,9,10; Demographic 5,6,7,8,9)
- b) What aspects of the Internet such as newsgroups, e-mail, mailing lists, and academic sites are being used? ? (In-Depth #2; Demographic #8)
- c) What types of problems arise with the Internet's use? (In-Depth #7)
- d) How has the home-based nature of the Internet increased informal learning? (In-Depth #3)

2. Long-Term Learning Projects Initiated prior to Internet Access

- a) In what ways has the Internet expanded or benefited any continuing or ongoing self-directed learning projects which had initially begun before their use of the Internet? (In-Depth #1,6,10)
- b) How are Internet resources being integrated with other types of resources? (In-Depth #4,5,6)

3. Learning strategy preferences

- a) What are the learning strategy preferences of learners who gravitate towards the Internet? (ATLAS)
- b) How are particular learning strategy preferences associated with particular types of Internet usage? (ATLAS, In-Depth #1,2,3,4,5,6,7,8,9,10)

APPENDIX D

INTRODUCTORY WEB PAGE

Self Directed Learning on the Information Superhighway

All of your answers are completely anonymous.

Adults continue to learn through-out their lifetimes through a process called self-directed learning. It is what you and I do everyday when we 'study' or learn about our favorite hobbies, health concerns, home repairs, or vacation planning. Without the assistance of a formal educational institution we learn about the different topics that are of interest to us. We do this by reading books, watching tv or videos, by talking with friends and experts.

In the last several years the Internet has developed into a rich and accessible source of information for self-directed learning.

In conjunction with Oklahoma State University, Dr. Gary Conti and I (Ralph Spencer) are conducting research into the uses of the Internet by adults for informal or self-directed learning.

If you would like to be a part of this study, please follow the link below. There are three sections for you to complete;

1. A learning styles survey (1 minute)
2. A demographic questionnaire of 9 questions (1 minute)
3. An open ended questionnaire of 10 question (10 minutes or longer)

This should take anywhere from 15 minutes to one hour, depending on how long you want to make your answers. Your participation in this study will serve to increase our knowledge of the process of self-directed learning and how the Internet can be made a more effective tool in this process. Some of the pages load a bit slowly so please be patient. Thank you.

[Click here to begin](#)

All of your answers are completely anonymous.

Consent Agreement: I understand that participation is voluntary, that there is no penalty for refusal to participate, and that I am free to withdraw my consent and participation in this project at any time without penalty after notifying the project director. I may contact Dr. Gary Conti at telephone number (405) 744-9192. I may also contact Gay Clarkson, IRB Executive Secretary, 305 Whitehurst, Oklahoma State University, Stillwater, OK 74078; telephone number: (405) 744-5700.

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APPENDIX E

ATLAS

Atlas
(Assessing The Learning Strategies of AdultS)

Developed by Gary J. Conti and Rita C. Kolody. copyrighted 1998

Take the ATLAS Learning Strategies Instrument

ATLAS categorizes learners as Problem Solvers, Engagers, and Navigators. Problem Solvers think of a variety of ways to "solve the problem" at hand and then dive in with experimentation. Engagers wish to view the learning project within the total context of their lives and the people around them. Navigators prefer to structure the information to be learned.

What Are Learning Strategies?

It is clear to educators that individual differences exist in how students approach learning. For nearly two decades, educators have turned to the concept of learning styles as a means of exploring individual differences in learners with instruments to measure these differences developed by Kolb, Gregorc, Canfield, and Dunn. However, most of these instruments have inherent weaknesses. Consequently, many in the field of adult education have begun to explore the concept of learning strategies as a way to better understand these individual differences among learners. Contemporary studies with learning strategies suggest that distinct groups of learners do exist.

Regardless of the type of setting, learners use various strategies to accomplish their learning needs. Learning strategies are those techniques or specialized skills that the learner has developed to use in both formal and informal learning situations. They are techniques and skills that an individual elects to use in order to accomplish a specific learning task. These strategies vary by individual and by learning objective. Much of the research in the area of learning strategies has used the Self-Knowledge Inventory of Lifelong Learning Strategies (SKILLS). This research has consistently found that various groups of learners can be distinguished by the learning strategies which they use.

ATLAS (Assessing The Learning Strategies of AdultS) is the result of much of this research. An Adult Education Research Conference paper by Gary Conti and Rita Kolody provides an overview of how ATLAS was developed from the research base on SKILLS.

ATLAS Directions: The following questions are related to learning in real-life situations in which you control the learning situation. These are situations that are not in a formal school. For each one, select the answer that best fits you, and click on the line "Click here if this is my preference" that immediately follows your choice. There are only three questions to answer so Let's Begin:

When considering a new learning activity such as learning a new craft, hobby, or skill for use in my personal life:

I like to identify the best possible resources such as manuals, books, modern information sources, or experts for the learning project.
Click here if this is my preference

or

I usually will not begin the learning activity until I am convinced that I will enjoy it enough to finish it.
Click here if this is my preference

ATLAS Question Two

It is important for me to:

Focus on the end result and then set up a plan with such things as schedules and deadlines for learning it.
Click here if this is my preference

or

Think of a variety of ways of learning the material.
Click here if this is my preference

ATLAS Question Two

I like to:

Involve other people who know about the topic in my learning activity.
You are an Engager Subgroup 1–Go to the Groups of Learners Page to learn more

or

Determine the best way to proceed with a learning task by evaluating the result that I have already obtained during the learning task.
You are an Engager Subgroup 2–Go to the Groups of Learners Page to learn more

ATLAS Question Three

I like to:

Set up a plan for the best way to proceed with a specific learning task.

You are a Problem Solver Subgroup 1–Go to the Groups of Learners Page to learn more

or

Check out the resources that I am going to use to make sure that they are the best ones for the learning task

You are a Problem Solver Subgroup 2–Go to the Groups of Learners Page to learn more

ATLAS Question Three

I like to:

Involve other people who know about the topic in my learning activity.

You are a Navigator Subgroup 1–Go to the Groups of Learners Page to learn more

or

Structure the information to be learned to help remind me that I can successfully complete the learning activity.

You are a Navigator Subgroup 2–Go to the Groups of Learners Page to learn more

VITA

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SUPERHIGHWAY

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