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A Principled Approach to Facilitating Web-Based Distance Education in Post-Secondary Institutions

by

Heather Kanuka 

A thesis submitted to the Faculty of Graduate Studies and Research in partial fulfillment of the requirements for the degree of Doctor of Philosophy

in

Educational Administration and Leadership

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ABSTRACT

This study was designed to develop teaching and learning principles to guide in the facilitation of higher levels of learning in Web-based distance education. The research framework used Zetterberg's (1962) model for change followed by a validation process. Data from semi-structured interviews with university instructors, a focus group interview with educational technologists who were experienced in facilitating Web-based learning in post-secondary institutions, a review of related literature, and my own reflective journal, provided insights for the development of the principles and constructs. This was followed by a validation process from experts and scholars in the field through a consensus survey. The outcome was the development of nine principles that facilitate higher levels of learning in Web-based distance education. They are divided along the two dimensions of teaching and learning. The teaching principles include:

1. Active and purposeful presentation of complex abstracted phenomena.
2. The inclusion of diverse and/or multiple perspectives about the complex issues or problems presented.
3. The integration of learner relevance to the material presented.
4. The incorporation of diverse instructional methods.
5. A meaningful assessment process.

The learning principles include:

6. An ability to assume greater responsibility in the learning process.
7. The capacity to build meaning into the issues and problems presented.
8. An understanding that one's own world view is not the only one – nor necessarily the correct one.

9. An ability to provide evidence of new understandings and ways of thinking.

In addition to enhancing our understanding of uses of the Web with respect to facilitating higher levels of learning, these principles provide non-education Web users with a heuristic and an opportunity to further inform higher education researchers by building on these principles in future research. The outcomes of this study also provided many online activities that can support the principles identified.

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CHAPTER ONE

THE PROBLEM

The last decade witnessed an unprecedented popularity of the use of the Web in all levels of education – most notably as an information dissemination platform and as a communication medium. However it has been argued that the most meaningful educational use of the Web is as a tool for thinking (Jonassen, 1996). In particular, the Web appears to be an ideal platform to support higher levels of learning and knowledge construction due, predominantly, to its hypertext environment that has seemingly unbounded access to diverse information resources. The crux of this argument rests on the assumption that hypertext environments, such as the Web, require learners to make decisions repeatedly on which links to follow – and which not to – and regularly assess their state of progress. To cope in this environment, learners must apply higher order intellectual skills (Marchionini, 1988; Roselli, 1991). In addition, as hypertext environments can provide meaningful relationships between chunks of information that can be accessed through links, and in ways that reflect how we think, hypertext environments can also accurately represent our semantic interdependencies between concepts resulting in the facilitation of mental models and knowledge construction (King, 1996).

However, even though the Web is used extensively in distance education as a communication medium and as an information dissemination platform, there is little evidence to suggest that it is being used as a tool for thinking. A study by Moiduser, Nachmias, Lahav, and Oren (2000), for example, reviewed 436 educational Web sites and found that most are "still predominantly text-based and do not yet exhibit evidence of

current pedagogical approaches (e.g., use of inquiry-based activities, application of constructivist learning principles, and use of alternative methods)" (p. 55). Most often provided are course objectives, sequencing of the course content and/or advanced organizers, and presentation of content not covered in a textbook or reader – followed by questions for discussion. When Web sites are developed in a text-based content dissemination format, it is difficult to argue the advantages of the use of the Web over other distance delivery platforms, such as paper. Like the Web, paper-based platforms can provide this kind of information anywhere, anyplace, and anytime. Unlike the Web, however, paper platforms are more accessible, ubiquitous, and easy to use in that more learners have access to postal services than the Internet, it eliminates the need to be computer literate, and is ready to use (unlike many downloadable software and plug-ins required for the Web). Using the Web in this way results in "one step ahead for technology, two steps back for the pedagogy" (Moiduser, et al., p. 73). To state the obvious, when the Web is used simply as a study guide, it does not take advantage of its unique hypertext platform and the promising possibilities for creative exploration and knowledge construction. There are a variety of possible reasons that might explain why many Web sites are designed in a text-based content dissemination format. However the most probable reason is that distance educators are trying to use it in the same way they use established distance learning systems. In this respect, Haughey (1995) has observed that "our understandings of distance education are shaped by the media with which we are most familiar" (p. 2).

When considering the integration of the Web as a platform for learning in distance education, it is essential to understand that a hypertext environment is

fundamentally different from established content dissemination platforms – such as paper-based study guides and readers. It is also unlike other commonly used communication mediums in distance education, such as audio and video conferencing. In fact, the original vision for the Web was not as a platform for learning at all. Rather, the Web was designed as an information resource and for consultative uses, enabling those using the Web to move easily through the links and from one information source to another. This linking structure also changed the configuration of the traditional linear reading format to one that was ill-structured. What this means, essentially, is that the Web's linking structure removes the confines of a linear structure imposed on existing media.

Given that the Web is an ill-structured and non-pedagogical technology, using it as a platform for facilitating the learning process can be challenging – with the most notable challenge being the need to move our thinking beyond our existing paradigms with respect to the kinds of teaching and learning activities that can be facilitated. When creatively designed, it seems conceivable that the Web's hypertext platform could be a powerful instructional medium. For example, it seems possible that the Web could be an ideal medium to convey information, arguments, concepts and ideas in ways that can introduce abstract ideas presented from multiple perspectives through the use of strategic and creative linking structures and a flexible format. Research has further provided us with evidence that there may be a greater likelihood of facilitating higher levels of learning when the learning activities are developed in a loosely designed or flexible format – not typically found in unitized study guides and readers. Specifically, according to Marland, Patching, Putt, and Putt (1990), the organization of the content may actually

influence whether or not learners process the subject matter at a deep rather than surface level. Thus, it would seem to follow that if we are to integrate the Web into distance education in ways that facilitate higher levels of learning, the content and learning activities should be organized in a manner that supports creative exploration. This, in turn, requires a high degree of flexibility, and an opportunity for learners to assume greater responsibility for their learning. Based on this rationale, it seems reasonable to conclude that if the desired learning outcomes are to facilitate higher levels of learning, we should be designing instruction on the Web in a way that will use the Web's unique hypertext platform with thoughtful linking structures for creative exploration. Naturally this would require a careful balance in the design process where the instruction offers learners an information base with diverse instructional methods and flexible exploration, but also permits learners to move through the course material with a minimal risk of conceptual disorientation and cognitive overload to avoid unproductive learning. Hence, while the Web may indeed be a promising platform to implement higher levels of learning, it also seems to be accompanied by a few undesirable characteristics. What remains most problematic is the way the course content and instructional activities are structured, which typically replicates the traditional models while at the same time aiming to avoid information overload – but in the process failing to take advantage of the flexibility and resources that Web-based distance education can provide.

The problem of replicating traditional classroom models in distance education is not new, nor is it unique to the Web as a technology used in distance education. As Haughey (1995) explains, traditional tenets of teaching tend to be transferred to distance education, creating the same discontinuities to distance education that are present in

traditional learning environments. These are, according to Haughey, "partly the result of the transfer of traditional beliefs to distance education and partly the result of the ways in which distance educators have chosen to use particular technologies" (p. 8). And while it has been argued that the Web provides an opportunity for interaction between and among the instructor and learners through online discussions – which, in turn, has been argued can support critical thinking skills and deep learning – this too replicates the traditional classroom model and misses opportunities for distance educators to benefit from Web-based distance education. Moreover, empirical research has revealed that online discussions do not necessarily support higher levels of thinking and learning (see Kanuka & Anderson, 1998; Phillips, Santoro, & Kuehn, 1988). If higher levels of learning are to be achieved in Web-based distance education, there is a need to expand our perspectives of teaching and learning beyond what occurs in traditional classrooms.

To achieve this goal, the use of a principled approach framed within a model for problem solving and change could be effective. Models have shown to be effective at facilitating change in that they can be used to clarify our thinking about a relatively complex phenomenon. Accordingly, using a model for change could provide guidance in the development of distance teaching and learning activities in ways that effectively use the Web's unique hypertext platform to support flexible and creative exploration and diverse instructional methods necessary for higher levels of learning. According to Zetterberg (1962), constructs for change can be developed through an analysis of the literature, observation, experience, and discussion with those working within the field studied. Once the constructs for change have been developed, they can be validated through experts and scholars within the field (Nor, 1995). These experts can confirm

whether or not the constructs reflect the actual phenomena and can be applied to meet the desired goals. Using this process as a framework, the development of teaching and learning principles, composed of constructs, was the focus of this study. The principles were then used to work toward a model to facilitate higher levels of learning in Web-based distance education.

The purpose of this study was to develop teaching and learning principles that can be used as a guide in the facilitation of higher levels of learning in a Web-based distance education environment. To achieve this purpose, I sought to understand the phenomena that account for what is known about facilitating higher levels of learning, as well as the inferred properties of the Web as a learning platform. These, in combination, helped develop an understanding of how to effectively use the Web to facilitate higher levels of learning.

Purpose of the Study

This study sought to identify the essential principles and their constructs that result in the conditions necessary to facilitate higher levels of learning. The principles and constructs identified were then used to work toward a model for Web-based teaching and learning in post-secondary distance education.

The need for guiding principles was accentuated by the lack of understanding about how to facilitate higher levels of learning in Web-based distance education environments. Until teaching and learning principles are established, it is difficult to ascertain whether or not what is being done with the Web in the learning process is adequate and successful with respect to facilitating higher levels of learning. This study marks an important step in that direction.

Guiding Research Question

This study was guided by the following question: What are the essential principles and constructs necessary for higher levels of learning in Web-based post-secondary distance education?

Sub-question: What online activities can be identified that support the essential principles and constructs necessary for higher levels of learning?

Principles are defined as the essential qualities by which higher levels of learning are measured in Web-based instruction. Constructs are defined as the essential elements that compose each principle.

Domains and Concepts Relevant to the Study

This study drew on principles in the following theoretical areas:

1. constructivist learning theory and
2. education technology theoretical frameworks.

Constructivist Learning Theory

Constructivist learning theory set the theoretical foundation upon which this study was built. In particular, drawing on the principles of constructivist learning theory helped to increase my understanding of how to facilitate higher levels of learning necessary for constructing knowledge when using the Web's communication tools and hypertext platform.

Educational Technology Frameworks

Educational technology frameworks provided a common perspective about the use of technologies in the learning process that guided this study. By summarizing what is known about how to use technologies in the learning process, it then becomes clear about what is not known about the Web as a learning technology and, hence, provides the starting point for this study. The process for this study began by building upon existing educational technology theoretical frameworks in a way that created a bridge between the known and the unknown with respect to higher levels of learning in Web-based distance education. According to Chambers (1992), this sort of theory building is called a model because "it extrapolates some *particular and restricted aspects* from the one and applies them in the other, seeing what would then seem to follow from, or what insights might be suggested about the other" (p. 14). In turn, that which follows tends to become theory through the ability to create questions or hypotheses and eventually makes a contribution to first-order Scientific Theory.

Defining the Major Concept of this Study

This study is concerned with the facilitation of higher levels of learning in Web-based distance environments. Following is a description of higher levels of learning. Other terms (e.g. definitions of computer terms) are in Appendix A.

Higher Levels of Learning

A higher level of learning is characterized by attempts to understand complex phenomena that are enigmatic and ambiguous, where there is no one or right solution; nor is there a single perspective. It requires an ability to understand the varied, and often

conflicting, factors and conditions of a given issue or concept and, based on this understanding, create multiple structures to form diverse perspectives of what the whole is capable of being. It is challenging and often removes us from our comfort zones in that it requires us to take perspectives and positions that are unfamiliar and sometimes conflicting with our own world view. This kind of learning has sometimes been referred to as higher-order learning (e.g., Fabro & Garrison, 1998; Resnick, 1987a; Resnick, 1987b). However, inherent in the phrase "higher-order learning" is that there is an order in learning that goes from a low level of knowledge to a higher level and using a spiral or serial learning process. These skills may not be sufficient for apprehending complex and abstracted phenomena in that they disregard the need for multiple understandings required to understand phenomena that are often uncertain, unstable, unique, and value conflicted. Different from higher-order learning – which typically includes aspects of *Bloom's Taxonomy of the Cognitive Domain* (1956) (knowledge, comprehension, application, analysis, synthesis, and evaluation) – a higher level of learning is what Chia (1998) describes as a "parallel" learning process whereby the learning does not focus on the better or deeper understandings of what is known. Rather, it focuses on lateral learning which places an emphasis on the discovery of relationships between different pieces of information which, at first glance, appear to be unrelated to each other making the unknown, rather than the known, the focus of the learning process. Thus the essence of higher levels of learning is on the structuring and restructuring of abstracted phenomena where the aim is to seek relatedness amid apparent unrelatedness. The result is the construction of new knowledge.

Delimitations

In an attempt to define the central focus of the problem, the specific parameters of the study are stated in the following delimitations.

1. Only the uses of the Web to facilitate distance learning transactions were included in the study. This study did not examine, nor was concerned with, informational or supplemental use of the Web in the learning process.

2. Only opinions of post-secondary instructors, scholars, and experts with experience in delivering Web-based learning in post-secondary institutions were sought. This study was not concerned with the opinions of educators in the K-12 area or trainers.

3. The study obtained the opinions of instructors, scholars, and experts who have had experience in Web-based teaching and learning on the topic of using the Web to facilitate higher levels of learning. It is recognized that instructors are not the only ones who can provide valuable insights about facilitating higher levels of learning.

4. Only the constructs developed in this study were sought to be validated.

Limitations

The following limitations influenced the degree to which the results can be generalized to other adult and higher education institutions. Limitations that are specific to the methods used in this study are discussed again in greater detail in the Design and Methods chapter.

1. As the focus of the study was on the use of Web-based teaching and learning in adult and higher education institutions it is only generalizable to post-secondary institutions.

2. The results of the study were limited by the nature of the methods. Other kinds of data available through alternative methods were not included.

3. Because of the rapid rate of information expansion and technological change, the learning activities identified in this study may need updating soon after the completion of the study.

Assumptions

This study was based on the following assumptions (personal assumptions are discussed in Chapter Three).

Research Assumptions

1. It was assumed that the interview, focus group and survey participants responded openly, honestly, and accurately to the questions asked.

2. It was assumed that a higher level of learning is possible using the Web in distance education.

3. It was assumed that principles and constructs can be delineated despite their inter-relatedness in the learning and teaching process.

4. It is assumed that a model comprised of guiding principles would aid in the designing of learning environments that facilitates higher levels of learning.

5. With respect to constructivist learning theory, it is assumed that:
   - Teaching and learning cannot be viewed as the transmission of knowledge from the enlightened to the unenlightened.
   - Learning is based on prior knowledge.
   - Learning is a socio-linguistic process.
   - Learning is an active process.

Significance of the Study

There has been much speculation that the Web will revolutionize distance education. Evidence of this belief can be found in much of the current literature on Web-based distance education. An examination of this literature reveals that there is much talk about the ability of the Web to facilitate critical, creative and complex thinking skills in this post-industrial era of distance education – though, this literature provides the distance educator with little empirically supported guidance about how to facilitate these high levels of thinking. Thus far, the literature on the use of the Web in distance education has tended to be anecdotal advice with respect to its use as a content dissemination platform

and a communication medium for facilitating discussions. However, information dissemination and discussion are not enough to facilitate higher levels of learning and thinking. Learners must also be provided with opportunities to apply what they have learned. This requires knowledge and skills of educational methods and strategies, as well as an understanding of the use of the Web as a learning platform. Thus, while the literature is rich in descriptive guidance, Web-based instruction is still a nascent idea established upon anecdotal experiences. There is a need to move beyond personal experiences. Moreover, given that many educators who use the Web in the learning process are from diverse fields, many of which lack educational and pedagogical knowledge, also gives rise to a need for a heuristic to guide understandings with respect to higher levels of learning with the Web.

A model composed of guiding principles seemed pertinent to a heuristic in that it can be used to guide our thinking about a relatively complex situation (Mitchell, 1978). A good model will help us understand complex phenomena through extrapolating a concept from one area and applying it as an analogue in another, observing what insights might be gained about the other. The result is a bridge between the known and the unknown (Chambers, 1992). This syllogism underpinned the study, where existing educational technology frameworks, in combination with what we know about how to facilitate higher levels of learning, were used as an analogue to suggest constructs for higher levels of learning and the use of the Web to facilitate this process. Gathering data from instructors and instructional designers who have had experience facilitating learning on the Web, as well as from a review of the literature and a reflective journal of my own experiences, provided insights for the development of teaching and learning principles.

These principles of teaching and learning were then applied to the development of a model which illustrates their inter-relatedness. This was followed by a two step validation process on the principles' constructs from experts and scholars in the field. In addition to enhancing our understanding of uses of the Web with respect to facilitating higher levels of learning, the teaching and learning principles provide non-education Web users with a heuristic and an opportunity to further inform distance educators of the use of the Web in the learning process by building on the principles in future research.

CHAPTER TWO

LITERATURE REVIEW

The most important contribution of a literature review is to identify why some of the literature is noteworthy, and which literature has made important theoretical contributions to the field. The literature review for this study includes a review of distance education and Web-based learning environments. As this study was concerned with facilitating higher levels of learning in Web-based distance education, a review of distance education and Web-based instruction was necessary to provide a background with respect to our knowledge of the Web as a learning tool and distance education. The literature review for this study was immensely valuable in summarizing the current state of knowledge in these areas. Moreover, as the literature on Web-based teaching and learning contributed to the development of the principles and constructs, this review of the literature was a critical component in this study.

Distance Education

Introduction: What is Distance Education?

When most of us think of distance education, we probably tend to think of a situation where instructors and learners are separated by a geographical space and technology (print, video, audio, and/or data) is used to bridge the instructional space. In these terms, distance education can most easily be described as a learning transaction where the instructor is in some way removed from the student. Although this definition provides a clear description of distance education that most of us can relate to, it does not reflect many of the complexities often involved in distance education. To try to reflect

these complexities, distance education has been defined by Moore (1988) as the organizational and pedagogical methods of providing systematic education using various forms of educational and communication technologies. This type of definition, although not as readily comprehensible, acknowledges the complex issues associated with distance education. Following are a few of the better known definitions that incorporate the many and varying complexities involved in distance education.

- Distance education is planned learning that normally occurs in a different place from teaching and as a result requires special techniques of course design, special instructional techniques, special methods of communication by electronic and other technology, as well as special organizational and administrative arrangements. (Moore & Kearsley, 1996, p. 2)
- The ...[phrase] 'distance education' covers the various forms of study at all levels ...[that] are not under the continuous, immediate supervision of tutors present with their students in lecture rooms or on the same premises, but which, nevertheless, benefit from the planning, guidance and tuition of a tutorial organization. (Holmberg, 1977, p. 9)
- Distance teaching/education is a method of imparting knowledge skills and attitudes which is rationalized by the application of division of labor and organizational principles as well as by the extensive use of technical media, especially for the purpose of reproducing higher quality teaching material which makes it possible to instruct great numbers of students at the same time wherever they live. It is an industrialized form of teaching and learning. (Peters, 1983, p. 206)

- Distance teaching may be defined as the family of instructional methods in which the teaching behaviors are executed apart from the learning behaviors, including those that in a contiguous situation would be performed in the learner's presence so that communication between the teacher and the learner must be facilitated by print, electronic, mechanical or other devices. (Moore, 1973, p. 664)
- Distance education implies that the majority of educational communication between (among) teachers and students occurs non-contiguously, must involve two-way communication between (among) teacher and student(s) for the purpose of facilitating and supporting the education process, and use technology to mediate the necessary two-way communication. (Garrison & Shale, 1987, p. 11)

Common to each of these definitions is that the learner and instructor are separated and a technology is used to facilitate learning. Yet if we take a closer look at the literature that surrounds these definitions, what we find is that these definitions tend to differ with respect to their meaning of the words distance and education. For example, Willis (1993) uses distance education to refer to the organization framework and the process of providing education at a geographical distance, and associates distance learning as the instructional outcome or product of distance education. Moore & Kearsley argue, in agreement with Willis, that distance learning and distance education are not the same:

> Because distance education aims to provide instruction in places and times that are convenient for learners rather than teachers or teaching institutions, many people use the term "distance learning" as a synonym for distance education. We understand that this is not strictly accurate, since in education our interest is in

> learning that is deliberate and planned, and therefore with teaching as well as learning. (p. 2)

Although Willis, Moore and Kearsley agree there is a difference between distance education and distance learning, much of the literature uses the phrase distance learning in a way that is synonymous with distance education. For consistency in this literature review the distinction made by Willis, Moore and Kearsley will be kept.

The word distance needs to be clarified as well, as it too means many things to many authors and can include temporal, social, cultural, psychological, geographical, and transactional kinds of distance. Any and all of these terms have been used in the literature to describe the types of distance that can occur in the process of learning. Temporal distance relates to issues of limited and/or conflicts in time that many learners experience, often referred to as a time barriers. Haughey (1995) notes that new communication technologies has made the notion of time as a factor of distance education almost irrelevant. Though, the question that emerges as a result is "In what ways does electronic presence still leave learners at a distance?" (p. 4). Social distance, as the term implies, refers to an inability for a gathering of organized groups for the purpose of learning. Social barriers are commonly referred to as situational barriers. It needs to be noted that social issues sometimes also relate to issues of isolation, occasionally cited as the biggest barrier to distance education (Blanchette, 1999). Cultural distance relates to the differences between cultures that some students experience. Psychological distance deals with emotional separations that occur in learning transactions and geographical distance includes place separation. Transactional distance, however, is not so easily described. In simple terms, transactional distance

refers to the communication gap between the learners and the instructor. This space or gap must be bridged if learning is to be maximized—and is not limited to geographical or temporal distance education. As class sizes grow, for example, even students and instructors in face-to-face campuses are grappling with ways to overcome this type of communication gap.

The concept of transaction is not new. It was first introduced in the literature by John Dewey and developed by Boyd and Apps in 1980. Michael Moore then further developed it into a theory of transactional distance (Moore & Kearsley, 1996). The theory of transactional distance rests on the assumption that distance education is a pedagogical phenomenon where the focus is on the effect that distance has on the instruction, the learners, the instructors, the forms of communication and interaction, the curriculum, and the management of the program:

> When we speak of distance learning, we do not speak of an educational course that is no different from "contiguous" courses except for the physical separation of learners and teacher. This distance is a distance of understandings and perceptions caused by the geographic distance, that have to be overcome by teachers, learners, and educational organizations if effective, deliberate, planned learning is to occur. (Moore & Kearsley, p. 200)

Moore argues that we should use the phrase *transactional distance education* rather than *distance education* to make clearer that distance education is a subset of educational events where the instructors' and learners' separation is significant enough to influence their behaviors in major ways. Effective education, of any kind, necessitates sound instructional design and interaction procedures with a pedagogical emphasis, rather than

geographical. To achieve this, interaction between instructors and learners is required, as well as "environments that have the special characteristic of being separate from one another, and a consequent set of special teaching and learning behaviors ... How special will depend of the degree of the transactional distance" (Moore & Kearsley, p. 200).

We can see from the literature reviewed thus far that there is an assumption in the literature that the distance (transactional or otherwise) between the instructor and learners must be bridged. However, not everyone agrees that the distance needs to be bridged. Haughey (1995), for example, observes that while distance educators have viewed the main advantage of communication technologies as their ability to overcome the "problem" of distance – perhaps there is not a "problem" at all. Rather, distance learners may have chosen distance education "because of" the distance between the institution and themselves – and may be "quite happy with their choice of place and, instead, view the institution as sometimes too close for comfort!" (p. 10). Haughey notes further that embedded in the assumption that distance is a problem is also a view that the learners are not connected to the institution and the only "real learning takes place among registered members of the class" (p. 10). As such, models of learner interaction are typically replications of the classroom-based models – which are generally the result of the transfer of traditional beliefs to distance education and are, in turn, reflected in the ways that distance educators have chosen to use the technologies. In this article, Haughey asks us to reconsider our notions of the need for "here-ness" for both the institution and learner, and instead provide learning opportunities that celebrate the distances. In this way, we can become aware of the benefits of distance – and, correspondingly, the use of communication technologies that reflect the benefits of distance – rather than attempting

to replicate the traditional institutional models of teaching and learning that, inevitably, will result in an inadequate "imitation."

Summary

We can conclude from this section of the literature that when using the phrase "distance education," care needs to be taken to define both "distance" and "education." A review of the literature reveals that the word distance means many things to many people, and can include temporal, social, cultural, psychological, geographical and transactional kinds of distances. Moreover, we need to be aware of our assumptions about "distance" as a problem to be overcome.

An Overview of the Research of the Effectiveness of Distance Education

As mentioned in the prior section, many post-secondary institutions are beginning to explore the use of technology mediated distance learning. Yet in spite of this apparent surge in popularity, there is still much reluctance in higher education communities to adopt and/or integrate technologies due, primarily, to a belief that they are incapable of facilitating higher order thinking skills (Kanuka & Anderson, 1999). In an effort to dismiss this notion, research has been conducted. With few exceptions, the outcomes of these research studies indicate that technology mediated learning outcomes are similar to face-to-face learning outcomes (Russell, 1999; Gold & Maitland, 1999) – though a close investigation of the literature reveals a glaring deficiency of original experimental research.

The research that has been conducted in this area falls into three broad measures of the effectiveness of distance education: outcomes, attitudes, and satisfaction (Gold &

Maitland, 1999). Overwhelmingly, these studies conclude that "regardless of the technology used, distance learning courses compare favorably with classroom-based instruction and enjoy higher student satisfaction" (Gold & Maitland, p. 13). When looking at the original experimental research, the outcomes indicate that distance education compares favorably with face-to-face instruction. Recent studies by Hammond (1997), Cheng, Lehman and Armstrong (1991), Jewett (1997), Martin and Rainey (1997), and Souder (1993), revealed that grades or test scores were either the same or higher in technology-mediated distance delivered instruction with satisfaction levels being somewhat more favorable. These results are consistent with other reviews of the literature such as Russell's *No Significant Difference Phenomenon* (1997) and Dillon and Gabbord's (1998) review of the quantitative research. The research using descriptive analysis and case studies suggest similar findings, though the intent of many of these types of studies is to develop recommendations to improve learning, rather than compare outcomes (Gold & Maitland, 1999).

Some reviewers of the research (Dillon & Gabbord, 1998; Gold & Maitland, 1999) have called into question the validity of these results. Original research reviewed by Dillon and Gabbord, for example, revealed the following problems:

- Much of the research does not control for extraneous variables and therefore cannot show cause and effect.
- Most of the studies do not use randomly selected subjects.
- The validity and reliability of the instruments used to measure student outcomes and attitudes are questionable.

- Many students do not adequately control for the feelings and attitudes of the students and faculty—what the educational research refers to as "reactive effects."

Moore & Kearsley (1996) add to this list of problems with the literature. Following are their concerns:

- The sheer weight of opinion in the literature should not allow us to overestimate its significance, since much of what is written is based on anecdotal evidence offered by persons and institutions with vested interests in the techniques being evaluated or in the very programs they are evaluating.
- Teachers or university faculty with extremely limited resources have often undertaken the research, and as a result, the methodologies of many of the research designs are weak.
- In many large institutions where more resources are available, there is a preoccupation with so called "institutional research" that aims at solving a particular problem of that institution or evaluating a particular course.
- It is usually unrelated to any theoretical framework, and this means it has little or no general value.
- Even when research is done in research universities, it is usually undertaken by persons with an interest in technology, but little or no knowledge of distance education theory. (Moore & Kearsley, p. 76)

We can conclude from the research that when the achievement of learning and the attitudes of the learners (with regard to satisfaction) measure effectiveness that distance education is, at the very least, as effective as face-to-face education and perhaps under certain conditions even more effective. Unfortunately a significant portion of the

research reviewed is plagued with flaws, calling into question these results. Based on this, the overall effectiveness of distance education remains inconclusive.

Summary

We can conclude from the research that when the achievement of learning and the attitudes of the learners (with regard to satisfaction) measure effectiveness that distance education is, at the very least, as effective as face-to-face education and perhaps under certain conditions even more effective. Unfortunately, a significant portion of the research reviewed is plagued with flaws, calling into question these results. Based on this, the overall effectiveness of distance education remains inconclusive.

Distance Education Theory

The emergence of significant theoretical contributions to distance education in English speaking communities can be traced to Charles Wedemeyer and Otto Peters. Charles Wedemeyer's contributions focused on the pedagogical assumptions of independent study and on educational issues concerning learning at a distance. Alternatively, Otto Peters began analyzing the structure of distance education and developed an industrial model that focused on the organization of the educational process with an aim of achieving economies of scale (Garrison, 2000). Peters and Wedemeyer ignited a dynamic debate in distance education that put an industrial approach to distance education on one end of a continuum and a humanistic approach to distance education at the other end (Evans & Nation, 1992).

Following Peters and Wedemeyer, Börje Holmberg developed a theory that argued the need for guided didactic conversation. Similarly, Daniel and Marquis (1983)

argued the need for the right mix of interaction and independence in distance learning transactions. The essence of Holmberg's theory is that well-developed self-instructional materials and friendly conversation results in a fostering of personal relations, intellectual pleasure and study motivation (Holmberg, 1989). Conversation was the defining characteristic of Holmberg's theory.

Michael Moore has argued that there is, essentially, only one *well-developed*, pedagogically-based, theoretical framework in the field of distance education: the theory of transactional distance. Other theorists in the area of distance education have built upon this theory (e.g., Randy Garrison, Doug Shale, and Myra Baynton) (Moore & Kearsley, 1996). At the time that Michael Moore conceived this theory (in 1972), distance education was being practiced in significantly different ways – in ways that reflected the influence of the behaviorist and humanistic schools of thought. In particular, during this time distance education practice ranged from an industrialized and behaviorist models utilizing highly structured and institutionally controlled courses for mass consumption in Europe (e.g., Otto Peters) to a highly flexible approach stressing the independence of the adult learner in America (e.g., Charles Wedemeyer). These two dynamically opposing schools of thought were not unique to the field of distance education. Evidence of this can be seen in Bååth's systematic search of models applicable to distance education: "Skinner's behavior-control model, Rothkopf's model for written instruction, Ausubel's organizer model, the model of structural communication, Bruner's discovery-learning model, Rogers' model for facilitation of learning, and Gagné's general teaching model" (in Holmberg, 1989, p. 20).

Influenced by both schools of thought, Michael Moore aimed "to provide a conceptual tool that would help students and others to place any distance education program in relationship with any other" (Moore & Kearsley, 1996, p. 199). To accomplish this Moore sought to isolate those elements of educational transactions that most critically influence the learners in distance education environments. Essentially, the foundation of this theory rests on the argument that distance education refers to distance as more than simply a geographic separation of the learners and their instructors. Rather, "it is a distance of understandings and perceptions, caused in part by the geographic distance that has to be overcome by teachers, learners and educational organizations if effective, deliberate, planned learning is to occur" (Moore, 1991, p. 2). Thus, a physical separation can lead to a psychological and communication gap that results in misunderstandings for the learners. This is transactional distance. It should also be made clear that transactional distance is a relative, rather than an absolute form of education. Specifically, with respect to the separation between the learner and instructor, there are many different degrees. Moreover, distance education is a subset of education programs and, as such, is education. Thus, much of what we currently know about teaching and learning can be applied to both the theory and the practice of distance education. However, even though we can apply much of what we know, if the degree of separation is great, it can transform traditional expository teaching so significantly that new ways of teaching are needed.

The new ways of teaching fall into two clusters (that make the first of two dimensions in distance education): dialogue and structure. Dialogue is best described as the interaction between the instructor and learners. Alternatively, structure is concerned

with the elements of the course design. In learning environments where the learner receives directions and guidance through both a high degree of structure of the course and dialogue, then there is a low level of transactional distance. Alternatively, where learners make their own decisions about strategies and little, if any, dialogue, there is a high level of transactional distance. These two variables are what determine the success of the learning transactions in distance education:

> What determines the success of distance teaching is the extent to which the institution and the individual instructor are able to provide the appropriate opportunity for, and quality of, dialogue between teacher and learner, as well as appropriately structured learning materials. (Moore, 1991, p. 5)

Thus, the most distant learning environment would be one in which there was neither dialogue nor structure.

Dialogue and structure are the two variables for one dimension of distance education. According to Moore (1990), there are two dimensions to consider in distance education, with the second dimension being the amount of learner autonomy exercised. Moore recognized "that models of distance education that only considered the variables of teaching (i.e., dialogue and structure) would be flawed (Moore & Kearsley, 1996, p. 204). For example, even where a course is structured the learners may decide for themselves whether the guidance and directions will be used and, if so, when, where, in what ways, and to what extent (Moore, 1991). As such:

> there is a relationship between transactional distance and learning style, since the greater the transactional distance, the more autonomy the learner has to exercise. Thus it can be argued that while transactional distance is a characteristic of every

> educational *program*, and that programs differ in transactional distance according to the extent of dialogue and structure within them, there is also variability in the transactional distance between teachers and learners *within* each educational program, resulting from the interaction of dialogue, structure, and the *characteristics of each learner*. (Moore, p. 5)

The question that begs to be asked with Moore's transactional distance theory is: *What is the ideal transactional distance that practitioners should aim to achieve?* The answer: *There isn't one*. The right mix of structure, dialogue and autonomy will be dependent upon a number of factors including: the content of the subject-matter, philosophy of the educator, the characteristics of the learners, the medium of communication, the educational objectives, teaching strategies, and evaluation methods.

Moore's theory has been criticized for retaining the "dominant structural features of the industrial model" (Garrison, 2000, p. 9). Moreover, Garrison argues that the interrelationships between dialogue and autonomy is not apparent with respect to whether dialogue and structure are clusters, variables or dimensions:

> Understanding transactional distance very much depends upon whether we are discussing a two-by-two matrix, a single continuum, or distinct clusters. This confusion is compounded when we add the concept of autonomy with its definitional problems (psychological or educational autonomy) and its relationship to transactional distance. (Garrison, p. 9)

Although Garrison's criticism of Moore's theory may possibly be, in some respects, well founded (i.e., learner autonomy), a careful read reveals that Moore does, in fact, clarify between clusters, variables, and dimensions, as well as the relationships between each.

As I have described these terms for this section of the literature review, so too have they been described, with consistency, within the literature cited (Moore, 1990; Moore, 1991; Moore & Kearsely, 1996).

Following Michael Moore's contribution, it was not until the late 1980s that we began to see much significant contribution to distance education theory again. But beginning in the late 1980s, Garrison (1989) and Garrison and Shale (1989) made an attempt at another framework that explicitly placed sustained real two-way communication at the core of educational experience, regardless of the separation of the instructor and learner. Although the framework did not redefine the essential nature of the teaching and learning transactions, a defining and important premise is mediated communication as a defining characteristic. Initially conceived by Garrison (1989), Garrison and Shale built upon this defining characteristic, while at the same time emphasizing educational issues. The attempt was to "focus on the functional basis of education first by placing the teaching and learning transaction at the core of distance education practice" (Garrison, 2000, p. 9).

Another theoretical model developed by Garrison and Baynton (1987) also reflects this notion, though the focus of this framework is more on the concept of learner autonomy – built upon Moore's second dimension. The main assumption in this framework is that independence, or self-direction, is only one element of a complex interaction among several components that characterize the education process, with the others being power and support. An assumption of this framework is that the concept of control is at the centre of educational transactions, and is intended to replace the idea of self-study, which has often been – and sometimes still is – viewed as a defining feature of

distance education. However, when control is shared, it can be "seen to be reflective of the transactional nature of an educational experience" (Garrison, 2000, p. 10).

Garisson (1989), Garrison and Shale (1989), and Garrison and Baynton's (1987) contributions have been criticized by Moore (1990) as being too vague and

> ... of being no real help, since distance education is frequently chosen by individuals and organizations for reasons besides the unavailability of traditional educational methods. By this definition a face-to-face evening class is also distance education since it is a means of extending access etc., which is ridiculous. Neither are they correct, bearing in mind we are trying to describe what *is* rather than to prescribe what we may prefer, in saying distance education "means something more than simply reading a text or watching a television broadcast." Sometimes it does and sometimes it does not. (pp. 11-12)

In spite of Moore's convincing criticisms, these theorists have made significant contributions to the understanding of the relationship of the two dimensions introduced by Moore (dialogue and structure, and autonomy). In particular, Garrison and Baynton (1987) provided valuable insights with respect to Moore's autonomy dimension through better articulation as to what learner autonomy means in relation to the variables of power, control and support. Although other contributions have been made to transactional learning theory (i.e., Saba, 1989), nothing significant has been contributed for the last decade.

Summary

Currently, there are a limited number of well-developed theoretical frameworks in the field of distance education. The theory of transactional distance is one of a few well-

developed pedagogically-based theoretical frameworks – with Garrison, Shale, and Baynton having built upon and made significant contributions to this theory. The central premise upon which this theory rests is that distance education is a pedagogical phenomenon. In particular, even though there is a separation between learners and instructors, what is of concern in this theory is the effect that this separation has on the instruction, the learners, the instructors, the curriculum, and the management of the program. The emphasis is on practical outcomes through the development of policies and/or strategies to overcome these separations through instructional design and interaction procedures, and always with an emphasis that distance education is a pedagogical phenomenon, not geographical or technical.

Web-based Instruction

Introduction

The kinds of communication technologies available to distance educators have exploded over the past decade: digital and interactive videodisk, interactive television, net-based audio and video streaming, video conferencing, computer mediated conferencing, Web browsers, integrated distributed learning environments, semantic networking, computer-based instruction, expert systems, satellite communication—to name only the most common. The use of the Web, however, has become the technology of choice in the field of distance education. There are several reasons for this: it is believed that it can improve access to education and training, improve the quality of learning, reduce instructional costs, as well as having consumer popularity, ease of accessibility, and platform independence (Bates, 1995; Bates, 1997; Henke, 1997; McGreal, 1998).

Much has been written about the use of the Web in distance education within the last few years. An Internet search on google.com, for example, pulls up about 1,460,000 Web pages on the words "Web" + "distance." Yet, a closer look at these Web sites reveals that the majority of the literature is not original research and has not been peer reviewed—although some high quality scholarly journals do exist in electronic form on the Web. Hara and Kling (1999) also observed that much of the literature regarding the Internet—peer reviewed or not—is dominated by anecdotal stories, rather than systematic and empirical research. For these reasons, literature reviews on the use of the Web in distance education have tended to be rather inadequate.

While acknowledging this inadequacy, it can also be argued that anecdotal and non-peer reviewed literature can, at times, be worthy of reporting in a literature review—though extra caution needs to be taken to guard against inaccurate, insidious, and biased information. In particular, with new fields of study it can take a decade or more to build up a solid base of peer reviewed research (Shneiderman, 1997). As the World Wide Web is relatively new to the field of education, there has not yet been enough time to establish a solid base of research. Until such time as a solid base of research is established, anecdotal stories shared by early adopters are all we have to help guide us as we try to assess the overall effectiveness of the use of the Web in distance learning. We can learn much from innovators who share their personal insights and wisdom about this new medium. Moreover, we should be using their experiences to guide us in our theoretical developments.

Categorization of the Literature

Reviewing the literature on the use of the Web in distance education is an overwhelming task. So much has been written about so many facets of the Web that without structuring the literature in some way, it is difficult to make generalizations on what the literature says. When looking back on the literature, three general categories emerge: (1) the Web as a tool in the learning process, (2) the Web as an interactive learning medium, and (3) the Web as a learning environment. Under the Web as a tool category is the literature on the Web as a technology and how to effectively construct learning activities from a technological perspective. Under the Web as an interactive learning medium category is the literature on how the Web's unique features can be used to facilitate interactive and engaged learning. Under the Web as a learning environment is the literature that relates to how the Web presents a new learning environment that is different from traditional distance learning environments. Such issues as learner control and instructional design fall under this category.

The Web as an Instructional Tool

The literature on Web-based instruction deals with the Web as an instructional tool in four different ways. First, the Web can be used as an *information* tool. This is where information about the class (e.g., the course description, objective, and rationale) is placed on the Web. This kind of use of the Web is not considered to be essential for the learner to access to successfully complete a learning activity (i.e., a course). A second use of the Web is as an *enrichment* tool. This is where additional resources related to the course content are provided for the learner (e.g., a Web site with links to additional course related information that is online). As with the first, this kind of use of the Web is

not considered to be essential for the learner. A third instructional use of the Web is what is considered to be *Web reliant*. This is where major course components are placed on the Web. This type of use relies on the Web for substantial parts of the learning activities and requires that the learner access the Web at some point. Examples might be where the instructor places class announcements, assignment guidelines, course information (e.g., textual lectures) and/or required learning activities (i.e., online quizzes or discussion groups) on a Web site. A fourth use of the Web is where instruction is considered to be *Web aggregated*. This is where the entire learning activities and course contents are provided on the Web. This type of Web use would require that the learner use the Web to access and complete the course; face-to-face interaction with the instructor or other learners is not required to successfully complete the learning activities. As the focus of this section of the literature review is on the use of the Web in distance education, only the literature related to the use of the Web as a "Web aggregated" instructional tool has been included.

An important issue when considering the Web as an aggregated tool for learning will be the type of computers that are being used by the learners as well as the type of connection to the Internet. Depending upon the learners' type of computer and connection, Web based instruction can offer text, graphics, sounds, video and data. McManus (1996) explains these advantages:

> The Internet can deliver video, but not as quickly as videotape, television, or CD-ROM. It can carry real time personal interaction, but not as well as telephone or video conferencing. It can display textual information, but not as usefully as a book or magazine. Why then should the Internet be used? The Net has two real

advantages over other media. It combines advantages of other media so that it conveys video and sound better than a book, is more interactive than a videotape, and unlike a CD-ROM, it can link people from around the world cheaply.

Whether or not instruction can be designed using these features of the Web will depend on the type of hardware and software that the learner has access to. It is important therefore that the instructor know what kind of computer and connection their learners are using (McManus,1996).

Web browser software, such as Netscape or Internet Explorer, is what learners most often use to view online course material. Overall, Web browsers are easy to learn to use (relative to other software application programs) and learners require little technical knowledge to load, configure, and use the software. In fact, most computers today come Internet ready, where the learners do not have to load or configure the Internet software, further reducing the technical knowledge required. However learners who are very unfamiliar with computers overall may wind up having their learning come to a complete stop if there is no technical assistance. That is, technical glitches represent a potentially serious limitation of Web-based instruction which must be addressed. Beadle (1996) reports a frequently mentioned problem with technology-mediated learning as "...getting stuck and not knowing what to do" (p. 19). Other concerns cited by Beadle included an inability to understand the reference manuals, commands, and computer language. It has been suggested that to overcome these kinds of technical difficulties there should be timely technical support offered to learners (Blanchette, 1999; Kanuka 1999). Nichols (1997) cites research that strongly suggests that when there is an absence of conventional assistance, the learner will have a lower chance of success: "Athabasca University, a

dedicated distance education institute, has found that human contact is essential if an institute wishes to increase student completion rates."

Overall though, the technical issues due to software installation and use appear not to be the biggest technical issue related to the learner (Ryder & Wilson, 1995). Beadle (1996) adds to this opinion by including a need for instructors to teach problem-solving skills and building self-confidence. She notes that the major frustration for learners are the number of connection failures and the amount of time it takes to do assignments online. The learners need to be aware from the onset that there will be technical problems and working ahead on assignments that are weeks away is necessary due to the technical problems that may arise. Moreover, the learners need to be made aware that frustration is a normal part of learning, particularly when using computers. Instructors can help overcome the learners' frustration by encouraging an attitude of persistence.

Another technical issue brought forward by Marchionini (1988) relates to new skills required by the learner to read on the computer screen. Specifically, most of the learners' learning depends on their ability to read. Reading hypertext requires different skills than have traditionally been used in reading print-based documents. This factor is an important educational consideration:

> If large amounts of [the learners'] reading in the future will be in electronic form, not guided or constrained by the linear flow of printed text, entirely new strategies may be needed. Likewise, writing text meant for electronic distribution and access may require new strategies and skills. (Marchionini, p. 9)

Kearsley (1988), Duin (1988), and Comber (1996) cite research that supports this problem with empirical evidence that reading on the computer screen is approximately 30% slower than printed text.

Another technical issue that will influence the instructional environment includes a need for instructors to have skills on how to create a document in HyperText Markup Language (HTML). Specifically, the educator wishing to deliver a course over the Web will need to have access to a server on which the course will reside and will either need to learn HTML or have access to someone who knows how to do it. There are, as McManus (1996) and Bates (1997) also point out, significant costs associated with these technical factors. Additional technical problems that Web-based instruction poses to the educator are outlined by Marchionini (1988). First, it is unreasonable to expect that educators will have the required time to author their own Web-based courses. Second, managing the learning environment will become more complex as Web-based instruction is integrated into distance education. It is inevitable that instructors will need additional time to attend to the technical problems related to the technology systems. Third, writing objectives and creating appropriate assignments for Web-based instruction will require the instructors to alter their thinking about the learning process. Fourth, instructors will be faced with the problem of evaluating the quality of Web-based instruction and learning that has occurred in a hypertext environment. In traditional environments, for example, learners are evaluated on whether or not they have met the learning objectives. With Web-based instruction, "if goals in providing hypermedia assignments are related to processes and interactions, then [instructors] must invent new strategies of evaluation that address interactions" (p. 12).

Summary

Overall we can conclude from the literature on the Web as a technical tool that educators need to know what kind of computer and connection their learners are using, offer timely technical support, create documents in HTML and have good time management skills. In addition to these technical aspects, the instructor will need to be prepared to help learners overcome their technical frustrations by encouraging an attitude of persistence and problem-solving skills.

The Web as a Learning Environment

Understanding the ill-structured nature of the Web involves recognizing that a Webbed learning environment is fundamentally different from traditional learning technologies. It has been argued that the Web can offer an opportunity to provide a learning environment that has the ability to promote a most appropriate learning environment through the use of hypertext. In particular, unlike traditional learning technologies, hypertext "allows learners to access knowledge from multiple perspectives, for various purposes, and via different learning strategies" (Lanza, 1991, p. 21). However, to promote effective learning with hypertext, the educator must be aware of its strengths and weaknesses. Web-based instruction can provide the learner opportunities that optimize the learning, yet it can also pose many challenges resulting in unproductive learning. The biggest challenges for instructors are learner control issues and instructional design. Following is a review of the literature on each.

Learner Control

Much of the literature on the advantages of using the Web relates to learner control. Many authors argue that the Web offers an opportunity to facilitate learning in a way that has the potential to mimic a learner's mental model due to the high level of learner control. The main advantage of hypertext appears to be that it can be used as a tool for thinking and communicating which, due to the processing capabilities of computers, supports a cognitive model for using information through the ability to rapidly and readily access large amounts of information using variety of media. The result can be an enhancement of thinking skills, such as metacognitive, critical, creative, and complex problem solving skills (Eklund, 1995; Jonassen, Peck, & Wilson, 1999; Kearsley, 1988; Lanza, 1991; Marchionini, 1988).

The rationale for these claims is varied. Lanza (1991) claims that the use of hypertext on the Web is much like the human cognitive structure and the use of hypertext "seems a promising approach to realizing the purposive instructional function of mapping a knowledge domain onto the cognitive structure of learners" (p. 19). Marchionini (1988) argues that hypertext can make explicit relations with the linking capability that can detail, clarify, support, refute, define, or illustrate ideas among and between concepts. When comparing hypertext as a medium to paper, hypertext not only stores and manipulates information—which can be done on paper—but unlike paper is not subject to the spatial constraints: "Freedom from print-on-paper technology allows rapid access to massive quantities of information in a variety of media (e.g., sound, moving images, etc.), editing and updating capabilities, and easy traversal of links both within and across documents" (Marchionini, p. 8). Learners who use hypertext can, then, be released from the directed and linear structure of printed material. Moreover, learners can browse

within a Web site moving easily through large amounts of information with either an instructor-directed design or in a self directed manner, rather serendipitously (Marchionini). In addition, in conventional text it is fairly safe to assume that learners most often read the text sequentially from the beginning to end. With hypertext a learner can link to any knowledge base immediately based on the following criteria: personal relevance, interest level, curiosity, experience, information needs, and task demands (Jonassen, 1988). Thus hypertext allows the instructor/author to present a large amount of information in a way that allows learners to make their own decisions about which links to follow and which not to, giving learners greater control of their learning. It is argued that this kind of learner control provides meaningful relationships between the mind and the nodes in a hypertext environment. In particular, the nodes can be linked in ways that reflect the way we think and can more accurately represent our semantic interdependencies between concepts (or mental models) (King, 1996).

Similar to Marchionini (1988) and King (1996), Eklund (1996) maintains that effective use of hypertext rests on the assumption that the learner's interpretation of the course is more important than the educator's. There are, according to Eklund, built-in mechanisms in hypertext where an author/expert can define the structure of the material by simply sequencing the nodes using links. It is, however, at the user's discretion whether or not this sequence is followed. This kind of environment necessitates that learners continually make decisions and assess their state of progress, resulting in forcing learners to apply higher-order intellectual skills (Roselli, 1991).

Kearsley (1988; see also Jonassen & Grabinger, 1989) argues that hypertext can provide a better learning environment as it directs focus to the relationships between

ideas and not isolated concepts. Specifically, it is possible with the associations provided by links in a hypertext environment that the Web can facilitate remembering, concept formation, and understanding while offering a greater sense of control over the reading process. This may produce increased involvement and desire to read more (Kearsley).

Eklund (1996) also suggests Web-based instruction is useful in facilitating learning. He argues that because the structures reflect the accumulation and organization of knowledge structures, "each knowledge structure exists as an object, idea or event as well as a set of attributes that link it to other structures." As we learn, then, we increase our structures and links, either adding knowledge to existing structures (known as accretion) or altering existing structures (known as restructuring).

Kearsley (1988) and Eklund (1996) make convincing arguments that the structure of hypertext (its nodes and links) closely reflects how we construct our knowledge. The underlying reasoning is that, if learning is viewed as an active process of reorganizing knowledge structures, each new concept/idea can be seen and understood as a node that is connected (or linked) to other concepts/ideas. When learning is approached from this perspective, the hypertext structures and our cognitive structures are very similar. This aspect of the Web, in conjunction with a learner centred approach associated with constructivist models that supports learner control, can produce Web-based instruction that meets the unique processing abilities of each learner. This will result in enhancing the learners' thinking skills and the development of new skills. Hypertext, then, appears to be a promising technology that can depict and display relevant knowledge structures and map that structure onto the learner's knowledge structure (Jonassen, 1988).

The assumption that the Web provides a knowledge structure that reflects the way learning typically takes place (e.g., is capable of mimicking a learner's mental model) in the content area has been the dominant benefit cited in the literature thus far. There are, however, a few shortcomings to learner control. Learner control with hypertext can provide freedom that can enhance and enrich the learning experience; it can also create chaos and confusion. Failure to understand learner control issues when using the Web may result in leading learners into random travelling through the Web resulting in ineffective learning. Learners must be able to use the Web in a way that not only allows them to understand information provided on the Web, but also be able to use the Web in a way that will bring order out of the confusion and chaos. The ill-structured nature of the Web requires learners learn how to make critical and informed choices about which nodes they will or will not access; this involves having some prior knowledge of the content as well as using metacognitive skills. Those learners who do not have these skills may experience cognitive overload and conceptual disorientation. Some learners have described this experience as "chaotic, unstructured, and even somewhat frightening" (Berenfeld, 1996, p. 77).

Understanding the effects of learner control necessitates understanding the Web on two levels: technology and learning. The most prevalent technical issue in the literature is the seemingly endless amounts of information that learners can access. The process of accessing information involves learners making a decision of which—if any—hypertext link(s) to follow (Roselli, 1991). That is, learners can decide whether to choose paths identified by explicit connections or to navigate freely in tune with their individual capacity and aims. The result is that hypertext can create environments endowed with

high quantities of information for learning any topic but may also lead to some problems precisely due to the amount of information that can be freely navigated (Marchionini, 1988; Roselli, 1991.

On a learning level, Roselli (1991) warns that hypertext can create difficulty with psychological and social order evolving from the need to ensure that learners attain a common base of knowledge and skills while allowing them to guide their own learning process. In particular, as mentioned, learner control can sometimes result in learner disorientation and/or cognitive overload. Cognitive overload can then give rise to a further problem called conceptual disorientation that occurs when a learner loses sight of the task while exploring the network.

A notable article by Jackson (1997) provides an alternate perspective to the popular notion that the Web provides increased learner control and reflects our knowledge structures. She argues:

> There are no natural or automatic links between information ... the presence of a link reflects a communicative choice made by the designer. A link, therefore, is strategic ... the use of a link in the creation of Web structure enables the designer to control the potential ways a user can move through information. Web designers might choose to use a very limited number of links, or to use them in traditional indexing fashion, or to use them to encourage linear progression through the material, or to use them conscientiously to approximate an associative experience for the user. Differences in structure reflect differences in communicative agendas.

Based on this argument, it seems difficult to assume that the Web allows learners to become creators of their own knowledge. Once we become critical of the assumption that the Web is a neutral repository of information that reflects how we construct our knowledge, reviewing the literature on learner control with respect to the Web becomes much more complex.

There have also been studies that indicate there may be negative consequences when considering increasing the level of learner control. Studies on learner control have been conducted over the past two decades. Prior to the 1980s studies on learner control usually focused on "control of course flow, control of structural features of instruction and motivational effects of learner control" (Steinberg, 1989, p. 117). The results of these studies showed that some learners' achievement was the same with control as without control—but learners who were poor performers in the subject area learned the least. These learners seemed to have two major deficiencies: (1) they failed to employ adequate review strategies and (2) they did not know how to manage their time and frequently did not complete the course during the allotted time (Steinberg).

As a whole, the research indicates that learners learn less with learner control and are not very proficient at selecting exercises at appropriate difficulty levels; learners who are high achievers in the subject area are most likely to manage their learning appropriately. The research cited by Steinberg (1989) reveals that at times learner control resulted in greater task engagement and better attitudes, but not necessarily in greater achievement—and at times even led to worse performance. The research on aptitude and trait-treatment research yielded no definitive conclusions. Moreover, while many students were motivated by learner control, others were indifferent to it. These early

studies were often criticized for failing to show learner control advantages because they did not account for the psychological processes in learning and individual differences in learning skills and strategies (Steinberg). More recent studies have focused on these issues. Reviewing these more recent studies, Steinberg discovered that most of the results are still in agreement with earlier research and none of the studies reviewed are in conflict. In general, the research indicates that when a task is not overly complex, there are likely to be few, if any, benefits of learner control. Learners with little knowledge of the content do not perform as well under learner control. This research indicates that the less a learner knows about a subject, the greater his/her need for instructional support (Steinberg).

Similar in focus to Steinberg (1991), Eklund (1995) reviewed research that studied relationships between learning outcomes and navigational paths. The research cited by Eklund indicates that there is a relationship between high achievers and learner paths. It would appear that while much of the literature claims that hypertext provides higher order learning opportunities for learners in an ill-structured learning environment, studies have revealed that learners tend to adopt a linear pattern similar to that taken with a book. Other studies have shown that knowledge of the subject matter correlates highly with the ability to navigate in a non-linear environment, in agreement with Stienberg's (1991) review of the research. A study cited by Eklund also showed that knowledge of hypertext environments predicts a greater use of the learner's ability to navigate.

Summary

Overall, we can conclude from the literature on learner control that learners are not confined by the instructor/author's organization of the information when hypertext is

used. Rather hypertext can reflect the learners' knowledge structure, which is based upon their unique set of experiences and abilities. It can also support the ways that individuals prefer to access, interact with, and interrelate with information. Hypertext permits this kind of learner control. It has also been argued that hypertext models the human associative memory and, as such, assists in higher order thinking. However, studies on learner control reveals that these benefits are only found when learners are high achievers and have prior knowledge of the content.

Instructional Design

Instructional design on the Web necessitates both thoughtful analysis and investigation of how to use the Web's unique features in conjunction with sound instructional design principles (Ritchie & Hoffman, 1997). Understanding both aspects is important in designing effective Web-based instruction as the very nature of the Web changes the relationship between learners and instructors. Specifically, the Web's hypertext platform changes the way information can be presented, accessed, and manipulated resulting in a situation where the learner can assume the role of either information consumer or information producer (Hedberg, Brown & Arrighi, 1997). As such, effective instruction needs to begin with a focused understanding of the desired learning outcomes. Only after this has been assessed can it be determined if the Web is an appropriate delivery medium (Willis & Dickinson, 1997).

Yet, irrespective of the desired learning outcomes, there are specific design issues that often plague instructors when authoring with a non-linear medium such as hypertext (Jonassen, 1988). According to Jonassen (1988), these issues include the following kinds of questions:

1. Where does the instructor begin when creating a hypercourse?
2. How should the hypertext be structured—if at all?
3. How can the instructor's knowledge structure of the course content be developed with clarity and then mapped onto the non-linear hypertext medium?

Hill (1997) also argues that creating Web-based instruction can pose frustrating challenges for even the most experienced instructional designers. Cornell and Martin (1997) add to Jonassen's list of design problems that hypertext poses. These include: "student and teacher degree of acceptance, prior participant knowledge, attitude toward technology, content level, degree of interactivity, amount of difficulty in using the system, ease of accessibility to the system, and teacher and student ability and availability to communicate" (p. 93). Eklund (1996) provides cautionary advice about designing instruction using hypertext: as a static and non-adaptive medium it does not teach. As such, hypertext provides learners with an excellent opportunity to learn of their own accord but is a non-pedagogical technology due to its minimal structure of content. Lanza (1991) cautions further that many developers are disregarding methodological and theoretical design issues because of the ease of producing hypertext-based instructional software. The lack of experience most educators have in writing for hypertext raises new problems when designing the instruction. These problems include such issues as not having access to the necessary strategies and tools that must be used when organizing collections of information resulting in proper navigation, current and accurate information, and well placed links (Marchionini, 1988). Moreover, acquiring the necessary tools and strategies resulting in effective instruction can often be a difficult and frustrating process as instruction was not the purpose hypertext was designed to serve;

hypertext was originally designed for consultative uses rather than for instructional uses (Lanza, 1991).

Lanza (1991) cites a major barrier to developing effective learning using hypertext as:

> The simplistic adoption of this new and fascinating technology by designers. The indiscriminate use of hypertext as an instructional technology would give rise to a proliferation of programs whose projects would be technology-driven rather than prompted by real needs and educational aims, and thus certainly of scanty effectiveness. (p. 18)

Van Dijk and Kintsch (1983) add that designing a hypermedia environment is considerably different from other computer systems for instruction. Specifically, as readers in a literate society we have become familiar with established word compositions. We rely on patterns to identify a word's genre, anticipate its development and integrate with a meaningful whole. Reading comprehension studies by van Dijk and Kintsch revealed that understanding and learning are best facilitated from texts with well-defined structures. King (1996) further points out that:

> As hypertext structure grows in size, it becomes more difficult for a reader to construct a mental model of that structure. The hypertext is a network of information rather than a cohesive expository or narrative presentation .... reading hypertext requires the reader to navigate multiple links and nodes while constructing a mental model of the structure .... document features that can help the reader construct an accurate mental model will lead to improved comprehension of that document. (p. 16)

Quinlan (1996) argues that the more difficult instructional design issues to surpass are rooted in culture, genders, lifestyles, learning styles, paradigms, and comfort zones. The three most commonly cited problems with designing instruction using the Web include (see also Quinlan, 1997; Ryder & Wilson, 1995):

1. lack of logical organization of information,
2. enticing Web sites that rob learners of their time, and
3. questionable reliability and credibility of information. (Quinlan, 1996)

Ryder and Wilson acknowledge that many of the problems encountered when designing instruction with this media are in need of further study.

But by far the most commonly discussed instructional design issue in the literature is providing the learner with useable navigational aids (Bernhardt, 1993; Glover, 1994; Keyes, 1994; Lindstrom, 1994; Lynch, 1995; Martin, 1990; Nielson, 1993; Weise, 1995). There is overwhelming agreement in the literature that, due to the ill-structured nature of the Web, it is essential that the learner have a sense of orientation within the Web pages. If the learner is not supported with appropriate navigational cues, the result is chaos and confusion, often referred to as lost in hyperspace. As Lakeman (in King, 1996) stated: "things that jar you out of experiencing the medium and make you aware of its [the Web's] limitations are bad design" (p. 15).

The point being made by many of these authors is that educators who are using the Web need to use theories of learning to guide the instruction. Unfortunately, it is not easy to apply theoretical principles in practice (Lanza, 1991). Kearsley (1988) supports this assumption by arguing that the challenge in authoring with hypertext is to match the way the learners might think about the subject with the design structure. Though

Kearsley (see also Lanza) adds that in addition to applying theoretical principles, substantial experience in teaching the subject matter is also needed. The subject matter must be structured in a way that supports the mental models that learners may create when they use hypertext. It is that structure comes from the experience of teaching the subject matter.

Most authors would concur with Lanza's (1991) claim that effective learning can occur in Web-based instruction, but a clear and comprehensive framework for the studying process is essential. This leads to a number of instructional design considerations. A variety of guidelines for designing effective instruction on the Web have been offered in the literature. Eklund (1996), for example, provides three guidelines that should overcome navigation problems. The first guideline is to include punctual aids. Punctual aids are buttons that offer links to other documents as well as to a "help" infrastructure. The second guideline is the inclusion of structural aids that provide the learners with overview maps, local maps, fisheyes, filters and indexes. Overview maps are "zoom out" features that show the relationships between the nodes and links; local maps show links to the current node; fisheyes are "zooming in" features of a node; filters are a simplified illustration of the links and nodes, and; indexes shows the structural hierarchy. The third guideline is the inclusion of historical aids that show where the learner has been. This includes history trails (that allow the learner to review the trail through the material), footprints (that generate marks showing when the learner has passed through a node) or landmarks (that allows the learner to mark a particular node). According to Marchionini (1988), however, it is likely that navigational problems decrease as learners gain experience with hypertext and educators apply common-sense

interface designs. A recent study by Reed and Oughton (1997) (see also Collett, et al.,1999) confirms this.

A different way of looking at the design issues is to determine how a Web environment can be planned so that it will create structure out of the ill-structure—and to do so in ways that will facilitate the integration of what learners have learned into their knowledge structures. According to Jonassen (1988):

> The less structured the hypertext is, the less likely users are to integrate what they have learned. Without an explicit external organization, many learners have difficulty acquiring new knowledge. The willingness and ability of learners to use their own knowledge structures for assimilating information is dependent on individual differences. (p. 14)

In keeping with Jonassen's claim, Yang and Moore (1996) argue that a paramount problem with instructional design is that most Web based courses are grounded on the capabilities of technology rather than learning theories or research findings. For example, authors have traditionally structured knowledge to fit the linear print medium (Kearsley, 1988). Hypertext, on the other hand, encourages non-linear authoring using the interconnection of links and nodes for knowledge networking.

More recent literature, however, argues that structure should not be created out of the Web's ill-structured environment. Those who argue this point offer a number of ways to author Web courses that take advantage of its ill-structured environment. Most of the approaches offered are based on a constructivist approach where the learner accepts control of learning (Kanuka & Anderson, 1999). Specifically, there seems to be agreement in some of the more recent literature that there is a need to design instruction

on the Web in a way that will control the learning process as well as furnish the learner with a high level of control. Creating learning materials that do not force the user to follow obligatory paths does this best. This calls for a delicate balance in the design process as the goal is to develop Web-based instruction in a way that can offer learners an information scope better suited to their needs and requirements, but also allow them to navigate with a minimal risk of disorientation (Eklund, 1996).

In response to this emerging view, El-Tigi and Branch (1997) argue that designing Web-based instruction using constructivist principles (such as learning activities with opportunities for learner control in an ill-structured environment) is difficult to achieve due to the fact that there are few instructional design guidelines that exist. As such, the quality of instructional resources on the Web ranges from excellent to extremely poor. While the Web can provide these opportunities, Ele Tigi and Branch note that these features are often missing:

> The significance of utilizing the Web for instructional purposes lies in its power to deliver large amounts of information in an open, non-linear way that provides alternative perspectives during learning. However, the pedagogic use of hypermedia necessitates a goal structure whereby learning goals should be met (Fischer & Mandl, 1989), otherwise, the absence of an apparent instructional design 'blueprint' combined with an abundance of access to information could become overwhelmingly unstructured, thereby impeding the learning process and stifling a sense of accomplishment. (p. 23)

One solution, offered by El-Tigi and Branch, is to combine instructional design principles with the technological attributes of the Web. The result would be a maximizing of Web-

based learning. They propose a model for designing Web-based instruction whereby information is presented on the Web that is sequenced and organized in ways that empower learners by giving them a greater amount of control in the learning process. Web structures should resemble a theoretical organization and a social construction of the world. Web-based learning designed in this way provides learners with an opportunity to process information through the expansion of easily accessed information. This kind of framework effectively utilizes the multi-dimensionality of the Web to represent various relationships among concepts.

Eklund (1996), alternatively, argues that as hypertext is a non-sequential and ill-structured medium, a non-linear method for organizing and displaying information is needed. The logic behind this view is that a student's interpretation of the courseware is more important than the designer's interpretation of the courseware. Thus, even though the author/expert designs the structure of the material in hypertext it is at the user's discretion that this sequence is followed. Lanza (1991) also notes that as direct instructional strategies are not inherent in hypertext, the learners are not required to follow planned learning sequences: "Users are given the conscious responsibility of exploring the instructional material by navigating along paths which are dynamically defined according to their own interests and needs" (Lanza, p. 19). In this kind of learner controlled environment (when, where, and how to proceed) the learning experience should promote effective assimilation of knowledge. Specifically, according to Lanza, when learners are active in the learning process, they comprehend and remember information:

> The more complex the cognitive tasks are, the more active the learners' involvement must be. Learners who are given the opportunity to be the builders and protagonists of their own learning should be more motivated and independent, and the control they exert over their learning development should help them to become skilled and effective. (Lanza, p. 19)

The connection between this kind of learning experience and hypertext is that the cognitive process, through the active use of nodes and links, reconstructs the learner's knowledge resulting in knowledge expansion or modification.

> In order to create their own paths, learners must deliberately select links, and thus follow relationships, in assimilating hyperknowledge. The itinerary on associative bases should foster the integration of the access material, both nodes and links, into the foregoing knowledge; thus, hypercourses should induce cognitive internalization. (Lanza, p. 19)

Responding to these positions, Eklund (1996) maintains that instructional design should therefore be based on the premise that an expert's sequencing and linking of nodes, combined with a domain referenced design of interface ergonomics, provides a knowledge structure which reflects the way learning typically occurs. Though, Eklund cautions that a problem with this assumption is that not all learners are typical. Specifically, unlike intelligent systems, hypertext-based systems are most often a static, non-adaptive learning medium: they do not teach, rather, they provide learners an opportunity to learn on their own. Eklund also points out that hypertext has been criticized for lacking structure or expert guidance in instructional sequencing. Lanza (1991) asserts further that a stimulating learning environment will not, in and of itself,

increase a learner's autonomy or skilled effectiveness and efficiency. For this to happen, "it is crucial to establish, at the moment of design, a balance between the real and the presumed skills possessed by the learners, and between their cognitive needs and the possibility of these being satisfied" (Lanza, 1991, p. 19). This position is in keeping with the literature reviewed on learner control.

Learners using hypertext, then, will need to acquire new strategies and tools that will best utilize their time and effort with these new learning materials (Marchionini, 1988). The learners' skill development can be enhanced by designers who, by keeping root-nodes (an outline of the course topics) for learners as a link from every other course related node, help learners to determine the most appropriate time to follow a new topic (Kearsley, 1988). When learners have decided that they have reached competency on a topic, they can access and proceed to a new topic through the root-node (Lanza, 1991). In this respect, then, the root-node provides learners with not only topic selections, but also serves as a tool for navigational facilitation.

Of course, nodes and links go hand-in-hand and discussions of nodes also necessitates discussions of links. The linking of nodes is a paramount design consideration that can promote—or impede—effective learning: "The affective and mental involvement of learners during their interaction with the system depends heavily on links" (Lanza, 1991, p. 20). Decisions on the use of links by the designer can facilitate flexibility for learners to choose whatever links they wish to activate—and yet at the same time, the designer establishes the choices provided. Links, then, offer learner control but the designer also establishes what links they are free to choose (Jackson, 1997). Creating relevant link choices necessitates that designers know how learners

learn. The result will be an intuitive navigation within the Web environment. Although, it may be the case that the Web offers learner control resulting in an individualized approach for learners, it does not necessarily correspond that Web-based instruction provides individualized instruction. Individualized instruction is a potential in Web-based instruction; whether or not it is designed in this way depends on the knowledge and skills of the instructional designer (Lanza, 1991).

To help focus on design decisions, Jonassen and Grabinger (1989) have proposed three different approaches to structuring and developing hypermedia environments: deductive, inductive, and instructional.

1. The deductive approach is a top-down design that begins with a well-prescribed content structure or expert's knowledge structure. This approach assumes that learning is a process of replicating the content or expert's knowledge structure.
2. The inductive approach follows a bottom-up design. It is based on observation of the learners in an unstructured hypermedia system. Learners are observed to determine how they assimilate, access, and use information in the unstructured environment. In this approach, the design is structured to support the verified learner patterns.
3. The instructional approach is a systematic process for designing and developing instructional hypermedia environments. Typically, this approach includes needs assessment, task analysis, test item construction, selection of instructional strategies, and selection of the delivery system.

Yang and Moore (1996) argue the use of hypermedia as a non-linear tool should include designing instructional hypermedia as micro designs within the following five

categories: information formats, language usage, highlighting techniques, operating directions, and screen layouts. This includes the interrelationships of screens, content organization and presentation flow of hypermedia systems.

A discussion on instructional design using the Web also involves information design. The structure of information (information design), Zhu (1996) explains, is one of the most important issues to be considered in designing hypermedia environments. Traditional text paragraph boundaries have a relatively minor impact on the flow of the reading. However, the structure of hypertext information nodes has a much greater impact. According to Conklin (1987) "a hypertext node, unlike a textual paragraph, tends to be a strict unit which does not blend seamlessly with its neighbors" (p.36). Walley (1989) expands further and states that it is important for educators to understand that hypertext fragments the medium resulting in "nuggets of knowledge" (p. 62). Hypertext authors have to make decisions regarding links (when, where, and how many), which have epistemological consequences. Jonassen and Grabinger (1989) propose that the structure of information should be directed by how the hypertext will be used. Specifically, different purposes require different information structures. Following are approaches adapted from those proposed by Jonassen and Grabinger:

- Conceptualized structures include predetermined content relationships such as taxonomies.
- Task related structures are those that resemble or facilitate the completion of a task. Primary tasks include retrieving information, such as in information retrieval systems, and learning from instructional systems.

- Knowledge-related structures are those that are based upon the knowledge structures of the expert or the learner.
- Problem-related structures simulate problems or decision making.

The purpose, or desired learning outcomes, will have an impact on the design of Web-based instruction and, according to Corry (1998), should be developed keeping the learners' backgrounds and usability factors in mind.

Finally, on a technical note, designers of Web-based instruction must know the kind of software and hardware their learners will be using. Using this information, the instruction should be designed in one of three ways: (1) limit the technical features to the lowest common access of the learners, (2) limit the course to learners who have the computers and connections for effective access, or (3) design the course for multiple levels of access (McManus, 1996). The third option is probably the best way to design Web-based instruction in that it is possible to design Web pages so that learners who have slow modems can easily access the textual instruction and at the same time those learners with optimal access can receive full multimedia effects. Unfortunately, as McManus points out, although multiple levels of access will widen the audience, it requires more time for planning on the part of the educator and considerable more development time. However, the need for this kind of technical development might not be all that necessary. Based on the findings of Ryder and Wilson (1995) as well as Kanuka (1999), the technical barriers (such as learning how to install and use the Internet) were the easiest ones to surpass when designing instruction for the Web.

Ryder and Wilson (1995) provide a number of strategies that instructional designers should consider before developing Web-based instruction. First, there needs to

be a clear payoff for the students. Specifically, the learners need to be offered some compelling reasons for engaging in the discomfort of learning on the Web. Second, help needs to be provided with technical issues. Third, there needs to be an awareness of a cultural/personality compatibility. Specifically, Web-based instruction can conflict with learning styles and lifestyles. For example, a learner may resist using the Web for learning on the grounds that technologies influence their lives in a negative way. To address this issue, provisions need to be made for these learners to acquire the tools to retain their sense of control over the technologies and to overcome the feeling that they are being controlled. Fourth, a proper support structure needs to be in place. A proper support system will include: non-judgmental social support, hand-holding, the removal of technical barriers and ubiquitous access. The fifth and final strategy offered by Ryder and Wilson for administrators is to ensure that learners have a voice when learning with Web-based instruction.

Finally, Ryder and Wilson (1995) argue that, at this point in time, theory and practical knowledge about Web-based instruction lags behind the technology. Most uses of the Web in the learning process are mimicking existing practices with the lecture method. But to change this would also necessitate changes that are rooted in our culture, genders, lifestyles, learning styles, paradigms and comfort zones. With this in mind, designers of Web-based instruction should heed the following recommendations: integrate Internet resources by providing authentic tasks that provide learners with legitimate reasons to use the Web; facilitate adoption of the Internet into cultural practices through policy incentives and practices, and; encourage learners to make unique contributions on the Web. This strategy alone, according to Ryder and Wilson, "affords

ownership and empowerment—the learner had made her [his] presence known in cyberspace. She [he] is attached to the World-Wide Web!"

These considerations, according to Eklund, should include an expert's construction of the learning domain to form the basis for the structure of the nodes and links, inclusion of concept maps, an online help feature, an adaptive interface that is capable of modifying the environment to suit the individual learner, and adaptive advice to suggest preferred paths based on the learner's demonstrated knowledge. Hill (1996) adds further that a key element of a sound technology program is a focus on the process rather than product. When the focus is on the process, the emphasis of hypertext learning is on the development of skills of thinking that can be used to solve problems, rather than focusing of technical skills used in creating technological artifacts.

Summary

Effective instructional design on the Web necessitates understanding how to use the Web's unique features in conjunction with sound instructional design principles. Both aspects are important in designing effective Web-based instruction as the Web's hypertext platform changes the way information can be presented, accessed, and manipulated resulting in a situation where the learner can assume the role of either information consumer or information producer. How best to design Web-based instruction, based on the literature, remains unclear. Despite all the literature on effective instructional design for the Web, little empirical research exits to support the claims of many of the authors cited in this section.

The Web as an Interactive Learning Medium

A review of the research on interactivity in the learning process reveals that the benefits of interactive learning include increased student interest, higher cognitive processing, development of cooperative learning skills, teacher involvement, curriculum integration, and teacher/student collaboration (Milheim, 1996). Studies reviewed by Chambers (1992) in the area of interactivity indicate that, in addition to the cited benefits, learners learn faster and retain more if they interact in the learning situation. In light of the benefits outlined by the research on interactivity, Heines (1985) argues that technology mediated learning is neither instructionally nor financially justifiable without meaningful interaction. Filipczak (1996) maintains that, when done right, interactive learning can be the most effective way to teach. When designers are successful at integrating interactivity into their instructional design, learners will interact with the computer in a meaningful way that engages them and imparts some knowledge or skills. A necessary first step to making the leap between interactive technology mediated learning and the classroom, according to Filipczak, is to convince classroom instructors to be more interactive in the classroom.

Zurkin and Sumler (1995) conducted a major review of the literature on technology-mediated distance education and arrived at the similar kinds of conclusions as the authors cited above. Their review of the research also revealed that there was a common element to learner achievement success: interactivity. Specifically, "the more interactive the instruction, the more effective the learning outcome was likely to be" (Zurkin & Sumler, p. 100). The key ingredients within the interaction are: (1) the availability of the instructor, whether face-to-face or through technology-mediated

communication, and (2) the intellectual engagement of the student with the content. Based on the literature, it would appear that interactivity is a crucial element in the design and development of effective technology mediated learning. In fact, according to Burnham and Walden (1997), designing for interaction in technology mediated learning should be as important in the designing process as the learning objectives.

Although the literature varies on this somewhat, the types of interaction that are most often of concern in Web based instruction include: (1) learner – learner interaction; (2) learner – instructor interaction; (3) learner – content interaction; and, (4) learner – interface (technology) interaction (Moore, 1989; Hillman, Willis & Gunawardena , 1994). The key features of interactivity include the identification of immediacy of response, non-sequential access of information, adaptability, feedback, options, bi-directional communication, and grain-size (the length of time required of a given sequence before allowing further input) (Borsook & Higginbotham-Wheat, 1991). It is these ingredients that make the Web a unique instructional tool. Human-to-human interactivity is a goal for which computer-to-human interaction should be striving. To achieve this, a systematic analysis of existing and future courseware based on guidelines drawn from current research in cognitive science, artificial intelligence, hypermedia technology, and mediated delivery systems should be completed. These authors maintain that in an evaluation of courseware, designers and instructors of technology mediated learning must address the nature of interactivity. Developers should attempt to use as much and as many of these key features as possible—within the constraints of time, resources, and costs. If Web-based instruction is to be used to its potential it is crucial that interactivity is maximized.

The simplest form of interaction that the Web provides, according to Starr (1997), is achieved through clicking on hyperlinked text or images taking the user to another Web page. However, most educators would argue that a mouse click is not an activity whereby the learner is intellectually engaged, or interacting, with the content presented. "True interactivity goes beyond static Web pages and page linking, and creates truly interactive pages with information exchange between the user and the server" (Starr, p. 8). Hedberg, Brown and Arrighi (1997) support Starr's argument and assert further that "it is important the user is required to think before a response is possible" (p. 52) and the "ultimate in interactivity is the process of knowledge construction" (p. 57). Milheim suggests instructional strategies that support interactivity with the Web. Such strategies might include designing interactive programs with comprehensive navigation options that are easy to use, utilizing questions that require students to significantly interact with instructional material, and evaluating learner responses in a manner that is personally meaningful to the user.

In addition to the above strategies by Milheim (1996), creative programming and HTML (HyperText Markup Layout) forms can also provide an interactive learning medium that includes computer generated learner-response feedback. Forms can be used to provide the learners with an opportunity to give feedback (i.e., assessment and evaluation) both to and from the instructor and to track learners through a log in system. HTML Forms, such as true-false, multiple-choice and short answer types of questions, can make the difference between a passive presentation and an active learning experience (McManus, 1996). Using HTML forms can provide immediate feedback based on learner responses to both the students and the course instructors.

The role of feedback, according to Byrnes, Debreceny and Gilmour (1995), in *any* learning environment is clearly important. When course delivery is provided in a face-to-face environment, feedback is generally fairly straightforward using recognized and accepted evaluation methods in conjunction with written and/or verbal instructor feedback. With Web-based instruction, however, where the student population is often geographically scattered, feedback is not as straightforward or as easy to provide.

Summary

Overall, we can conclude from the literature that effective interactive use of the Web includes an ability to make the content being taught stimulating and interesting; presented at the right level of understanding that is also engaging; the use of valid assessment methods; and the provision of the highest quality of feedback on the learners' work. In the end, however, it is the quality of the interaction that will, in turn, also determine the quality of a learner's educational experience.

Summary of Findings in the Literature

There has been much speculation in the literature that the Web will revolutionize distance education, though whether or not this is certain is yet to be seen. This literature review reveals that there is extensive literature on the use of the Web in distance education with respect to the construction of knowledge; however, it provides the educator with little valid guidance. The reasons for this are varied. First, this review of the literature reveals that much of the literature in both Web-based instruction and distance education is anecdotal rather than formal, original and/or empirical research. Second, there are few well-developed and pedagogically based theories of distance

education (i.e., Peters, Wedemeyer, Holmberg, Moore, Garrison, Shale and Baynton). Moreover, much of the literature on Web-based distance education has not used these theories as frameworks for research. As a result, there are significant inconsistencies between opinions and corresponding advice with respect to the use of the Web in distance education. One thing that is apparent from the literature, however, is that the Web as an instructional medium for distance education is only as good as the skills and the attitudes of the people who use it and the educational methods and strategies they use and apply. Hence, while the Web may indeed be a suitable learning medium to implement higher levels of learning, it is unclear how to carry out. The use of a principled approach in this process might be useful through an ability to guide our thinking about the use of the Web as a learning tool in the distance learning process. With respect to the problem of this study, principles may be able to provide guidance in the development of a heuristic that effectively uses the Web's unique hypertext platform in ways that support creative exploration and diverse instructional methods for higher levels of learning.

CHAPTER THREE

DESIGN AND METHODS

This study sought to identify the essential principles and their constructs that result in the conditions necessary to facilitate higher levels of learning. These principles and constructs were then used to work toward a model for Web-based teaching and learning in post-secondary distance education. The need for a principled approach was accentuated by the lack of understanding about how to facilitate higher levels of learning in Web-based environments. Until teaching and learning principles are established, it is difficult to ascertain whether or not what is being done with the Web in the learning process is adequate and successful with respect to facilitating higher levels of learning.

The literature on the model building process that guided this study is reviewed, followed by a discussion of the research design and methods, setting, subjects, and ethics.

Model Building

A model is a symbolic representation of elements in a complex situation and their interrelationships (Lippitt, 1973). At its most basic level, it can be defined as a visual representation of key elements in a complex system, including the relationship of those elements to each other (Collis & Pals, 2000). Although this definition of a model is straightforward enough, it does not reflect the various ways a model can be used—and in particular the many ways it can be used for research and theory building. With respect to research, a model is capable of representing reality in a way that delineates certain elements of the real world as being relevant to the problem under investigation and makes explicit the relationships among these elements (O'Sullivan & Rassel, 1989). Moreover,

a model does not necessarily have to be a visual representation; rather, it may simply be a conceptual representation. Thus a model may more accurately be described as a system that represents an area of interest in terms of the structure but not of the content, which promotes conceptualization of areas of interest in a clearer and more sequential manner (Mitchell, 1978). According to Borko (in Lippitt), a model is "always an approximation, usually a simplification, and hopefully an aid to insight" (p. 1). As such, the primary purpose of a model is to facilitate the conceptualization of a complex phenomenon without attending to each and every detail (Nor, 1995), or to see the big picture. Stogdill (1970) advances this point by maintaining that "we cannot claim to understand a set of events until we have acquired a model or theory that adequately accounts for the structural and operational characteristics of the system being observed" (p. 9). In agreement with Nor and Stogdill, Lippitt maintains that models serve as an aid to understanding an event or situation. As models are constructed to explain the world in simplified terms, the primary value of a model, then, is in its ability to exploit and use it in the quest for a solution of an unresolved question (Davies, 1978).

The words model, theory and framework have often been used interchangeably. However, according to Garrison (2000), there are differences. A theory is "an explanation, a systematic account of relationships among phenomena" (p. 3), a framework "represents a broad paradigmatic set of assumptions that provides the elements of the theory but without the detail and completeness" (p. 3), and a model "is a less abstract form of a theory and represents structural relationships among the key concepts" (p. 3). In contrast to Garrison, other authors do not make these distinctions.

Chambers (1992), for example, clarifies the many kinds of theory and maintains a model is theory as hypothesis:

> Sometimes in pedagogical talk, the words, "theory" and "model" are used interchangeably. "Model" normally refers to the way in which an explanatory idea, system or concept from one area is used as an analogue to suggest construals or procedures in another. A model is a sort of bridge between the familiar or known and the less familiar or unknown ... This sort of theory is called a "model", because it extrapolates, some *particular and restricted aspects* from the one and applies them in the other, seeing what would then seem to follow for, or what insights might be suggested about the other. That which seems to follow or be suggested may become theory of Type 8 (hypothesis), and it is hoped, eventually make a contribution to theory of type 14 (First-order Scientific Theory). (p. 14)

Likewise, Stogdill (1970) asserts that theories and models are more similar than different. While a theory may have a tendency to enjoy a longer life span than a model, models have all the empirical and logical characteristics of a theory, and are all concerned with the explanation of a system of events. The system of events sought to be explained typically includes the *relationship* (principle) between identified *elements* (constructs) and the *real world* (a complex situation). Essentially, then, models, frameworks and theories are abstracted phenomena constructed intellectually to describe a relationship between aspects of reality and the properties of that reality.

Lave and March (1975) believe that anyone can learn the model-building process and "the best way to learn about model building is to do it" (p. 10). Following are the steps for model building according to Lave and March:

1. Observe facts.
2. Look at the facts as though they were the end result of some unknown process (model). Then speculate about processes that might have produced such a result.
3. Deduce other results (implications/consequences/predictions) from the model.
4. Then ask yourself whether these other implications are true and produce new models if necessary. (pp. 19-20)

Zetterberg (1962) developed a somewhat more comprehensive stepwise process to problem solving and/or facilitating change that has been successfully adapted to the model building process (i.e., Nor, 1995). Given that models are useful tools to facilitate problems solving and change, Zetterberg's framework provides a model for model building. The framework includes (1) exploratory inquiry, (2) scholarly understanding, (3) scholarly confrontation, (4) discovery of solutions, and (5) scientific advice. Following is an expanded explanation of each step.

Exploratory Inquiry: In this step, there is an investigation of the details of the problem. This investigation is done by talking to the people involved, reading related literature, and observing the problem situation first hand.

Scholarly Understanding: The investigation of the problem from step one is translated into scientific terms, and the corresponding theoretical problems are formulated. General descriptive information regarding the variables to the problem is constructed from related literature resulting in scientific terms and speculations.

Scholarly Confrontation: The speculation of the problem and scientific terms are stated as well as a descriptive orientation about the variables of the problem(s) to those who helped identify the problem from step one.

Discovery of Solutions: The researcher analyzes the data producing recommendations and solutions that are further refined.

Scientific advice: A translation of the solution(s) is presented with reference to the specific context. There are also recommendations of the complications and consequences that might occur should one adopt the solutions proposed.

According to Stogdill (1970), observation and analytical skills are required to analyze a system of real world events by isolating the determining variables operating in the system. These variables (or dimensions) need to be clearly defined in proper terms so that others can identify the same variables. Skills in perceiving or determining the relationships between the different variables are required for model building. Moreover, not only do the structural components of the system need to be identified, but the operational characteristics should be identified too. The model builder's conceptualization of the model of the system, then, needs to consist of a set of defined concepts and a set of statements on the relationships between the concepts.

Once a model is constructed it should not only be functional, but also testable for evaluation purposes (Lave & March, 1975). Our ability to analyze a system of events to be modeled, according to Stogdill (1970), is limited by what we know and do not know about it: "We make useful speculations in the absence of sound knowledge, but accurate information is a help toward valid conceptualizations" (p. 6). Lave and March assert that a good model should be simple, fertile in a way that it can produce a number of

predictions per assumption, and unpredictable in that it presents "interesting implications that are surprising and that are not immediately obvious from the assumptions" (p. 67).

It is possible to test a model's validity against sets of data that can support or refute the validity (Collis & Pals, 2000). Typically, however, models are not proved. Rather, those for whom its use is intended support them, most often through perceived value – though it should be noted that some models have been tested empirically. Golden, Beauclair and Sussman (1992), for example, developed a simple three-factor model and validated the model through a factor analysis of responses to a questionnaire. The factor scores were then combined in a regression equation. Even though we can see from this example that a model can be quantitatively assessed, Stogdill (1970) maintains that, in the end, the usefulness of a model rests in its ability to provide a conceptualization of the real world and its demonstrative, descriptive, and predictive powers by those for whom the model is intended. In agreement with Stogdill, Lave and March (1975) state that models can be evaluated "in terms of their ability to predict correctly other new facts" (p.19).

Research Design

The research framework followed Zetterberg's (1962) model for problem solving and change. The next section provides a description of each of the steps in Zetterberg's framework, as well as a description of the data collection methods. These steps were used as a guide in working toward building a model to identify the conditions for higher levels of Web-based learning. It is recognized that there are other frameworks for the model building process, such as Loomis (1960) and Boone (1985), which could have

been useful for this study. However, Zetterberg's process was selected due to its generic nature and ease of applicability. Zetterberg's model for change has also been successfully applied in other recent distance education model building processes (Nor, 1995). Figure 1 illustrates the steps that were used for this study.

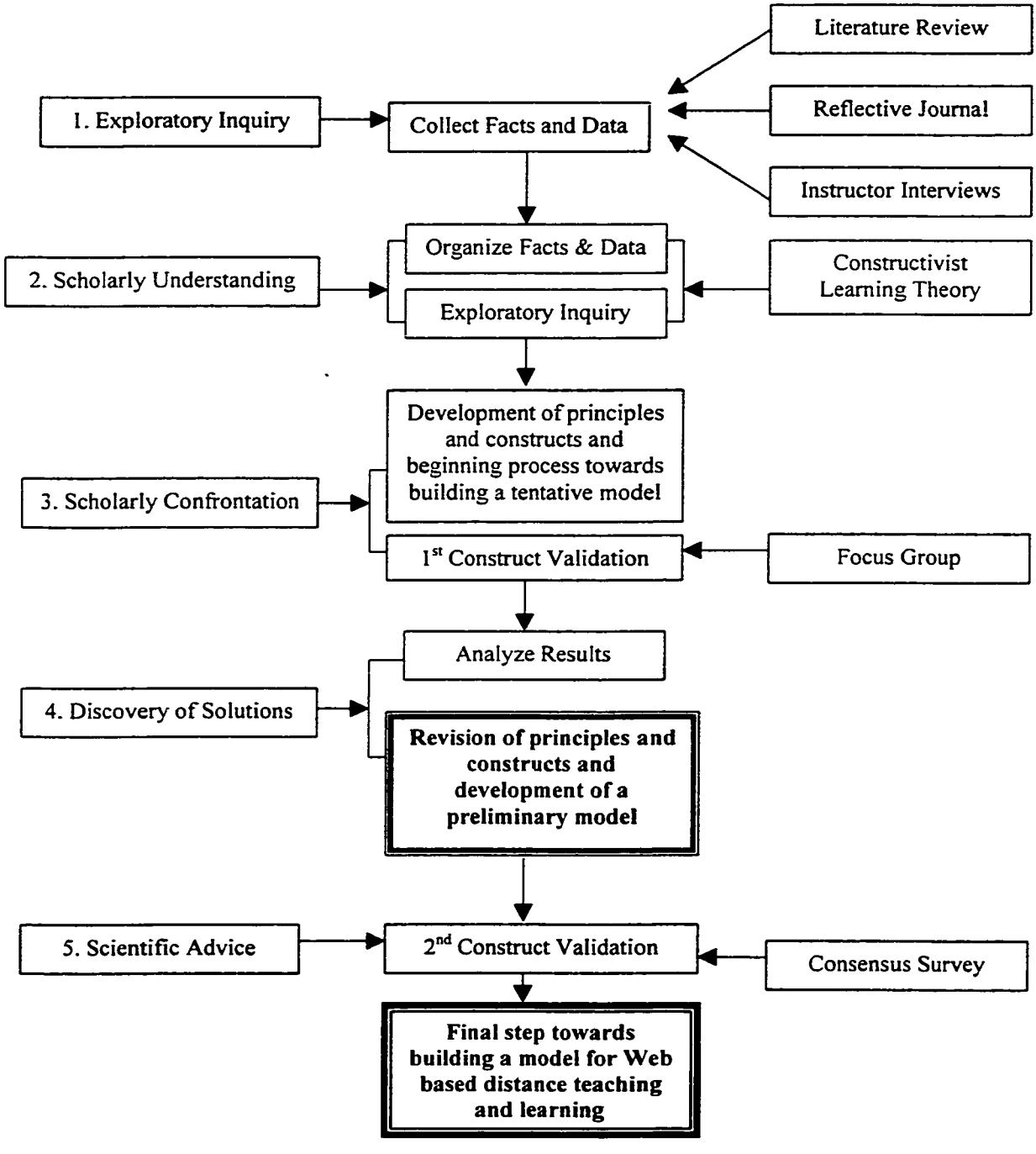


Figure 1. Steps in Working Toward a Model for Web-based Teaching and Learning

Data Collection

Step One: Exploratory Inquiry

The first step in Zetterberg's (1962) model for change is exploratory inquiry. The aim of this step was to discover the details of the problem and gather as much information as possible through the various means available. The problem was identified as a need to identify and validate the principles and their constructs that could elucidate the conditions necessary to facilitate higher levels of learning in a Web-based environment. In an effort to explore the problem identified, a review of the literature was conducted, a panel of 12 instructors with experience using the Web in distance learning activities were interviewed, and a reflective journal of my own personal experiences and observations developing Web-based instruction was kept. Following is a broader description of each.

Semi-Structured Interview

A semi-structured interview was used in step one. The main advantage of a semi-structured interview (over a structured or unstructured interview) is that it makes interviewing across a number of different participants systematic and comprehensive by delimiting in advance the issues to be explored (Patton, 1990). The interviewer remains free to explore, probe, and ask questions that elucidate and illuminate the topic. A semi-structured interview, then, allows for the building of a conversation, to word questions spontaneously, and to establish a conversational style while continuing to focus on the topic. As such, the semi-structured interview seemed to be a fitting method for exploratory inquiry.

Participants

The interview participants were comprised of 12 instructors with experience using Web-based instruction at the University of Alberta.

Interview Questions

In an attempt to begin to lay the foundation for the development of the principles, the interview questions were developed using Berge's (1995) conceptual framework. This framework is concerned with the changing roles and functions necessary for effective online instruction. This seemed an appropriate framework to begin the process of identifying the principles of higher levels of learning, as understanding effective instruction is essential to the identification of the principles. According to Berge, there are many necessary conditions for successful online instruction, which he categorized into the following four areas: pedagogical (intellectual; task), social (friendly, social environment), managerial (organizational; procedural; administrative), and technical (systems and software). Using this framework, the following questions were used as a guide in the interviews:

1. Tell me what new skill(s) you had to learn in order to use the Web effectively for teaching? (technical)
2. Tell me about classroom management on the Web? *Follow up*: How are these issues effectively resolved in a Web-based environment? (managerial)
3. Describe to me the steps that you took to foster inter-learner interaction? (social)
4. Tell me about your experiences with respect to the teaching/learning transactions when using the Web? *Follow-up*: How does it differ from face-to-face? (pedagogical)

Trustworthiness

The aspects of trustworthiness in qualitative research, according to Guba (1981), include: credibility, transferability, dependability, and confirmability. Following was how this study addressed each aspect of Guba's recommendations:

1. Credibility: As the aim of qualitative research is to take account of the vast array of interlocking factor patterns, there is a need to take certain actions that account for these complexities. These actions ensure that the credibility of the study is not compromised. The actions that I took to maintain credibility of the study were peer debriefing, member checks, and the establishment of structural corroboration. For the peer debriefing, I interacted with other colleagues who were willing to act as a "jury" with respect to the data collection and interpretation. Their critiques during the debriefing indicated where redirections of the inquiry were required. A member check was also conducted. This process involved examining my data interpretations with four of the participants from whom the data were obtained. Specifically, I brought the preliminary results of the analysis to four participants and asked if what was written was an accurate interpretation of what was said. Based on their feedback, adjustments to the data were made (i.e., clarification of terms). Finally, the establishment of structural corroboration involved checking my data interpretation to be certain that there were no internal conflicts or contradictions.
2. Transferability: Qualitative researchers maintain that "transferability" is more appropriate than "generalizability" of the results of research on the basis that virtually all phenomena are context bound. Transferability of semi-structured interviews can be evaluated based on how representative the participants are of

the population for which the transfer is intended. However, it needs to be noted that the participants selected for this section of the study were not intended to be a representative population; rather, participants were selected based on their ability to provide insights about the topic. Based on this objective, instructors at the University of Alberta who had experience teaching a Web-based distance delivered course were selected as participants. The information gathered was descriptive data intended to identify the principles and constructs. It is not until step five of Zetterberg's model for change that this study is concerned with transferability.

3. Confirmability: To ensure confirmability of the study, I established an audit trail as well as arranged for an audit to be done by an external auditor. The audit trail is in the form of the actual interview transcripts (transcribed from audio tapes to a paper format) and a description of the process in a hand written journal. An audit was completed by my supervisor who commented on the degree to which the procedures used fell within generally accepted practice and the interpretations were consistent with the participants' interviews. While prolonged and engaged discussions with others are also used to establish confirmability, this was not done for this section of the study.
4. Dependability: Dependability was addressed by myself through practicing reflexivity. Reflexivity is to "intentionally reveal to his [or her] audience the underlying epistemological assumptions which cause him [or her] to formulate a set of questions in a particular way, and finally to present his [or her] findings in a

particular way (Ruby in Guba, 1981, p. 87). My epistemological assumptions are recorded in my personal journal (Table 4; Chapter 4).

Limitations

Several limitations were inherent within this part of the study.

1. The perceptions of the participants, because of a lack of awareness and bias in their roles as instructors and faculty members within a university setting, limited the findings.
2. Many of the participants had a lack of extensive experience using the Web and/or distance delivery that resulted in limited findings.
3. The use of standardized questions for all participants limited the range and depth of understanding on the topics investigated.
4. A general lack of reflexivity with respect to the participants' evaluation of the online learning process (i.e., number of students, cultural issues, design and development concerns, adult learner issues, etc.) limited the findings.
5. Developing common concepts based on the data was limited due to many contradictions of what participants said within the interviews.
6. When member checks were conducted there were many changed views on critical issues, which limited the findings.

Literature Review

The most valuable contribution of the literature review was to identify important and relevant contributions with respect to the identification of the essential principles and constructs necessary for effectively facilitating higher levels of learning. For this step, a review of the literature was conducted in the areas of constructivist learning theory and

educational technology frameworks. This step contributed greatly to the process of identifying the principles of higher levels of learning.

Journal

When the Bachelor of Education (adult education outreach program) and Master of Education (adult education outreach program) at the University of Alberta began to integrate Internet technologies (the World Wide Web and computer mediated communication software) in 1997, I was hired to help develop the course Web sites. I did this for one year, during which I kept a journal consisting of my speculations, feelings, problems, ideas, hunches, impressions, likes, dislikes, and prejudices of this process. The value of this activity was to become self-conscious about my own relationship to the use of the Web and my eventual design and analysis for this research. Good qualitative research studies will not only keep accurate records of the methods, procedures, and evolving analysis—but will also be self-reflective resulting in a balance between reflective and descriptive material (Bogdan & Biklen, 1992). Becoming aware of, and understanding, my own assumptions through journal writing was an essential activity in that it helped in articulating not only what I was doing, but why.

Step Two: Scholarly Understanding

In step two, scholarly understanding, an attempt was made to identify the essential principles and constructs necessary for higher levels of learning that were grounded in constructivist learning theory. In this step, the data gathered from the interviews, the reflective journal, and the literature review (step one) were analyzed and integrated through a comparative and critical analysis process to identify principles and constructs

necessary to facilitate higher levels of learning. Constructivist learning theory was used to understand the relationships among the insights gathered in this step. The results were then organized in a classification scheme in keeping with the system of events in a model. The system of events sought to be explained included the principle between the identified constructs and Web-based teaching and learning activities. Figure 2 illustrates the structure used to classify the events sought to be explained.

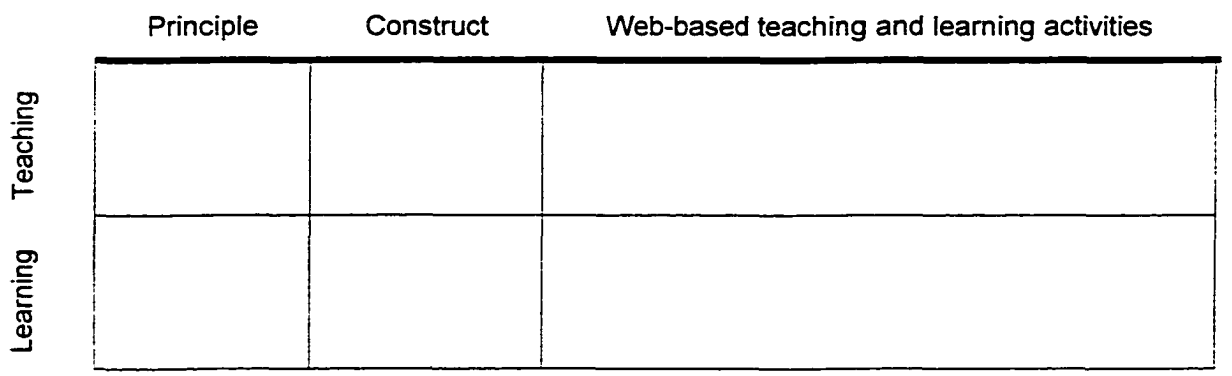


Figure 2. Events sought to be explained

Step Three: Scholarly Confrontation

In step three, *scholarly confrontation*, the relationship of the facts and insights discovered in the previous step (scholarly understanding) were examined. The result was the development of principles and constructs fundamental to the facilitation of higher levels of learning. The first validation phase of the tentative constructs was conducted with a focus group comprising educational technologists and Web-based instructional designers. The data from the focus group members included their assessment of the principles and constructs and suggestions for revision, addition, or deletion. This step was a critical component of the proposed research in that it served as a way for refining

the principles and constructs that were presented later to the final survey participants (step five).

Focus Group

Interviewing a group of people on a focused topic can be a powerful way to collect data (Glesne & Peshkin, 1992). According to Stewart and Shamdasani (1998), focus groups can be used for both exploration and confirmation. Though the most common purpose is to stimulate an in-depth exploration of a topic, they are particularly effective when little is known about the phenomenon of interest. Focus groups contain group members who are knowledgeable in the researcher's topic. They are a convenient way to accumulate the individual knowledge of the members and can often inspire insights and solutions that are difficult to achieve with other interview methods. In particular, focus groups "allow respondents to react to and build upon the responses of other group members. This synergistic effect of the group setting may result in the production of data or ideas that might not have been uncovered in individual interviews" (Stewart & Shamdasani, 1998, p. 509). An additional benefit of focus groups is that they tend to "provide checks and balances on each other that weed out false or extreme views ... and it is fairly easy to assess the extent to which there is a relatively consistent, shared view" (Patton, 1990, p. 336).

There are a number of drawbacks to focus groups that need to be addressed. First, due to the amount of response time, the number of questions that can be asked is often limited to a maximum of ten. Group interviews also require considerable group process skills – in particular, it is important to know how to conduct the interview so that one or two people will not dominate the interview. Finally, due to the small number of panel

members and the convenient nature of most focus group sampling, it significantly limits the generalization to larger populations (Stewart & Shamdasani, 1998). To overcome these limitations, other types of research that provide more quantifiable data from larger groups of respondents often follow focus groups. Such is the case with this study.

Participants

The focus group participants were a carefully selected group of well-informed and experienced individuals from the University of Alberta who had the potential to provide insight into facilitating the teaching and learning process in a Webbed environment. A requirement to be a group member was related education (such as a Masters degree in Instructional Technology) and/or related experience in facilitating Web-based instruction at the University of Alberta. Twelve people were invited and although ten agreed to participate, it was impossible to schedule a time when everyone could meet. As it turned out, only six could be scheduled at the same time. Two other invited participants offered to review the data from the focus group session and provided additional input. This offer was accepted and minor additions to the data were made.

The group interview began with the presentation of the principles for teaching and learning developed from steps one and two (see Appendix B). Participants were then asked to reflect on the following question: *How can the principles of teaching and learning facilitate the design of Web-based learning with adult learners in a post-secondary setting and Webbed environment for the purposes of higher levels of learning?* It was also indicated that consensus was not required or necessary and the principles and constructs were open to additions or deletions. The primary objective was to gain insight on creating the conditions for facilitating the principles of teaching and learning in an

environment where they could consider their own views in the context of the views of the other group members.

As I had no prior experience in facilitating focus groups, I hired a PhD student with considerable experience to record the participant responses and help guide the discussion. The data were transcribed and posted on a Web site for the panel members to review and ensure that the data were accurate.

Limitations

Several limitations were inherent within this part of the study.

1. The participants' desire to "blur" the principles and constructs eliminated the ability to effectively discuss in detail the principles and constructs presented, limiting the findings.
2. Less than half of the invited participants could attend in person; that, in turn, may have decreased possible insights that could have been gained with a larger group.
3. While the educational backgrounds of the participants were similar, their experiences were varied. The result was a lack of common understandings between group members for many of the principles and constructs resulting in a limiting of the findings.
4. Although efforts were made to prevent domination by certain group members by bringing in an expert, there were several points during the interview where two group members dominated aspects of the discussion. As a result, these aspects of the findings were limited.

Step Four: Discovery of a Solution

The fourth step in Zetterberg's (1962) model for change was the *discovery of a solution.* The solution included revisions to the principles and constructs based on the feedback received by the focus group members in the previous step. The teaching and learning principles were discussed and recorded, as well as the corresponding constructs and definitions. The data were transcribed and analyzed for confirmation, rejection, or modification of the principles, constructs, and definitions.

Step Five: Scientific Advice

The fifth and final step was *scientific advice.* As part of Zetterberg's (1962) scientific advice, a second validation process involving a consensus survey was used in conducting this section of the research. The principles and constructs were offered to the final survey participants as a paper based and mailed survey (see Appendix C).

Consensus Questionnaire

Research questions that are best answered with consensus surveys, sometimes also referred to as the Delphi technique, are those in which the researcher is trying to reach a consensus of opinion about a particular area (Linstone & Turoff, 1975). This method is also useful when developing standards or policy issues for a field or profession undergoing a transformation due to a relatively new phenomenon (Fish & Busby, 1996). Given that the objective of this section of the study was to determine the extent of group consensus about the proposed principles and constructs, as well as the fact that distance education is a field undergoing a transformation due to a relatively new phenomenon (the Web), this study was well positioned to find a consensus survey of this kind useful.

An additional reason for using a consensus survey for this study was to serve a need to structure a group communication process that acquired useful results. It was not the *nature* of this method that determined its overall appropriateness; rather, it was the *circumstances* of the research focus that necessitated this kind of group communication process. When the initial process of determining who would be selected to participate in this study was considered, it became clear that there were specific circumstances that would prohibit certain kinds of communication processes. Following were the circumstances:

1. The research problem did not lend itself to well defined systematic techniques; it could, however, acquire useful results from subjective judgments on a collective basis.
2. The research participants were representative of diverse backgrounds with respect to experience and expertise. Because these experts were geographically dispersed throughout North America, frequent group meetings would be virtually impossible due to time and cost restraints.
3. Related to the prior point, that the participants have diverse backgrounds, it was assumed that the experts may be uncompromising between opinions in a way that the communication process might have to be refereed and confidentiality assured.
4. The heterogeneity of the research participants had to be preserved to avoid domination of some experts in the group.

For these reasons a decision was made to use the Delphi technique to determine consensus. However, asking a panel to spend considerable time responding to written consensus questionnaires would likely be beyond what most panel members would be

willing to do. As such, a one-round consensus questionnaire using the interquartile range (IQR) to calculate the mean and bimodal distributions, as well as a request for an explanation for disagreement with the principles, was developed. In the survey design, the principles were presented as headings and the corresponding constructs were each followed by a Likert-type opinion scale (see Appendix C). Space was provided for the respondents to provide an example of how the principles could be facilitated on the Web if they agreed with the principles and constructs. If they disagreed, they were asked to explain why. It was hoped that this kind of questioning and response presentation would prompt the participants to consider the principles and constructs in ways that reflected their practice. Consensus was determined through the interquartile range. If a participant's response fell outside the interquartile range (the interval containing the middle 50 percent of the responses) it was determined that the response was not within the group consensus and as such it was hoped an explanation would be provided as to why. The purpose of requesting respondents who fell outside the group consensus to explain their alternative position was to encourage the participants without strong convictions to agree with the constructs presented or justify their position. It was expected that participants who felt strongly in their disagreement would not only hold their opinion but also defend it. The most useful aspect of this technique was that it kept opposing opinions (those who fell outside the IQR and median) separate to ensure the crucial function of the opposing opinions could be explicitly expressed. This introduced a structure for clarity that made the inclusion of opposing opinions controlled. This technique, then, did not necessarily lead to a convergence of opinions: bimodal distributions remained a possible outcome. However, the resulting outcome, irrespective

of whether or not an opinion synthesis occurred, may be more valid than other methods (e.g., Likert-type questionnaires) *because of* the acknowledgment and accommodation of opposing opinions. It was hoped that by developing the questionnaire in this way, the spirit of obtaining consensus with the Delphi technique would be retained while avoiding a domination of group opinion that is characteristic of Likert-type opinion surveys.

Participants

The final survey participants were a group of selected experts and scholars from across North America who were considered knowledgeable and familiar with Web-based learning. Experts and scholars were defined as those who had a PhD, scholarly publications, and experience using the Web to facilitate teaching and learning. The participant names were selected from the Canadian Association for Distance Education directory guide, from a list of participants at the TeleLearning '98 conference, and from related publications. A search on the Web was then done to seek out individuals who were working as faculty in a post-secondary setting and who were in North America. Seventy-eight individuals were selected in cooperation with my supervisor and with advice from another committee member. The survey also included a demographic section to determine the exact nature of the respondent's experience using the Web to facilitate teaching and learning, as well as the nature and extent of publications.

Determining a sample size sufficient for reliability based on the literature was difficult as different authors offer conflicting advice. According to Dalkey (1972), the reliability is related to the size of the group; the reliability of the group responses increases with the increase of the group size (Dalkey, 1972). Yet, in another publication (Dalkey in Shearin, 1995), he states that one should not be concerned in a statistical sense

about the size because inferential statistics are not used. That is, the objective in selecting persons to serve on a panel is to choose or find people having special knowledge or expertise in the research area. Allen (in Shearin) claims, for the reasons cited by Dalkey, a definitive sample size is not required for an effective study—but also states in another publication (Allen, 1978) that an ideal size is a panel of 30 people. This is also in contrast with Martino (1972) who writes that a panel of 15, consisting of a cross-section of experts from a particular field, is sufficient for reliable results. According to Martino, if the researcher has 15 or more responses to the questionnaire, the study can be considered to adequately meet the question of reliability. Finally, according to Tersine and Riggs (see also Brady, 1988), a panel of 10 to 15 members has been judged sufficient for producing effective results.

It was anticipated that there would not be less than a return rate of 30% of the 78 invited to participate in this study thereby ensuring a sufficient number of panel members based on the criteria specified by both extremes (e.g., Allen, 1978; Martino, 1972).

Reliability and Validity

The purpose of determining the validity in this study was to ensure that what was set out to be measured was really measured. According to Fish and Busby (1996), the issue of validity with this type of methodology is directly related to the selection of the panel of experts. Also according to Fish and Busby, traditional approaches to determine reliability and validity are not easily obtained or applicable when using consensus questionnaires. Reliability and validity for this step included a panel of experts, an adequate sample size and an appropriate participation rate.

Limitations

The following limitations influence the use of the results.

1. Although the consensus survey was pre-tested, the results indicated that there was ambiguity in interpretation of some of the terms used in the survey.
2. In some cases, the respondents did not provide explanations or examples to the open ended sections of the survey.
3. A larger number of respondents to the survey would have provided great validity and reliability.
4. As is evident by the raw scores, all constructs had consensus making the need for IQRs unnecessary.
5. A few of the respondents were slow in returning their surveys, resulting in an exclusion of their responses.
6. With an exception of the pilot study respondents, all survey respondents were from the United States.

Ethics

The Faculty of Education Ethics Board approved this study. In each of the research methods (in steps one, three and five) participants were given an explanation of the purpose verbally and in writing and asked to sign a consent form (see Appendix B and C). They were also informed of the expected duration and provided with an assurance that confidentiality would be maintained, a statement that participation was voluntary, and withdrawal at any time would mean that any data provided would be withdrawn from the study and destroyed.

CHAPTER FOUR

DATA ANALYSIS PROCESS

This study was guided by the following question: What are the essential principles and constructs necessary for higher levels of learning in Web-based post-secondary distance education? The research framework followed Zetterberg's (1962) model for change:

(1) *Exploratory inquiry* – data collection of the literature, interviews, and reflective journal.

(2) *Scholarly understanding* – data analysis using constructivist learning theory to understand the relationships of the data collected in step one.

(3) *Scholarly confrontation* – development of principles and constructs and a first validation through a focus group on the principles and constructs.

(4) *Discovery of solutions* – data analysis of focus group interview from step three and, based on the data analysis, revision and refinement of the principles and constructs.

(5) *Scientific advice* – data collection through a consensus survey and a second validation on the revised principles and constructs and data analysis.

Analysis of data from the individual interviews, literature review, journal, focus group interview and the consensus questionnaire are presented in this chapter.

Step One: Exploratory Inquiry

Instructor Interviews

NUD*ist qualitative software was used in the data analysis of the instructor interviews. Key words were selected through preliminary readings of the data and an initial "feel" for what may be commonalties between interviews and were then input on NUD*ist to help search for commonalties. These words included: feedback, instruction, strategies, planning, reflection, technical, flexibility, interaction, resources, anxiety, collaboration, learner centred, structured, motivation, responsibility, critical thinking, complex thinking, creative thinking, higher ordered learning, management. Keywords that had three or more occurrences and were related (same concepts/issues) were then further explored for emerging themes. As noted in the limitations section in the previous chapter, the identification of topics and themes from the instructor interviews was difficult in that there were not only conflicting opinions between instructors, but also many contradictions of what participants said within the interviews. Moreover, when a member check was conducted, there were many changed views on critical issues. These problems seemed to relate to the amount of experience that the instructors had with the technologies/delivery methods and the extent to which they had administrative responsibilities with respect to the distance program or the regular university program.

Following are themes that emerged from the data for the instructor interviews using Berge's (1995) conceptual framework.

Technical

- Having a good understanding of the Web in terms of a strong technical background and the ability to troubleshoot when problems occur (or having

access to someone with these skills) is important. This is essential in order to ensure that the learning activities focus on the course content, rather than the technology.

- Many of the learners look to the instructor to not only learn how to use the Web, but also teach using the Web. As such, it is important that the instructor model effective use. This requires a solid understanding of the Web in a technical sense.
- Having good keyboarding skills, and a good working knowledge of a variety of software and technical processes (i.e., copying documents, online editing features, attaching files, virus checking), is essential to facilitating effective Web-based teaching and learning.
- Having access to a high performance and dependable computer with a reliable Internet service provider is essential to facilitate effective Web-based teaching and learning.

Management

- Acquiring strategies for time management is critical to creating and sustaining an effective online learning environment.
- Learning how to maintain control and quality of the online learning activities must be done by thoughtful planning. However, there must also be some flexibility built into the planning in order to accommodate technical problems that may occur.
- It is necessary to anticipate learner needs regarding resources (i.e., reading resources, counselling, registration, etc.)

Social

- Facilitating interaction online is different than in face-to-face learning transactions. As such, acquiring moderating and chairing skills is essential to maintain the quality and quantity of the online interactions.
- There are some negative effects of the technology with respect to the quality of online interaction. Specifically, there can be a loss of instructor influence, greater difficulties in achieving higher order learning, group communication, and spontaneity.
- There are also some positive effects of the technology on the quality of online interaction. Specifically, there is potential to increase the quality of conversation as there is time for reflection prior to responding, increased instructor availability, and greater convenience.
- To have high levels and quality of interaction there is a need to control the interactions by setting realistic guidelines.

Pedagogical

- The amount and kind of feedback is essential to facilitating effective online learning activities. However, feedback is a complex issue. For example, it is sometimes difficult to know when it is best to respond to the group or the individual, determine how long is too long to respond (time lag) versus too soon, or when to let group members respond versus the instructor.
- Evaluating the online learning activities is also complex. For example, do the same accountability and credibility factors apply in the online learning activities? Some instructors perceived a change, while others did not.

Literature Review

Following is a summary of the educational technology theoretical frameworks (Jones, et al, 1995; Koshmann, et al., 1994, Laurillard, 1996; Means, 1994) and constructivist learning theory (Brooks & Brooks, 1993; Cunningham, 1993; Hein, 1991; Jonassen, et al., 1999; Merrill, 1991; Wilson, et al., 1995) used to develop the principles and constructs.

Educational Technology Theoretical Frameworks

Theoretical frameworks are essential to the process of conducting research. In particular, researchers need to use theoretical frameworks in order to relate to, or build upon, prior research. Unless research is set in a theoretical context, the result is that important questions are not being investigated, resulting in an inability to make meaningful relationships with prior research. The end result is that not only are past research findings not meaningful, but it also makes building upon existing research meaningless. Moore and Kearsley (1996) explain the need to use theory through its ability to give "us a common framework, a common perspective, and a common vocabulary that help us ask questions in a sensible way and make sense of problems" (p. 197). Moreover, when we summarize what we know, theory can help identify what is not known, revealing what needs to be researched.

This section of the literature review (Table 1) is a summary of the literature on frameworks considered to be relevant to the study (i.e., frameworks for educational technology that are in keeping with constructivist learning theory) highlighting the learning principles and a brief description.

Table 1.

Educational Technology Theoretical Frameworks

Author	*Learning Principles*	*Brief Description*
Jones, Valdez, Nowakowski, & Rasmussen, (1995)	• Vision of learning	Responsible, strategic, energized and collaborative.
	• Tasks	Authentic, challenging, and multidisciplinary.
	• Assessment	Generative, seamless, ongoing, and equitable.
	• Instruction	Interactive and generative.
	• Learning context	Knowledge-building and empathetic.
	• Grouping	Heterogeneous, flexible and equitable.
	• Instructor roles	Facilitator, guide, co-learner and co-investigator.
	• Learner roles	Explorer, cognitive apprentice, instructor, producer of knowledge.
Koschmann, Myers, Feltovich & Barrow (1994)	• Multiplicity	Knowledge is a complex, dynamic, context sensitive, and interactively related; instruction should promote multiple perspectives, representations and strategies.
	• Activeness	Learning is an active process requiring mental construction on the part of the learner; instruction should foster cognitive initiative and effort after meaning.
	• Accommodation and adaptation	Learning is a process of accommodation and adaptation; instruction should stimulate ongoing appraisal, incorporation, and/or modification of the learner's understanding.
	• Authenticity	Learning is sensitive to perspective, goal, and context; instruction should involve authentic activities, settings, and objects of study.
	• Articulation	Learning is enhanced by articulation, abstraction, and commitment on the part of the learner; instruction should provide opportunities for learners to articulate their newly acquired knowledge.
	• Termlessness	Learning of rich material is termless; instruction should instill a sense of tentativeness with regard to knowing, a realization that understanding of complex material is never "completed", only enriched, and requires a lifelong commitment to advancing one's knowledge.
Laurillard (1996)	• Teaching is *discursive.*	There needs to be some dialogue between the learner and instructor about why the topic is important.
	• Teaching is *adaptive.*	The instructor must be prepared to shift the focus to reflect how the learners are doing.
	• Teaching is *interactive.*	Learners must engage in the topic at a practical level and receive feedback on their actions.
	• Teaching must be *reflective.*	Learners must connect the feedback they received from their actions back to the topic and articulate it back to the instructor in an essay or project of some kind exhibiting their new understanding.

Means (1994)	• Engaged	Learners are engaged in authentic and multidisciplinary tasks.
	• Performance	Assessments are based on the learner's performance of real tasks.
	• Interactive	Learners participate in interactive modes of instruction.
	• Collaborative	Learners work collaboratively.
	• Heterogeneous groups	Learners are grouped heterogeneously.
	• Facilitator	The instructor is a facilitator in learning.
	• Experiential learning	Learners learn through experiential learning.

Summary

Using a framework can be an invaluable aid to instructors who have had little or no prior experience integrating the Web into distance education. The literature reviewed included a number of frameworks considered to be useful when developing, designing, and implementing learning on the Web in distance delivered higher education. There are a number of common elements that each of the authors of the frameworks considers to be important for facilitating effective teaching and learning. These include: interaction between the learners, the content and the instructors (learner-learner, learner-instructor, and learner-content interaction), active learning, timely and constructive feedback, authentic learning activities, collaborative learning, authentic performance based assessment, flexibility, reflection, and presentation of information from multiple perspectives.

Constructivism

The above technology theoretical frameworks are consistent with a learning theory known as constructivism. The assumptions underpinning constructivist learning theory are not new. Indeed, as humans, we have been trying to understand our world since the dawn of consciousness (Taylor, et al., 2000). Constructivism has a rich, and

somewhat tumultuous history – advanced by radical views (e.g., von Glaserfeld, 1984) – resulting in an acquisition of a reputation perceived by many as extremist. However these extreme views do not have to be accepted in order to recognize the significance of the basic tenets of constructivism as an explanation for how we construct meaning about our world.

While constructivism originally began with the insights of Aristotle, Plato and Socrates, contemporary constructivist ideas emerged with Piaget, Dewey, Vygotsky, Kelly and Bruner (Taylor, 2000, et al.). Although these theorists come from diverse fields, they have notable similarities. In particular, they all believe that knowledge is created through individual interaction with social processes and contexts, and that knowledge is contextual. They also believe that knowledge is not independent of the thinking or perceiving self. Contemporary constructivism, according to Candy (1991), is concerned with two things: "how learners *construe* (or interpret) events and ideas, and how they *construct* (build or assemble) structures of meaning. The constant dialectical interplay between construing and constructing is at the heart of a constructivist approach to education" (p. 272).

Within the last decade, key assumptions about how we construct knowledge, drawn from each of these theorists, have been further developed by educational technologists. Table 2 provides an overview of constructivist principles by those who have made significant contributions to the theory within the last decade, with respect to educational technologies. This synopsis (Table 2) of constructivist principles reveals that there is a common belief among the authors that knowledge is actively constructed, contextual, embedded in prior experiences and conversations, and reflective.

Table 2.

Constructivist principles

Author and Date	*Principles*
Hein (1991)	• There is no knowledge that is independent of our prior experience making learning contextual (we learn in relation to our prior knowledge). • We learn to learn, which consists of constructing meaning and systems of meaning, and, in turn, constructing meaning is a mental process. • Learning is a sociolinguistic process that is intimately associated with others in the experience.
Jonassen, Peck, & Wilson (1999)	• Knowledge is constructed, not transmitted • Knowledge construction results from activity, so knowledge is embedded in activity. • Knowledge is anchored in and indexed by the context in which the learning activity occurs. • Meaning is in the mind of the knower and there are, therefore, multiple perspectives on the world. • Meaning making is prompted by a problem, question, confusion, disagreement, dissonance (a need or desire to know) and so involves personal ownership of that problem. • Knowledge-building requires articulation, expression, or representation of what is learned (meaning is constructed). • Meaning may also be shared with others, so meaning making can also result from conversation. So, meaning making and thinking are distributed throughout our tools, culture, and community. • Not all meaning is created equal.
Merrill (1991)	• Knowledge is constructed from experience. • Learning is a personal interpretation of the world. • Learning is an active process of meaning-making based on experience. • Learning is collaborative with meaning negotiated from multiple perspectives occurring in a situated and realistic setting. • Assessment should be integrated with the task, not a separate activity.
Wilson, Teslow, & Osman-Jouchoux (1995)	• Reflection is a key competent of learning to become an expert. • Instruction and assessment should be based on multiple perspectives. • Learners should participate in establishing goals, tasks, and methods of instruction and assessment.

Table 3 provides an overview of the constructivist literature on instructional strategies. They have been placed in a separate table because these authors focus on instructional strategies that can achieve the instructional principles described in Table 2.

Table 3.

Instructional strategies for constructivist principles

Author and Date	*Instructional Strategies*
Brooks & Brooks (1993)	• Problems of emerging relevance should be posed to the learners. • Learning should be structured around primary concepts in a search for essence. • The learning process should seek and value the learners' points of view. • The curriculum should be adapted to address the learners' suppositions. • Assessment should be in the context of the instruction.
Cunningham (1993)	• Learning should be embedded in authentic and relevant contexts and with a variety of modes of representation. • Learners should be encouraged to voice their opinions and take ownership in the learning process. • Learners should be provided with experience of the knowledge construction process so they can become aware of theory and their own knowledge construction process. • Learners should experience and learn to value the multiplicity of perspectives. • Learning should be a social process.

We can see from these overviews that a key tenet of constructivist learning theory is that the construction of knowledge cannot be viewed as the transmission of knowledge from the enlightened to the unenlightened. Nor can the learning process be teacher-centred where the student is a receptacle of information (like a beaker that can be filled with information). Neither can the learning process be content-centred where reality is arrived at through an observable cause and effect relationship. Rather, the educator is a guide, helper, and partner where the content is secondary to the learning process; the

source of knowledge lies primarily in experiences. The educators' role is not to provide information; rather, they must create the conditions within which learning can take place. The focus of education is not on the content—it is on the process.

Another tenet of constructivism is that, since learning is based on prior knowledge, educators cannot assume that all their learners will understand new information in the same way. More importantly, educators must understand that learners need different experiences to advance to their different kinds and levels of understanding. Educators must bring the learners' current understandings to the forefront if learners are to apply their current understandings to new situations in order to construct new knowledge. To achieve this, educators need to incorporate problems that have "real world relevance" to the learners through interaction with others where the interplay among other learners helps individuals become explicit and reflective about their own understandings by comparing them to those of their peers.

Summary

This section of the literature review sets the theoretical foundation upon which this study is built. As such, it is essential to examine constructivist learning theory to understand the rationale for the approaches used in this study. If learning is a process whereby we actively construct knowledge using language, then context-rich, long-term learning environments with tools that enhance communication and access to real-world examples are required. This kind of learning environment will provide learners with opportunities to discuss and reflect on the phenomena presented. Moreover, in this kind of learning environment, the tasks will reflect the complexity of the real world in which learners must function after the planned learning activities have occurred. Using the

principles of constructivist learning theory, with the Web's communication tools and ill-structured hypertext platform, it seems possible to create such an environment.

Journal

As mentioned in the methods chapter, when the Faculty of Education at the University of Alberta began to integrate Internet technologies (the World Wide Web and computer mediated communication software), I was hired to help develop the course Web sites. I did this for one year, during which I kept a journal. The value of this activity was to become self-conscious about my own relationship to the use of the Web and my eventual design and analysis for this research. Following are my reflections in Table 4.

Table 4.

Personal reflections

Assumption	Brief Description
The Web can be an effective medium to support knowledge construction.	This belief can be approached from two positions. The first position argues that the effectiveness of the Web is due to the ability of learners to follow their own paths, in a way that mimics their existing mental models. The other position argues that the Web is effective because in order to make meaning from the large amount of information that can be accessed, learners are forced to search for patterns (sequencing, prioritizing, categorizing, summarizing, and analyzing) and make meaningful relationships (synthesizing and evaluating), or creating new mental models.
Many of the problems encountered with Web-based instruction and hypermedia revolve around learner control and instructional design.	The challenge is to structure the learning so learners do not experience navigational problems but also provide learner control that will facilitate either the construction of new mental models or build on existing ones.

Exposition and rhetorical discourse seem to help facilitate the apprehension of complex material.	If we accept the assumption that knowledge construction occurs socially through the use of language (an assumption of constructivist learning theory) then learners need to be able to verbalize their understandings of complex material through the precise expression of language. This involves interpretation, clarification, and articulation through exposition and rhetorical discourse with information that is unbounded, dynamic, contextual, complex, and abstract.
The learning outcomes should result in understandings of the multiplicity of perspectives on the issues presented.	This process requires that the same material be presented from a number of diverse and conflicting views followed by group work such as discussions and collaborative or cooperative activities.
Heterogeneous groupings facilitate multiple perspectives.	It is essential that the group participants have diverse backgrounds (age, gender, culture, race, religion, ability, etc). Heterogeneous groupings provide diversity of views and help bring authenticity to the diversity of perspectives.
Effective facilitation of the construction of knowledge requires learners assume responsibility for their learning.	Alternatively, instructors must relinquish control. This is often a difficult process for both learners and instructors. Instructors can create the conditions for this kind of learning environment but, unfortunately, because constructivist instructional strategies require learners to move beyond their "comfort zones", they often give poor evaluations of the course. As a result, many instructors are unwilling to facilitate this kind of learning environment.
Computer generated feedback is not sufficient.	There needs to be a human element in the learning process that includes interaction. It is the level of the interaction among the learners, the instructor, and the content that will determine the level of learning attained.
Reflection is essential to higher levels of learning.	Reflection is essential to fully apprehend complex issues and concepts. Learners need to not only reflect about the multiplicity of perspectives on the presented material, but they also need to reflect on how they are thinking about what they believe, what others believe, and whether their own (or others') actions reflect their beliefs.
Constructing knowledge is a dynamic, successive, and social process based on what is known (our past experiences).	If knowledge is constructed based on our past experiences and everyone has different experiences, then we must all have different understandings of what is known. The result is multiple understandings, or perspectives, of what is known. The role of education, then, should be to help learners to understand and be explicit about not only their own understandings, but also others. It is not enough that learners know and understand their own world.
Knowledge is not permanent or fixed.	We live in a world that is changing, complex, and ill-structured. There is no reality in any absolute way. In this kind of world, learners must be able to use their knowledge flexibly. To help them be able to do this, educators need to facilitate the exploration of multiple and differing perspectives that take the learner through the same information several times and from several perspectives and several different contexts. In this kind of learning environment the tasks become authentic in that they reflect the complexity of the real world in which learners must function after the planned learning activities have occurred.
A constructivist environment requires new instructional strategies, which, in turn, require new assessment strategies.	Unfortunately, credentialled learning has established grading systems which serve a variety of purposes. Hence, creative assessment strategies are required that serve both the institution and retain the spirit of constructivism.

Step Two: Scholarly Understanding

In this step, the data gathered from step one were analyzed and constructivist learning theory was used to understand the relationships among the data gathered from the literature on educational technology theoretical frameworks, the interviews and the reflective journal. This step involved a comparative and critical analysis process that found general explanations and characteristics of higher levels of learning in Web-based environments. The process for this step began by using the structure for model building, which involved a system of events that sought to explain the *relationship* (principle) between identified *elements* (constructs) and the *real world* (a description of the complex situation). These three categories (principles, constructs, and descriptions) provided the structure for the data analysis. The two aspects for all educational activities were placed on separate dimensions: *teaching* and *learning*. The rationale for including these dimensions is that it is my belief that there can be no teaching without learning and no learning without teaching. Applying the three events and the two dimensions, a grid was created for organizing the data where the three events were placed horizontally and the teaching/learning dimensions were placed vertically (see Figure 2, Chapter 3, p. 79). Using this grid, an analysis of the system of events that typically occurs when facilitating teaching and learning in post-secondary institutions were then identified and placed within the grid (Table 5). As the data were entered, it became evident that the elements identified were sequential and were then organized accordingly within the teaching and learning dimensions. With respect to the teaching dimension, the following sequence emerged: the learning process should be a planned and purposeful *presentation* of abstracted phenomena that includes a *multiplicity of perspectives and information* to be

fully apprehended with *relatedness* for meaningful understandings achieved through the use of diverse *instructional methods*, followed by meaningful *assessment*. The sequence of events for learning that emerged was: a need for learners to assume greater *responsibility* that involves *making meaning* of the material presented as well as the ability to *reconstruct* meanings necessary to understand the multiplicity of perspectives, followed by an ability to provide *evidence* of new knowledge.

The principles are also interrelated between the teaching and the learning dimension (horizontally). As with the linear relationship within the teaching and learning dimension, the system of events is prefaced with the presentation of *abstracted phenomena* by the instructor that requires an inclusion of a *multiplicity of perspectives* to be fully apprehended by the learners. To be fully apprehended, the learners must assume greater *responsibility*. In turn, to help the learners assume greater responsibility instructors need to provide the material with *relatedness* for more meaningful understandings and diverse *instructional methods*. And while the instructor can help in this process, ultimately, it is the learner who must *make meaning* of the material presented. Moreover, if a multiplicity of perspectives is to be achieved, then the learners must be able to *reconstruct* meanings. Finally, the system of events in credentialled post-secondary settings typically provides closure in the teaching/learning process with meaningful *assessment* activities and learners must provide *evidence* of the new knowledge they have constructed. Figure 3 represents the inter-relatedness of the teaching/learning process.

Toward a Model for Facilitating Higher Levels of Learning in Web Based Distance Education

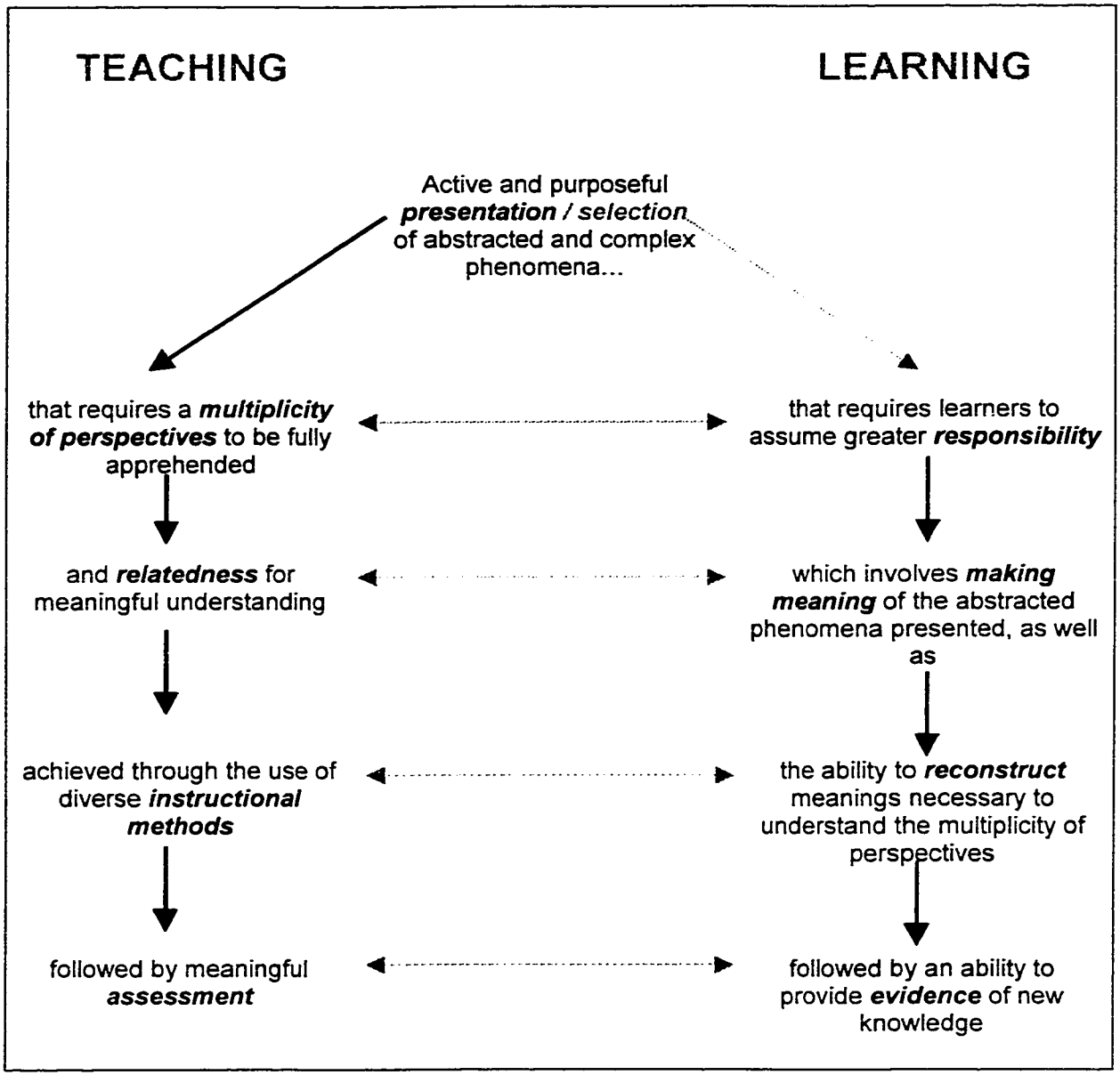


Figure 3. The teaching/learning sequence

Finally, using the data from step one, a comparative analysis was conducted to identify which *constructs* (the building blocks for the principles) should be placed under each of the teaching and learning principles. Appendix B provides the result of this analysis. This list was later presented to the focus group participants for validation.

Step Three: Scholarly Confrontation

In this step, the relationship of the principles and constructs discovered in the previous step were examined. The principles and constructs identified in step two were presented to a focus group of instructional technologists and instructional designers who have had expertise in the area of Web-based instruction. The aim of the focus group was to validate the principles and constructs, and obtain examples of how to facilitate the principles using the Web. The main objective was to confirm the principles and constructs presented. The focus group members were asked to make suggestions, additions, deletions and corrections, as well as to recommend different and/or additional principles and constructs.

Focus Group

At the onset of the session it was suggested by a panel member and agreed by all that the boundaries for the principles of teaching and learning should be blurred. Based on this suggestion and consensus, the question focused on a holistic approach rather than a breakdown of each principle and construct. The following themes emerged:

- *The Web can be a powerful tool in the learning process through the opportunity it affords in extending our brains.* In particular, the Web can provide easy and fast access to information that provides multiple perspectives on issues or problems resulting in helping the learners understand the multiplicity of the ways they may think about the problem(s) presented. Thus, it is a powerful information source that offers access to multiple views quickly and immediately and in this sense is an effective mindtool.

- *The Web can also add relevance to the problems or issues presented through its ability to access real world examples, guest speakers, case histories, raw data, and related Web sites.* For example, if using the case method on the Web, it can be designed to allow novices and experts to explore, in a collaborative way, the issues or problem presented. The case method in particular can serve as an instructional strategy that provides learners with opportunities to experience and respond to complex problems in a variety of real life settings. To be most effective, learners should reflect on relevant theories and techniques as they attempt to understand a real world problem, develop a response, and consider the potential consequences. To help in this process they should also be encouraged to explore the Web's resources through seeking out other case histories, searching for alternative perspectives and, when applicable, drawing on raw data that is related to the problems or issues presented. In addition, experts in the topic should be invited to participate in the case study. The Web is a unique environment in that experts from across the globe can be contacted and accessed much easier and cost effectively than would be possible in face-to-face settings. The benefits of inviting experts include their ability to pose probing questions, evaluate case responses, and contribute their own perspectives based on their experiences. This kind of learning environment, then, allows learners to "take a stab at reality" and make mistakes in a safe environment.
- *The Web can provide simulations that are difficult to present in face-to-face settings.* The main advantage of using the Web for simulations over other media (such as CD-ROM) is that it can connect learners resulting in a more interactive and collaborative/cooperative learning experience. Simulations can, for example, create

rule-based worlds designed to allow learners to assume a variety of roles where they can experience the effects of their actions in a safe environment, similar to the case method environment. However, what makes simulations in a Webbed environment a particularly unique experience for learners is its ability to connect other participants in ways where their actions will also affect the simulation outcome. This makes the simulation much more complex and, in turn, more accurately reflecting the complexity of world in which they must function after the planned learning activity.

At the conclusion of the focus group, the participants were asked again to review the principles, constructs, and definitions with respect to any omissions, additions, or clarifications to the definitions (see Appendix B). All focus group members agreed that the principles and constructs represented the necessary conditions to facilitate higher levels of learning. Some discussion revolved around the term "ill-structure" and the difficulty in its meaning. It was agreed that the definition provided sufficient explanatory power to ensure it was not confused with the term "non-structure." Given the uneasiness of some group members – in addition to my own personal feelings about it – I decided that the construct should be removed.

As mentioned earlier, not all invited participants could attend the focus group session, and two offered to contribute via email. This offer was accepted and feedback was also provided via email. Comments from these participants suggested problems of relevance with four of the constructs: equitability, non-reward based, motivating, and engaging. While not discussed as problems in the focus group, I considered the possibility of either eliminating these constructs (as suggested). Table 5 provides the results of the revised and refined principles and constructs.

Table 5. Tentative Principles and Constructs

PRINCIPLE	CONSTRUCTS	DESCRIPTION
How can principles of teaching facilitate the design of web-based teaching?		
Active and purposeful **presentation** of abstracted and complex phenomena	Complex problems	A problem that is enigmatic and ambiguous with no one or right solution is presented to the learners. Complex problems typically have the following characteristics: unique, unstable, uncertain, value conflicting and cutting across a number of disciplines resulting in no single vantage point.
	Interactive	Interactive learning can be described as an active intellectual participation between and among the learners, instructors, and the subject matter.
	Strategic	A repertoire of teaching/facilitating strategies is essential in achieving the planned learning objectives. A careful plan intended to accomplish the intended outcomes.
Multiplicity of perspectives and information to be fully apprehended	Multidisciplinary	A multidisciplinary approach to teaching will involve the relating to, or making use of, several disciplines (or branches of knowledge) at once.
	Conflicting phenomena	The presenting of two or more occurrences, circumstances, or observable events that are contradictory.
	Multiple sources	A set of information sources with diverse perspectives and positions on an issue.
Relatedness for meaningful understanding	Authentic	The phenomena are presented by a credible authority in the field, making the issues worthy of study.
	Experiential	The phenomena are related to or derived from experience or an actual event.
	Discursive	Conclusions proceed through a reasoned discourse rather than intuition.

Table 5. Continued

Diversity of **instructional methods**	Inquiry based	A close examination, investigation or probe in a quest for knowledge, data or truths.
	Problem solving	To explain, decipher or resolve something that is enigmatic, meaningless, incomprehensible and/or unintelligible.
	Decision making	A position, conclusion or passing of judgment on an issue reached after generating the alternatives, evaluating the choices, and assessing the consequences.
Meaningful **assessment**	Shared ownership	Being involved in negotiable assessment gives learners shared ownership in their own learning. Inherent in shared ownership is that both or all give and receive resulting in partial possession by each person and all members of the group.
	Instructional	Assessment is personally meaningful and used as a positive tool for personal growth. Assessment, then, becomes part of the instructional process.
	Performance based	Involving a demonstration, exhibit or performance in real conditions or authentic simulations.
How can principles of learning facilitate the design of web-based learning?		
Assume greater **responsibility**	Goal setting/task selection	Learners lead in setting standards of excellence, defining benchmarks, and selecting learning activities in ways that are meaningful, authentic, challenging and multidisciplinary to address the issues presented.
	Learning / thinking strategies	Learners can draw on a number of ways to accomplish the learning objectives. A repertoire of thinking/learning strategies is essential to fully apprehend the multiplicity of complex problems.
	Self assessment	Learners accurately evaluate their strengths and weaknesses and determine where to focus their efforts to make the learning process personally meaningful.

Table 5. Continued

Meaning making into abstracted phenomena	Inquirer	The process whereby learners question, examine, query, explore, investigate or reconsider a question, make discoveries, and/or acquire information.
	Generative	The ability to originate, transform, reshape or reinterpret new information through a different scheme or structure resulting in new understandings.
	Reflective	Characterized by thoughtful mediation or contemplation that uses the powers of the mind to conceive ideas and/or draw inferences resulting in the expression of carefully considered thought.
Reconstruction of meanings	Diversity	Learners work with others of distinct and different characteristics, abilities, cultures and backgrounds. It is not enough to know and understand their own worlds; they need to know and understand others in order to reconstruct meanings.
	Negotiated	Deliberating through discussion with another or others in order to come to terms or reach a mutual agreement.
	Empathic	The identification and understanding of other's situations, feelings, and motives resulting in the valuing of diversity and a multiplicity of perspectives.
Evidence of new knowledge	New and multiple perspectives	This requires the ability to understand that one's own world view is not the only one, nor necessarily the correct one; rather it is one of many.
	Increased value of diversity	Through new and conflicting information, new cognitive structures are created or recreated, which enable learners to rethink prior understandings of phenomena.
	Producer	Learners develop tools to help them understand abstracted phenomena and construct meaningful understandings to the world in which they live. In order to construct knowledge, learners must produce meaning.

Step Four: Discovery of a Solution

This step was the discovery of a solution. The solution was the revision and refinement of the principles and constructs in the previous step. The data and feedback from the focus group were analyzed thoroughly to permit confirmation, rejection, or modification of the principles and constructs and to refine them to the greatest degree possible before they were submitted to the final survey participants. The survey was then developed in a format where the constructs were presented with the principle as a leader to each question and the constructs were placed on a five-point Likert type opinion scale. The five points were: agree, strongly agree, disagree, strongly disagree, or no opinion. The "no opinion" option indicated that the construct proposed in the survey has no relationship to facilitating higher levels of Web-based instruction; the "strongly agree" option indicated that the element proposed in the survey has a critical relationship to higher levels of learning. The survey was piloted with eight faculty members at the University of Alberta who had experience teaching Web-based distance courses. The feedback from the pilot study members included their assessment of the principles and constructs, and suggestions for revision, addition, or deletion of principles and constructs. Feedback from the pilot survey suggested that there were no problems with the principles and constructs. However, responses to a few of the questions revealed that the wording for certain questions was either confusing and/or could be interpreted in a variety of ways. As such, this step served to refine the survey with respect to wording and selection of terms. Revisions were made and the revised survey was presented to the final survey participants in the fifth step (Appendix C). The data from the pilot study were later included in the data analysis, as the responses from the pilot surveys on the Likert-type

questions were not significantly different from panel of experts and the data in the open ended sections contributed many insightful examples.

Step Five: Scientific Advice

The fifth and final step in Zetterberg's model for change is scientific advice. The revised and refined preliminary model was offered to the final survey participants as a paper based and mailed survey. The final survey participants were a group of selected scholars from across North America who are knowledgeable and familiar with Web-based instruction. Surveys were sent out to 78 scholars in Canada and the United States (30 and 48 respectively). Twenty-six responded (eight Canadians and 18 Americans) for a response rate of 33 percent. Of the 26 respondents, seven did not make contributions to the open-ended questions.

Confirmation of Panel Expertise

The demographic section of the survey revealed that all respondents had experience facilitating learning activities on the Web (average = 4.5 years), all taught courses where the Web was used in some way to facilitate learning activities, and 77 percent taught courses where the Web was the only communication tool used to interact with students. All respondents had published in the area of Web-based teaching and learning with 40 percent having published in books, 83 percent in refereed journals, 67 percent in non-refereed journals, and 75 percent in other areas (e.g., conference proceedings, technology reports, newsletters, CDs, electronic journals).

Consensus Questionnaire

The interquartile range determined the degree to which the panelists reached a consensus of agreement on each of the constructs. As such, the interquartile range provided information about the variability in the data without being affected by extreme scores. The interquartile ranges were calculated by taking half the difference between the upper quartile, or the point in the distribution below which 75 percent of the cases lie (the 75th percentile), and the lower quartile, the point below which 25 percent of the cases lie (the 25th percentile). This type of calculation provided information about the range of scores that lie in the middle 50 percent of the cases and in doing so provided information about the consensus of response on each item. The formulas for calculating the 25th, 50th, and 75th percentile were as follows:

$$25^{th}\text{ percentile} = Li + \frac{(n/4 - CumF)Wi}{Fi} \quad \text{or the minimum score}$$

$$50^{th}\text{ percentile} = Li + \frac{(n/2 - CumF)Wi}{Fi}$$

$$75^{th}\text{ percentile} = Li + \frac{(3n/4 - CumF)Wi}{Fi} \quad \text{or the maximum score}$$

where Li is the lower real limit of the interval containing the desired percentile; n is the number of cases; CumF is the accumulated sum of the frequencies of all intervals preceding the interval containing the desired percentile; Fi is the frequency of the interval containing the desired percentile; and Wi is the width of the interval containing the desired percentile.

Consensus and agreement were set at a median of 4.00 or above and an interquartile range of 1.00 or less, in keeping with the literature by Fish and Busby (1996).

Principles of Teaching

Question #1: Higher levels of learning typically involve ***complex abstracted phenomena****, and can be facilitated in a Web-based environment by...*

a. *including enigmatic, ambiguous and/or* ***complex problems*** *where learners must generate a number of possible solutions.*

Table 6.

Question 1a. frequency distribution — Disagree – Agree 1 2 3 4 5

Response	Frequency	Cumulative frequency
1	1	1
2	0	1
3	0	1
4	2	3
5	23	26

Mean = 4.43; 25th percentile = 4.15; 75th percentile = 4.72; interquartile range = 0.57

b. *using collaborative/cooperative learning strategies for* ***interactive*** *participation (i.e., active intellectual participation between and among learners, instructors, and subject matter).*

Table 7.

Question 1b. frequency distribution — Disagree – Agree 1 2 3 4 5

Response	Frequency	Cumulative frequency
1	0	0
2	0	0
3	0	0
4	1	1
5	25	26

Mean = 4.48; 25th percentile = 4.22; 75th percentile = 4.67; interquartile range = 0.45

c. *developing a strategic plan of action that will include a **repertoire of teaching methods** to accomplish the intended outcomes.*

Table 8.

Question 1c. frequency distribution

Disagree – Agree
1 2 3 4 5

Response	Frequency	Cumulative frequency
1	0	0
2	0	0
3	1	1
4	2	3
5	23	26

Mean = 4.43; 25th percentile = 4.15; 75th percentile = 3.72; interquartile range = 0.43

The interquartile ranges (Tables 6-8) indicate that there is consensus for all three constructs for the first principle of teaching, with one respondent holding a polarized view on question 1a.

Comments Submitted by Participants

A number of suggestions emerged from the comments in relation to each construct. First, one participant indicated that complex problems are best taught using case studies that include active group solutions and threaded conferencing software. There was also a suggestion that presenting complex problems are effectively facilitated when students develop their own case studies, followed by discussions using networked conferencing with respect to how the proposed solution(s) would (or would not) work in their own environments. Other suggestions on how to facilitate the presentation of complex problems on the Web included having the students email an expert about the problem (or case study proposed) and/or presenting a case study with links to a variety of Web sites. The Web sites must be accessed in order for the students to gain the necessary

information and generate possible solutions. It was also suggested that having the students develop a list of strategies for effective solutions might follow the presentation of a case study. However, caution was expressed by one participant who explained that ambiguity through the presentation of complex problems "*in Web-based courses only leads to confusion, and distracts the learning.*" Specifically, in Web-based learning no opportunities to explain, communicate or enhance through visual cues exist. As such, according to another participant, "*the material needs to be more straightforward than in a classroom in order to achieve higher levels of learning.*"

Most participants suggested that interactive participation can be effectively facilitated through collaborative and cooperative learning activities. Examples included the use of cognitive tools, such as computer mediated conferencing software (threaded conferencing) and the use of links that provide access to a resource base. It was also noted that collaborative/cooperative project work should be an extension of the case studies (or complex problem presented) where, in small group discussions, students can generate solutions, share and critique each others' proposed resolutions, prioritize solutions, and make collaborative judgments.

Finally, while the use of case studies appears to be the most effective method at presenting complex phenomena, the generation of possible solutions can be achieved on the Web by using a variety of teaching strategies. One participant indicated that teaching activities that are effectively facilitated on the Web, and involve interactive participation, include: "*brainstorming, role play, creative writing, simulations, journals, semantic Webbing, nominal group processes, guided questioning, debates, and case based reasoning.*" Another participant added "*voting, conversation, [and] theory bursts.*"

*Question #2: Higher levels of learning typically include diverse and/or **multiple perspectives** about the issue(s) or problem(s) presented, and can be facilitated in a Web-based environment by...*

a. *using a **multidisciplinary** approach of the phenomena presented (i.e., making use of several disciplines at once).*

Table 9.

Question 2a. frequency distribution

Disagree – Agree
1 2 3 4 5

Response	Frequency	Cumulative frequency
1	0	0
2	0	0
3	2	2
4	5	7
5	19	26

Mean = 4.32; 25th percentile = 3.97; 75th percentile = 4.66; interquartile range = 0.69

b. *presenting two or more opposing views and/or **conflicting phenomena.***

Table 10.

Question 2b. frequency distribution

Disagree – Agree
1 2 3 4 5

Response	Frequency	Cumulative frequency
1	0	0
2	0	0
3	0	0
4	3	3
5	23	26

Mean = 4.43; 25th percentile = 4.15; 75th percentile = 4.72; interquartile range = 0.57

c. *providing **multiple information sources**.*

Table 11.

Question 2c. frequency distribution

Disagree – Agree
1 2 3 4 5

Response	Frequency	Cumulative frequency
1	0	0
2	0	0
3	1	1
4	3	4
5	22	26

Mean = 4.41; 25th percentile = 4.11; 75th percentile = 4.70; interquartile range = 0.59

The interquartile ranges (Tables 9-11) indicate that there is consensus for all three constructs.

Comments Submitted by Participants

There were a number of responses which suggested that multiple perspectives do not necessarily mean that the perspectives must be conflicting; nor do multiple perspectives necessarily mean that the perspectives must be multidisciplinary. Thus, while multiple perspectives *can* be supported through a multidisciplinary approach and conflicting views, it is not always the case, though it was also noted that Web-based learning needs to have a greater use of multidisciplinary approaches to offset some of the inherent drawbacks of the medium. Therefore, even though the responses for this principle indicated that the participants were in agreement, the agreement was conditional.

Some participants also indicated that caution should be heeded when presenting multiple perspectives on the Web. In particular, while many participants maintained that the Web is a useful platform for using a multidisciplinary approach, presenting conflicting phenomena and multiple information sources through providing links to

resources (including video clips, audio clips, documents and other scanned artifacts), linking needs to be done with care and purposeful intent. Specifically, as one participant noted, *"it is risky to present conflicting phenomena in WBI. Confusion is a big barrier."*

With respect to providing multiple information sources, caution was also suggested. Specifically, it was indicated that while providing access to multiple information resources on the Web can be effective in facilitating multiple perspectives, care must be taken to avoid a tendency to provide too many links. As one participant noted, *"I've seen too many sites with too many links."* Without a clear purpose, the result can be confusion for the learners. Moreover, it was also mentioned that simply providing links to Web sites is not the most effective way to include multiple perspectives about the problems or issues presented. Rather, sequencing is essential and the linked information needs to be of good quality with a clear, concise, and comprehensive annotation in a way that is related to the problem(s) and issue(s) presented.

Finally, it was suggested that the use of online debates could be an effective way to support multiple perspectives. In particular, online debates can be an excellent way to present multiple perspectives through eliciting cognitive dissonance that is not only energizing for students, but also forces students to examine both their opponents and their own assumptions and arguments. A modified version of debates was suggested where the students are given an alias using CMC and assigned a position that is a contraposition to their current worldview. It was also noted that virtual field trips can also be an effective way to provide different lenses through which to interpret the issues and phenomena presented.

Question #3: Higher levels of learning typically involve phenomena that have personal ***relevance*** *to the learners, and can be facilitated in a Web-based environment by ...*

a. *presenting phenomena through a* ***credible authority*** *in the field.*

Table 12.

Question 3a. frequency distribution

Disagree – Agree
1 2 3 4 5

Response	Frequency	Cumulative frequency
1	0	0
2	0	0
3	1	1
4	5	6
5	20	26

Mean = 4.35; 25th percentile = 4.02; 75th percentile = 4.67; interquartile range = 0.65

b. *presenting phenomena that are related to, or derived from, an* ***actual event.***

Table 13.

Question 3b. frequency distribution

Disagree – Agree
1 2 3 4 5

Response	Frequency	Cumulative frequency
1	0	0
2	0	0
3	0	0
4	3	3
5	23	26

Mean = 4.43; 25th percentile = 4.15; 75th percentile = 4.72; interquartile range = 0.57

c. *guiding reasoned* ***discourse*** *among instructors and learners.*

Table 14.

Question 3c. frequency distribution

Disagree – Agree
1 2 3 4 5

Response	Frequency	Cumulative frequency
1	0	0
2	0	0
3	0	0
4	1	1
5	25	26

Mean = 4.48; 25th percentile = 4.22; 75th percentile = 4.67; interquartile range = 0.45

The interquartile ranges (Tables 12-14) indicate that there is consensus for all three constructs for the third principle of teaching.

Comments Submitted by Participants

Although 100 percent of participants agreed that using Web-based conferencing for guided reasoned discourse supports personal relevance, not all unconditionally agreed that a credible authority and/or an actual event was needed – in all learning situations. Similar to the prior question, while there was agreement, it was qualified. In particular, how great the need is to present an actual event will vary by subject. Some subjects, for example, may not be able to provide actual events. As one participant noted, "*I imagine there are topics in theology and cosmology that are worthy of study even though they are not derived from real world events.*" It was also noted that having an authority does not always ensure personal relevance for all students.

While noting these conditions, it was suggested that discussions about issues by those who have previously been through the process does bring relevance – especially for the concrete sequential type learners that like to see theory in action. The presentation of actual events also provides empirical validation, which was stated by a participant that this is viewed by many "*as the hallmark of good science.*" In addition, Web-based conferencing can provide access to experts that might be inaccessible by other forms of communication. It was also indicated that, while a credible authority can bring relevance, it is most effective when students are asked to apply the ideas presented by the authority in a context that each student finds personally meaningful. In the same way, the presentation of actual events is most effective when students are asked to evaluate the event from a personal perspective according to previously agreed upon criteria.

A few of the participants provided specific examples of ways they use the Web to support relevance. One participant provided an example where a different expert was available in the online forum every week and the students interviewed them about their experiences. Another example provided was a hybrid WebQuest where students must search for possible evaluations of the phenomena presented. Other examples included accessing case histories on the Web, as well as accessing authentic data (i.e., raw data on statistical Web sites). In these examples, the students must interpret the data and draw conclusions.

It was also stated by a participant that if the guided reasoned discourse is to be effective, then instructors must take an active role and assist in the process. An example of how to achieve this was through posing questions of emerging relevance. Otherwise, as was noted by another participant, students just want to compare and contrast (i.e., just post comments for visibility or marks) – and not engage in the difficult process of constructing knowledge. Another participant stated that sustainability is a problem. In particular, when an instructor enters the online discussion there is a tendency to stop the discussion. Alternatively, when instructors observe the discussion only, students tend to accuse the instructor of "not being there" – due to the lack of visual presence on the Web. Finally, an observation was shared by a participant that post-secondary instructors tend to have a very formal writing style, as opposed to conversational styles in face-to-face classroom settings. On the other hand, many learners use Web conferencing in a casual, conversational manner and can be "put off" by the formality of the instructor's responses. This is a facet of teaching online that is problematic and has received very little attention.

*Question #4: Higher levels of learning typically include **diverse ways of knowing**, and can be facilitated in a Web-based environment by...*

*a. presenting **inquiry based** learning activities.*

Table 15.

Question 4a. frequency distribution

Disagree – Agree
1 2 3 4 5

Response	Frequency	Cumulative frequency
1	0	0
2	0	0
3	2	2
4	0	2
5	24	26

Mean = 4.46; 25th percentile = 4.19; 75th percentile = 4.75; interquartile range = 0.56

*b. presenting **problem based** learning activities.*

Table 16.

Question 4b. frequency distribution

Disagree – Agree
1 2 3 4 5

Response	Frequency	Cumulative frequency
1	0	0
2	0	0
3	1	1
4	0	1
5	25	26

Mean = 4.48; 25th percentile = 4.22; 75th percentile = 4.75; interquartile range = 0.52

*c. presenting **decision building** activities.*

Table 17.

Question 4c. frequency distribution

Disagree – Agree
1 2 3 4 5

Response	Frequency	Cumulative frequency
1	0	0
2	1	1
3	1	2
4	2	4
5	22	26

Mean = 4.41; 25th percentile = 4.22; 75th percentile = 4.75; interquartile range = 0.59

The interquartile ranges (Tables 15-17) indicate that there is consensus for all three constructs for the fourth principle of teaching, with one respondent holding a polarized view on question 4c.

Comments Submitted by Participants

There were a number of diverse suggestions on how inquiry-based learning can be facilitated on the Web. One example presented was to pose open-ended questions followed by online links to related resources. Another suggestion was to use the problem-based method. However, the most frequently mentioned example was the use of WebQuests. It was also noted that inquiry-based learning is effective at helping students to find external resources to "*justify one's position...* [and] *also serves to initiate learners in the actual practice of scholarship.*"

One response indicated that providing rich online problems could facilitate problem-based learning. In particular, problem-based learning provides a focus and context that encourages students to go beyond the theoretical understanding of new concepts. It was suggested that instructors could use a project-based learning approach where students customize their own learning modules and activities. Another example was the use of authentic case studies (or case histories), followed by reflective question posing where the students must form responses. The most frequent example, was the use of the problem-based method.

While there was one participant who stated that "*decision-building is not really different from problem-solving*" (somewhat disagreeing with the construct), this participant also acknowledged that activities which force a final action can be of value. One participant suggested that CMC, preferably using a group participant as a small

group moderator, could support decision-building activities. It was also suggested that the delphi-technique could support decision-building process.

*Question #5: Higher levels of learning typically include an assessment process that is personally **meaningful** to each learner, and can be facilitated in a Web-based environment by...*

a. *using **negotiable** contracting, peer assessment, and/or self assessment.*

Table 18.

Question 5a. frequency distribution

Disagree – Agree
1 2 3 4 5

Response	Frequency	Cumulative frequency
1	1	1
2	0	1
3	0	1
4	2	3
5	23	26

Mean = 4.43; 25th percentile = 4.15; 75th percentile = 4.72; interquartile range = 0.57

b. *developing assessment activities in a way where they will also be used as part of the **instructional process**.*

Table 19.

Question 5b. frequency distribution

Disagree – Agree
1 2 3 4 5

Response	Frequency	Cumulative frequency
1	0	0
2	0	0
3	1	1
4	3	4
5	22	26

Mean = 4.41; 25th percentile = 4.11; 75th percentile = 4.70; interquartile range = 0.59

c. *selecting assessment activities that involve a demonstration, exhibit, presentation or* ***performance.***

Table 20.

Question 5c. frequency distribution

Disagree – Agree
1 2 3 4 5

Response	Frequency	Cumulative frequency
1	0	0
2	0	0
3	1	1
4	3	4
5	22	26

Mean = 4.41; 25th percentile = 4.11; 75th percentile = 4.70; interquartile range = 0.59

The interquartile ranges (Tables 18-20) indicate that there is consensus for all three constructs for the fifth principle of teaching, with one respondent holding a polarized view on question 5a.

Comments Submitted by Participants

While the IQR indicates that the constructs for this principle have consensus, many participants responding to the open ended section expressed a need to qualify their agreement. With respect to assessment in general, one participant noted that "*assessment techniques become limited on the Web.*" There are times, for example, when the implementation of an exam is appropriate for the content taught and must be proctored in a face-to-face environment. There are also times when students' verbal skills and abilities to respond spontaneously in real time need to be assessed. This too cannot be done, easily or ubiquitously, on the Web. Another participant acknowledged that using the Web for assessment is still "*tricky.*"

With respect to negotiated contracting, one participant (who indicated disagreement with this construct) stated "*that students have a tendency to try to negotiate*

for the least amount of work possible, or negotiate in projects where they are already knowledgeable." While acknowledging that this isn't always true for every class and every student, it does tend to be the typical scenario in this participant's experience. Another participant stated that peer assessment can "*often force students into socially awkward positions which they might not be willing to participate in*" and, as such, was hesitant to agree that negotiated assessment is effective at facilitating assessment that is personally meaningful. Similarly, another participant stated that the use of peer evaluation tends to "*be greeted with outright hostility by students.*" The reason noted was due to the decreased sense of community within an online class (as compared to face-to-face) and as a result, students do not trust their fellow classmates, leaving them to feel vulnerable. The remaining participants agreed that meaningful assessment could be effectively facilitated using the Web. One example included the use of Web-based conferencing and the SOLO taxonomy (Biggs, 1996) as a framework for negotiable contracting. Another suggestion was a proposed project and the criteria set in consultation with the instructor. A similar suggestion was made where the instructor has students self-report using a portfolio approach in which best practices are compiled by the participant over a lengthy period of implementation. A final suggestion provided is to have students create a case study (based on their own experiences) using Web-based conferencing, while receiving feedback from peers. The result is, essentially, a "*peer mentoring*" process.

Assessment that is instructional can be facilitated in a variety of ways on the Web. For example, one participant suggested quoting the student's contributions from the online transcripts and the students must then reflect on their own quotes. This, in turn,

motivates students to use their own work as part of the instructional process. Similarly, another participant suggested that journal activities could achieve this goal as well. Another activity suggested is to use student peers to provide constructive formative feedback. However, the most frequent example to make assessment part of the instructional process is through the use of embedded assessment.

Finally, assessment through performance was met with similar comments as the first construct (negotiable contracting). Specifically, how effective its use is for assessment is really dependent upon the discipline and objectives. Though where appropriate, using the Web to exhibit student work brings a wider audience for evaluation (e.g., peers, instructors, and experts in the field). One participant noted that, in order to accomplish higher levels of learning within any type of learning environment, the most important component is the task (or tasks) that students are challenged to accomplish. The task(s) should be authentic (e.g., as close to a real world performance or activity as possible). Another respondent indicated that the performance construct is most akin to task orientation, in that it is more authentic than academic. The development of Web-based portfolios is one example of an authentic assessment activity. A few of the participants also indicated success with presentations on the Web.

Principles of Learning

Question #6: Higher levels of learning typically require learners to assume greater ***responsibility*** *in the learning process, and can be facilitated in a Web-based environment by...*

a. *soliciting discussions among learners and instructors to negotiate and/or* ***set standards of excellence.***

Table 21.

Question 6a. frequency distribution

Disagree – Agree
1 2 3 4 5

Response	Frequency	Cumulative frequency
1	1	1
2	0	1
3	0	1
4	6	7
5	19	26

Mean = 4.31; 25th percentile = 3.97; 75th percentile = 4.66; interquartile range = 0.69

b. *requesting learners to draw on a repertoire of* ***thinking/learning strategies.***

Table 22.

Question 6b. frequency distribution

Disagree – Agree
1 2 3 4 5

Response	Frequency	Cumulative frequency
1	1	1
2	0	1
3	1	2
4	4	6
5	20	26

Mean = 4.35; 25th percentile = 4.02; 75th percentile = 4.67; interquartile range = 0.65

c. *supporting dialogue among learners and instructors in order to establish where to **focus efforts**.*

Table 23.

Question 6c. frequency distribution

Disagree – Agree
1 2 3 4 5

Response	Frequency	Cumulative frequency
1	0	0
2	0	0
3	0	0
4	4	4
5	22	26

Mean = 4.40; 25th percentile = 4.11; 75th percentile = 4.70; interquartile range = 0.59

The interquartile ranges (Tables 21-23) indicate that there is consensus for all three constructs for the sixth principle of teaching, with one respondent holding polarized views on questions 6a and 6b.

Comments Submitted by Participants

When setting standards of excellence in collaboration with students, there were a number of participants who expressed cautionary remarks. First, how well students can set the standards is really dependent upon the class and students, their prior knowledge, and motivation. It was also stated that, while it is important to be open to student suggestions and criticisms, "*I do not waste a great deal of time forcing students to my job!*" Another participant stated that learners have very little understanding of the learning process and certainly very little understanding of standards of excellence as they are connected to their responsibility. This lack of understanding seems to become more apparent in online learning. The remaining participants agreed with the construct and provided examples. One suggestion was to allow online discussions to be guided by the learners' stated needs and interests, within the overall framework of the curriculum.

framework of the curriculum. Another suggestion was through the use of learning contracts. It was also indicated that the use of self-assessment was an effective way to negotiate standards of excellence, and in particular advocating the use of the SOLO taxonomy (Biggs, 1996) to rank individual students against their peers for the purpose of assigning grades. It was also noted that there is a need to set practical limits on the amounts of evidence provided in meeting objectives, whether as text attachments or lengths and frequencies of postings in the online discussions.

With respect to the second construct, one participant stated that thinking and learning is often implicit and the difference is not really clear. As such, this participant recommended that instructors should focus on the resolution of the problem and let the problem and context reveal the variety of thinking strategies necessary to produce viable solutions. It was also suggested that this construct could be effectively facilitated through using the online analog of classroom assessment strategies. A number of similar suggestions were also made with respect to how the Web can provide learners with a repertoire of learning and thinking strategies. Specifically, the Web has the ability to present issues and problems through a variety of media (e.g., text, audio clips, video clips, Java simulations).

Finally, with respect to establishing where to focus efforts, one participant declared this construct might be troubling in that the focus is more on the process, rather than the discipline and, as such, will very much depend on the subject under consideration. Though, when appropriate, establishing where to focus efforts can be effectively facilitated through online collaborative projects where students are forced to prioritize activities. Another example provided had students develop an online group

project and present the project to the larger community where their feedback guides them in their assessment of where their efforts need to be focused. One participant also noted that the planning process should be more specific in the online classroom and goals and objectives need to be articulated in a clear and concise fashion.

*Question #7: Higher levels of learning typically require learners to **build meaning** into the issues and problems presented, and can be facilitated in a Web-based environment by...*

a. *providing activities where learners must **make sense** out of the information and/or data presented (i.e., compare, classify, induce, deduce, analyze, abstract, and evaluate).*

Table 24.

Question 7a. frequency distribution

Disagree – Agree
1 2 3 4 5

Response	Frequency	Cumulative frequency
1	0	0
2	1	1
3	0	1
4	1	2
5	24	26

Mean = 4.46; 25th percentile = 4.19; 75th percentile = 4.73; interquartile range = 0.54

b. *providing activities where the learners must **generate relationships** from the data and/or information presented.*

Table 25.

Question 7b. frequency distribution

Disagree – Agree
1 2 3 4 5

Response	Frequency	Cumulative frequency
1	0	0
2	0	0
3	0	0
4	6	6
5	20	26

Mean = 4.35; 25th percentile = 4.02; 75th percentile = 4.67; interquartile range = 0.65

c. *encouraging learners to engage in expressive **reflective deliberation** through critical dialogue.*

Table 26.

Question 7c. frequency distribution

Disagree – Agree
1 2 3 4 5

Response	Frequency	Cumulative frequency
1	0	0
2	0	0
3	1	1
4	1	2
5	24	26

Mean = 4.92; 25th percentile = 4.19; 75th percentile = 4.73; interquartile range = 0.54

The interquartile ranges (Tables 24-26) indicate that there is consensus for all three constructs for the seventh principle of teaching, with one respondent holding polarized a view on question 7a.

Comments Submitted by Participants

One participant selected "somewhat disagree" for the first construct (providing activities where learners must make sense out of the information and/or data presented), but did not provide an explanation why. The remainder of the participants agreed, and some provided examples. One suggestion was through the use of "starter-wrapper" activities on the Web. Another suggestion was where the instructor plays "devil's advocate" in Web-based discussions to force students to carefully analyze the argument to make sense of it. Another suggestion on how to encourage students to make sense of the information and/or issues presented was to have students extrapolate data to design additional experiments and test hypotheses from the initial data.

All participants agreed or somewhat agreed that in order to build meaning into the phenomena presented, learners must generate relationships. One suggestion on how to

achieve this was to require reflective papers on a regular basis. In these papers, students must demonstrate that they are generating relationships from the information presented and thinking critically about what they are learning. Another suggestion was to ask students to construct rules from a variety of data to force generalization and transference that results in the generation of relationships. Comparing and contrasting between different data sets – and inferring the effects of a variable – is also a way to get students to generate relationships. Finally, there was a suggestion that linking to Web-based databases with activities where the students interpret the data could help learners to generate relevance and make the data meaningful.

The final construct (expressive reflective deliberation through critical dialogue) also produced a number of suggestions. One suggestion made was to allow students to reflect on their field or practice experience in comparison to the current literature or information presented by the instructor. This can be facilitated through scaffold discussion and personal reflections of how one may have witnessed or experienced various concepts in practice. It was also expressed that requiring learners to reflect using Web-based conferencing forces many learners to carefully articulate themselves, which results in reflective deliberation, due to a posting's permanency and availability for others to view, refer to, and quote. Another suggestion was to allow students to reflect on their implementation (the good and the bad) and then provide them with the flexibility to re-try, with the understanding that their group peers will be moving on with their efforts.

*Question #8: Higher levels of learning typically require learners to understand that their own **world view** is not the only one (nor necessarily the correct one), and can be facilitated in a Web-based environment.*

a. *Developing activities where learners are encouraged to understand, value and be **empathetic of others world views.***

Table 27.

Question 8a. frequency distribution

Disagree – Agree
1 2 3 4 5

Response	Frequency	Cumulative frequency
1	0	0
2	1	1
3	0	1
4	5	6
5	20	26

Mean = 4.35; 25th percentile = 4.02; 75th percentile = 4.67; interquartile range = 0.65

b. *Requesting learners to **share views** and/or negotiate meanings in order to facilitate shared and equitable understandings.*

Table 28.

Question 8b. frequency distribution

Disagree – Agree
1 2 3 4 5

Response	Frequency	Cumulative frequency
1	0	0
2	0	0
3	0	0
4	4	4
5	22	26

Mean = 4.41; 25th percentile = 4.11; 75th percentile = 4.70; interquartile range = 0.59

c. *Encouraging learners to **work with others of diverse characteristics**, abilities, and backgrounds.*

Table 29.

Question 8c. frequency distribution

Disagree – Agree
1 2 3 4 5

Response	Frequency	Cumulative frequency
1	0	0
2	0	0
3	0	0
4	4	4
5	22	26

Mean = 4.41; 25th percentile = 4.11; 75th percentile = 4.70; interquartile range = 0.59

The interquartile ranges (Tables 27-29) indicate that there is consensus for all three constructs for the eighth principle of teaching, with one respondent holding polarized a view on question 8a.

Comments Submitted by Participants

While there was consensus with respect to the first construct (encouraging students to understand, value and be empathetic of others' world views), few made suggestions about how to facilitate this construct. There was also one participant with a polarized view ("somewhat disagree"). The participant who directed a comment to this construct indicated that understanding and valuing others' world views might "*go over the students heads.*" And while another participant somewhat agreed with this construct, he also indicated that there was uneasiness with the concept of assessing the levels of empathy in traditional instruction – much less on the Web. Alternatively, there was also a suggestion that being empathetic of others' world views may be easier in a Web-based

environment, as there may be a broader span of cultures represented through the medium. Another participant suggested that online role playing can be effective in facilitating students to be empathetic of others' world views.

The second construct generated the most examples of how to facilitate students to share views and/or negotiate meanings. One suggestion provided was through the use of TICKET (Teacher Institute for Curriculum Knowledge about Integration of Technology), focusing on the interaction with constructive friends' activity. This activity requires students to share their projects with their peers online, and their peers respond with critiques, suggestions, and support. A number of responses suggested the use of case studies followed by open-ended questions could be effective in facilitating students to negotiate and develop solutions. Almost all respondents indicated that, whatever the activity, Web-based conferencing is an excellent medium for sharing views and negotiating meaning. For example, one participant stated that Web-based conferencing is a particularly effective medium for this process because the Web does not show the students' skin color, age, height, gender, etc. The result is "*a leveling of the environment that can support greater equality for negotiated understandings.*"

As with the first construct, the suggestions offered for the third construct were limited. One suggestion offered indicated that online group work should ensure a mix of abilities, backgrounds and values. When heterogeneous groupings are used, students have a tendency to gain a wider perspective on the issues and problems presented – resulting from the diverse opinions of the group participants. Another suggestion was to have the students complete an online learning styles inventory and have the computer automatically select students with different learning styles for group work. Another

participant noted that it is often difficult to form diverse student groupings for two reasons. First, given the textual nature of the Web as a communication medium, it is often difficult to ascertain each student's unique characteristics (e.g., age, gender, skin color, etc.). Second, those students who participate in higher education tend to have similar characteristics and values. Given these two factors, it is often difficult to facilitate this kind of learning activity on the Web.

*Question #9: Higher levels of learning typically require learners to **provide evidence of new understandings** and ways of thinking, and can be facilitated in a Web-based environment by...*

a. *Providing opportunities for learners to demonstrate they have acquired **new and/or multiple perspectives** of the phenomena presented.*

Table 30.

Question 9a. frequency distribution

Disagree – Agree
1 2 3 4 5

Response	Frequency	Cumulative frequency
1	0	0
2	0	0
3	1	1
4	1	2
5	24	26

Mean = 4.92; 25th percentile = 4.19; 75th percentile = 4.73; interquartile range = 0.54

b. *Providing opportunities for learners to become more explicit about their **assumptions**.*

Table 31.

Question 9b. frequency distribution

Disagree – Agree
1 2 3 4 5

Response	Frequency	Cumulative frequency
1	1	1
2	0	1
3	4	5
4	3	8
5	18	26

Mean = 4.28; 25th percentile = 3.92; 75th percentile = 4.64; interquartile range = 0.72

c. *Providing opportunities for learners to demonstrate their ability to use a **variety of learning strategies** to produce meaningful understandings.*

Table 32.

Question 9c. frequency distribution

Disagree – Agree
1 2 3 4 5

Response	Frequency	Cumulative frequency
1	0	0
2	5	5
3	1	6
4	5	11
5	15	26

Mean = 3.70; 25th percentile = 4.13; 75th percentile = 4.64; interquartile range = 0.94

The interquartile ranges (Tables 30-32) indicate that there is consensus for all three constructs for the ninth principle of teaching, with one respondent holding polarized a view on question 9b and five respondents holding a polarized view on question 9c.

Comments Submitted by Participants

A variety of examples were provided for the first construct (students need to demonstrate they have acquired new and/or multiple perspectives). One example suggested that this could be accomplished using online student presentations and discussions. Another suggestion was through reflective papers or learning logs. It was also suggested that it is useful to predicate requests for input by asking for examples from the phenomena presented which show new gains in knowledge. Finally, one participant noted that there is often a lot of online "chat" for brainstorming and reflection, but students should be provided with the opportunity to write about their experiences and feelings in a summative way. As such, a check for understanding is needed, where students individually reflect on what the material meant to them at the end of each standard unit of information.

With respect to the second construct, one participant (who disagreed) stated that getting students to be explicit about their assumptions is difficult on the Web – as most students "just want to post and be done." Those participants who did agree provided a number of examples of how to facilitate this construct. One participant indicated that this could be achieved by providing a controversial view on the issues or problems presented and then challenging the students' current assumptions. Another example provided was to have the students maintain an online journal or create a repertory grid to record their reflections, and how their world views might – or might not – have changed throughout the course.

Finally, while the third construct had statistical consensus, there were five respondents who held polarized views (somewhat disagree) – with only two providing an explanation why. One participant stated that it might not be very important – especially if the task or problem does not require it. The other participant stated that Web-based learning does not give the same opportunity for students to demonstrate a wide range of learning strategies, as does a face-to-face class. For those that agreed with this construct, most suggested that in order for students to demonstrate their ability to use a variety of learning strategies, instructors must provide a variety of online instructional activities. Other suggestions included the use of online learning logs or reflective journals where students reflect on how they used different learning activities, as well as how effective it was for them.

Analysis Summary

Table 33 provides a summary of the analysis of the examples from the open-ended questions in relation to the principles and constructs.

Table 33. Summary of examples from consensus survey

PRINCIPLE	CONSTRUCTS	DESCRIPTION	SUPPORTING ONLINE ACTIVITIES
Principles of teaching			
Active and purposeful **presentation** of abstracted phenomena	Complex problems	A problem that is enigmatic and ambiguous with no one or right solution is presented to the learners.	Presentation of complex problems or issues in a Web-based environment can be effectively facilitated through the use of online case studies.
	Interactive	Interactive learning can be described as an active intellectual participation between and among the learners, instructors, and the subject matter.	Interactive participation can be effectively facilitated through online collaborative/ cooperative activities, such as interdependent learner teams.
	Strategic	A repertoire of teaching/facilitating strategies is essential in achieving the planned learning objectives, which is a careful plan of action intended to accomplish the proposed outcomes.	A repertoire of teaching activities that can be facilitated on the Web include: role plays, debates, theory bursts, brainstorming, semantic webbing, concept mapping, panels, jigsaws, and forums.
Multiplicity of perspectives to be fully apprehended	Multidisciplinary	A multidisciplinary approach to teaching will involve the relating to, or making use of, several branches of knowledge at once and returning to the same phenomenon from different perspectives.	Web-based guided hypertext thematic criss-crossing supports a multidisciplinary approach.
	Conflicting phenomena	The presenting of two or more occurrences, circumstances, or observable events that are contradictory.	Online debates can be an effective way to present conflicting phenomena.
	Multiple sources	A set of information sources with diverse perspectives and positions on an issue.	The Web can provide access to multiple information sources through hypertext links, which may include video clips, audio clips, archived documents and other scanned artifacts.
Relatedness for meaningful understanding	Creditable Source	Phenomena that are presented by a credible authority in the field can support relevance, making the issue(s) and problem(s) worthy of study.	Web-based conferencing can provide access to experts for supportive relevance, who might otherwise be inaccessible.
	Authentic Event	The phenomena are related to, or derived, from experience or an actual event.	The Web provides access to case histories with raw data, which can effectively facilitate the presentation of actual events.
	Discursive	Conclusions proceed through a reasoned discourse rather than intuition.	An instructor with e-moderating knowledge and skills can provide opportunities to support reasoned discourse using Web conferencing.

Table 33. continued

Diversity of **instructional methods**	Inquiry based	A close examination, investigation or probe in a quest for knowledge, data or truths.	WebQuests are an inquiry-oriented activity where the learners must interact with information that comes from the resources on the Internet.
	Problem solving	To explain, decipher or resolve something that is enigmatic, meaningless, incomprehensible and/or unintelligible.	The Web's vast resource base can effectively support aggressive problem-based learning, as this method requires access to ample information.
	Decision making	A position, conclusion or passing of judgment on an issue reached after generating the alternatives, evaluating the choices, and assessing the consequences.	An effective means to facilitate decision-making skills is through the use of the Delphi-technique and Web-based conferencing.
Meaningful **assessment**	Negotiated Learning	Being involved in negotiable learning for assessment gives learners shared ownership in their own learning.	Negotiated assessment can be effectively facilitated using Web-based conferencing, as it can support close collaboration and meaningful mutual learning, which is characteristic of negotiated learning.
	Instructional	Assessment is personally meaningful and used as a positive tool for personal growth.	Instructional assessment can be facilitated on the Web through the use of imbedded assessment and archived online messages for reflection.
	Performance based	Involving a demonstration, exhibit or performance in real conditions or authentic simulations.	The use of student-developed Web sites (e.g., Web-based portfolios) is effective at facilitating performance-based assessment.
Principles of learning			
Assume greater **responsibility**	Setting standards of excellence	Learners take charge in setting standards of excellence, defining benchmarks, and selecting learning activities in ways that are personally meaningful and challenging.	Self-assessment strategies, such as rubrics, are effectively facilitated using CMC.
	Learning/thinking strategies	A repertoire of thinking/learning strategies is essential to fully apprehend the multiplicity of complex problems.	The Web can provide learners with a repertoire of learning and thinking strategies through its ability to present issues and problems through a variety of media and a variety of learning methods.
	Focus efforts	Learners accurately evaluate their strengths and weaknesses and determine where to focus their efforts to make the learning process personally meaningful.	Establishing where to focus efforts can be effectively facilitated through online collaborative/cooperative group projects where students are forced to prioritize activities.

Table 33. continued

Meaning making into abstracted phenomena	Making sense	The learning process should require learners to compare, classify, induce, deduce, analyze, abstract and evaluate to make sense of the data or information presented.	A "devil's advocate" online discussion, as well as and "starter-wrapper" Web activities can facilitate the process of meaning making.
	Generating relationships	Learners should be encouraged to be generative, which includes the ability to originate, transform, reshape or reinterpret new information through a different scheme resulting in new understandings.	Linking to Web-based databases followed by activities where learners interpret the data can help generate relevance and make information meaningful.
	Reflective deliberation	Characterized by thoughtful mediation or contemplation that uses the powers of the mind to conceive ideas and/or draw inferences resulting in the expression of carefully considered thought.	Web-based conferencing can facilitate reflective deliberation due, precisely, to a posting's permanency and availability for others to view, refer to, and quote.
Reconstruction of meanings	Empathy	It is not enough for learners to know and understand their own worlds; they need to know and understand others. To do so is to have the ability to reconstruct meanings.	An effective way to facilitate learners to become empathetic of others worldview is through online role-playing.
	Negotiable meanings	Learning at a higher level is frequently not about discovering more, but about reshaping or transforming new and existing knowledge through the negotiation of meanings with others.	Web-based brainstorming is an effective method to create an equitable environment that is necessary for the negotiation of meaning.
	Diversity	To achieve shared understandings, learners must value diversity.	Heterogeneous groups using Web-based conferencing can lead to increases in cross-cultural online communication and interaction, which can facilitate the valuing of diversity.
Evidence of new knowledge	New and multiple perspectives	This requires the ability to understand that there is more than one worldview; it also requires the ability to understand that there may not be 'one' correct worldview.	This process can be facilitated using the Web with online group research projects and presentations, as well as reflective papers.
	Assumption articulation	The careful examination of something; that something being the self.	This can be supported through the use of Web-based repertory grids.
	Learning strategies	Learners should be required to provide evidence of their ability to develop and use a variety of learning strategies to produce meaningful understandings.	Web-based learning logs that require learners to write about their experiences and feelings of how they used varied learning strategies in a summative way can be used to assess a learner's ability to use diverse thinking strategies.

Summary

The data from the interquartile ranges (IQRs) indicate that there is consensus with respect to of the constructs presented. While the IQRs provide evidence that the constructs of this study support a heuristic with respect to facilitating higher levels of learning for Web-based distance education, the comments submitted by participants for each question were also insightful. The comments revealed that there are many complexities to these principles that are not so easily expressed with a Likert-type response survey.

CHAPTER FIVE

SUMMARY, IMPLICATIONS FOR PRACTICE, REFLECTIONS, RECOMMENDATIONS FOR FURTHER RESEARCH, AND CONCLUSIONS

This study sought to identify the essential principles and constructs that result in the conditions necessary to facilitate higher levels of learning. The need for the development of guiding principles was accentuated by the lack of understanding about how to facilitate higher levels of learning in Web-based environments. Until teaching and learning principles are established, it is difficult to ascertain whether or not what is being done with the Web is adequate and successful with respect to facilitating higher levels of learning.

This chapter provides a summary of this study, implications for practice, personal reflections, recommendations for further research, and conclusions.

Summary

This study was guided by the following question: What are the essential principles and constructs necessary for higher levels of learning in Web-based post-secondary distance education? The research framework followed Zetterberg's (1962) model for change:

1. *Exploratory inquiry* – The aim of this step was to discover the details of the problem and gather as much information as possible through the various means available. In an effort to explore the research problem, a review of the literature was conducted, a panel of 12 instructors with experience using the Web in distance learning activities was interviewed, and a reflective journal of my own personal experiences and

observations developing Web-based instruction was kept. This process laid the foundation for the development of guiding principles.

2. *Scholarly understanding* – In this step, an attempt was made to identify the essential principles and constructs necessary for higher levels of learning that were grounded in constructivist learning theory. In this step, the data gathered from the interviews, the reflective journal, and the literature review (step one) were analyzed and integrated through a comparative and critical analysis process to identify principles and constructs necessary to facilitate higher levels of learning. Constructivist learning theory was used to understand the relationships among the insights gathered in this step. The results were then organized in a classification scheme in keeping with the system of events in a model. The system of events sought to be explained included the principles, constructs, and Web-based instruction (Figure 2; p. 79).
3. *Scholarly confrontation* – In this step, the relationships of the facts and insights discovered in the previous step (scholarly understanding) were examined. The outcome of this process marked the beginning of the development of guiding principles, which included five principles of teaching, four principles of learning, and parallel constructs. The first validation phase of the principles and constructs was conducted with a focus group of educational technologists and Web-based instructional designers. The data from the focus group members included their assessment of the constructs and principles and suggestions for revision, addition, or deletion of the principles and constructs (Table 5; p. 109). This step was a critical component of the proposed research in that it served as a way for refining the

principles and constructs that were presented later to the final survey participants (step five).

4. *Discovery of solutions* – The solution included revisions based on the feedback received by the focus group members in the previous step. The teaching and learning principles were discussed and recorded, as well as the corresponding constructs and definitions. The data were transcribed and analyzed for confirmation, rejection, or modification of the principles, constructs, and definitions.
5. *Scientific advice* – As part of Zetterberg's (1962) scientific advice, a second validation process was used in conducting this section of the research. The principles and constructs were offered to the final survey participants as a paper based and mailed survey. The constructs were placed on a five-point Likert-type scale and presented to a group of selected experts and scholars from across North America who were considered knowledgeable and familiar with Web-based teaching and learning. Experts and scholars were defined as those who have a PhD, scholarly publications in this area, and experience using the Web to facilitate open and flexible learning. As the questionnaire responses were subjected to the calculation of interquartile ranges (IQR), the questionnaire was considered to be a "consensus survey." The data from the consensus survey indicated that there is consensus with respect to the essentiality of the principles and constructs presented. The outcomes of the survey also provided examples of supporting online activities. This marked the second validation phase.

While the IQRs provided evidence that the constructs of this study support the principles with respect to facilitating higher levels of learning for Web-based distance education, the comments submitted by participants for each question were also an insightful facet of the survey. The comments on the survey revealed that there are many complexities to the implementation of the principles presented that are not so easily expressed with a Likert-type response survey. These complexities are discussed in the next section.

Implications for Practice

The primary purpose of developing the principles and constructs was to extend our understanding of how to facilitate higher levels of Web-based distance learning. Principles are defined as the basic or essential qualities determining the inherent characteristics of higher levels of learning. Constructs are defined as the essential elements that compose each principle. The principles and constructs were developed to serve as a heuristic for facilitating higher levels of learning in distance delivered Web-based educational environments. The examples suggested by the participants were a most valuable aspect in achieving this objective. Following is a broader discussion of the data.

Principle #1

Higher levels of learning typically involve the active and purposeful presentation of complex abstracted phenomena, and can be facilitated in a Web-based environment. This principle includes the following three constructs: complex problems, interactive participation, and a repertoire of teaching methods.

1. *Complex problems. A problem that is enigmatic and/or ambiguous with no one or right solution should be presented to the learners. Complex problems typically have the following characteristics: unique, unstable, uncertain, value conflicting and cut across a number of disciplines resulting in no single vantage point.*

Based on the data from this study, facilitating the understanding of complex problems or issues in a Web-based environment can most effectively be supported through the use of case studies. Case studies have been defined as "a description of a real and relevant situation that is complex enough to warrant analysis" (Seaman & Fellenz, 1989, p. 111) and include three interrelated components: a case study or report, case analysis, and case discussion (Marsick, 1990). The survey results (that case studies can facilitate higher levels of learning) are consistent with much of the literature on the use of case studies in face-to-face settings (e.g., Christensen, 1987; Graf, 1991; Masoner, 1988; Metejka & Cosse, 1981; Pfeiffer & Ballew, 1988). According to Lacey and Merseth (1993), the use of case studies in the instructional process provides a learning environment that seeks to present the complex reality of any issue with its concomitant ambiguity and multidimensionality, thus providing a strong image of the multifaceted nature of most subject areas. Moreover, according to MacNeil (1998), the use of case studies can facilitate the acquisition of analytical skills and the ability to think clearly in ambiguous situations. The survey data also revealed that case studies are most effective when developed by students based on their own experiences, followed by active group solutions – which may include a variety of instructional methods.

Case studies have been facilitated on the Web in a variety of ways (see Collett, et al., 1999; Paulsen, 1995). The most frequently described practice is to introduce the situation (case report or problem to be studied) in a textual format on a Web page, followed by the use of Web-based conferencing for the analysis and discussion. Alternatively, case studies can be presented through video and/or audio clips on the Web – although this format would require that the course developer have access to the

necessary equipment and skills and course participants have access to a reliable and high speed Internet connection.

2. *Interactive participation. Interactive participation can be described as the use of collaborative/cooperative learning strategies to facilitate active intellectual participation between the learners, the instructors, and the subject matter.*

Studies reviewed by Chambers (1992) in the area of learning theory indicate that, in general, learners learn faster and retain more if they collaboratively interact in the learning situation. Research by Gokhale (1995) revealed that collaborative learning facilitates higher levels of learning, and in particular, critical thinking. Zurkin and Sumler (1995) conducted a major review of the literature on the use of computers in distance education and arrived at the same conclusion. Their review of the research also revealed that there was a common element to learner success – interactivity. Specifically, "the more interactive the instruction, the more effective the outcome was likely to be" (p. 100). They further identified the key ingredients with the interaction as (1) the availability of the instructor, whether face-to-face or through computer mediated communication, and (2) the intellectual engagement of the student with the content. According to Milheim (1996), interactive learning can result in not only increasing greater instructor/learner collaboration, but can also increase student interest and higher cognitive processing.

Based on the findings of this study, interactive participation can be effectively facilitated through the use of cognitive tools, such as Web-based threaded conferencing and group work. Furthermore, collaborative/cooperative group project work should be an extension of the case studies (or complex problem presented) where, in small group discussions, students can generate solutions, share and critique each others' proposed

resolutions, prioritize solutions, and make collaborative judgments. The survey data are in agreement with a study by Klemm and Snell (1996) who maintain that one of the most effective means to facilitate higher levels of learning is through collaborative group processes where learners are required to think critically, creatively, and integratively. However, Klemm and Snell also observe that "collaborative learning is seldom applied in a computer conferencing software environment, because the threaded-discussion systems do not expedite team building and effective group processes." The result is a trivialized group discussion. To avoid this scenario, and raise the intellectual level of the group, instructors should consider requiring learners to produce tangible work products (not just opinion postings) – where learners must participate in active sharing of information and intellectual resources to complete a group project. This is effectively achieved through interdependent learner teams, where each learner is assigned a well-defined role (e.g., leader, concept list editor, concept map editor, insight paper editor, research, and quizzer). Each role, of course, is necessary for the successful completion of a group project.

3. *Repertoire of teaching methods. A repertoire of teaching/facilitating strategies is essential in achieving the planned learning objectives, which is a careful plan of action intended to accomplish the proposed outcomes.*

There is existing literature that argues the need to use a variety of instructional strategies in Web-based environments. Blanchette (1999), for example, asserts that online learning tends to emphasize low levels of group discussion activities, such as small group discussions, while more complicated group activities such as role plays, case studies, and debates are still relatively uncommon. Bonk and Reynolds (1997) suggest alternative Web-based instructional methods that encourage higher levels of learning

such as creative, critical and cooperative learning. Likewise, Kanuka and Anderson (1999) claim diverse instructional methods are required to facilitate constructivist learning principles.

The data for this study indicate that, while the use of case studies appears to be the most effective method for presenting complex phenomena, the generation of possible solutions can be achieved on the Web by using a variety of teaching strategies. Participants indicated that teaching activities that are effectively facilitated on the Web, and involve interactive participation, include a variety of teaching methods such as voting, theory bursts, brainstorming, semantic webbing, concept mapping, critiques, round robins, gallery tours, discussion groups, learning logs, role-play, nominal group processes, panels, jigsaws, and forums. Paulsen (1995) provides an overview of many of these instructional methods and maintains that pedagogical techniques described in the adult education literature can be effectively facilitated in online forums.

Principle #2

Higher levels of learning typically include diverse and/or multiple perspectives about the issue(s) or problem(s) presented, and can be facilitated in a Web-based environment. This principle includes the following three constructs: multidisciplinary approaches, conflicting phenomena, and multiple information sources.

1. ***Multidisciplinary approaches.*** *A multidisciplinary approach to teaching involves the relating to, or making use of, several disciplines (or branches of knowledge) at once.*

A multidimensional approach involves returning to the same phenomenon from different perspectives. It can, according to Spiro and Feltovitch (1997), prepare learners "for the diversity of uses of ill-structured knowledge, while also demonstrating patterns of multiple interconnectedness and context dependency of knowledge, by criss-crossing

the knowledge domain in many ways thereby also teaching students the importance of considering complex knowledge from many different intellectual perspectives, tailored to the context of its occurrence." They further maintain that a nonlinear medium like hypertext would be very well suited to this type of approach to learning.

Based on the survey data, the Web is very effective at supporting multidisciplinary approaches, which is necessary to offset some of the inherent drawbacks of the medium. The first part of this position is in keeping with the literature by Spiro and Feltovitch (1997) who maintain that the Web is an effective platform for using a multidisciplinary approach precisely due to its vast resource base and ability to easily access these resources through hyperlinks. Other literature also supports this view. For example, Jonassen (1988) asserts that it allows for easy access to large amounts of information in a variety of media from both within and across disciplines based on the following criteria: personal relevance, interest level, curiosity, experience, information needs, and task demands. However, research has also revealed that simply providing access to hypertext links to present a variety of disciplines, where the learners have free exploration, is not necessarily effective at supporting a multidisciplinary approach. A study by Jacobson, Maouri, Mishra, and Kolar, (1996), for example, revealed that learners who were provided with guided and thematic hypertext learning activities performed at a significantly higher level on a knowledge synthesis task than learners with free exploration. The results of this study suggest, then, that when facilitating a multidisciplinary approach, instructional methods such as guided thematic criss-crossing should be used. Guided thematic criss-crossing is an instructional method that involves providing modeling and scaffolding support using three hypertext design features: (1)

case-based hypertext materials; (2) conceptual indexing and variable hypertext links (the coding of case-based materials with important abstract, conceptual or structural knowledge based upon understandings and representations held by domain experts); and, (3) case-theme commentaries (a short explanation of how a structural dimension of knowledge applies in different case-specific or situated contexts).

2. Conflicting phenomena. *Presenting conflicting phenomena requires the presentation of two or more occurrences, circumstances, or observable events that are contradictory.*

The results of this study indicate that online debates can be an effective way to present conflicting phenomena that promote thinking and reflection, especially if learners are expected to take a position that may be contrary to their own. Correspondingly, there is literature that supports the position that debates can achieve this in both face-to-face and online learning environments. According to Renner (1994), the desired learning outcome of a debate is to force learners to confront conflicting phenomena that challenge the learner to acquire better understandings. Seaman and Fellenz (1985) explain a debate in terms of a "structured discussion during which two sides of an issue are presented and argued by two or more individuals within a given time period" (p. 65). Instructors have traditionally used debates to enhance their learners' confidence and ability to express viewpoints as well as help them to develop coherent organization and precise expression of ideas structured in a manner that matches the speaker's (or writer's) purpose and intended audience (Kanuka & Kreber, 1999). The desired learning outcome of a debate is to force learners to confront situations that result in contradictions that challenge the learner to acquire better understandings.

Paulsen (1995) contends that online debates provide learners with the opportunity to improve analytical communication skills through the need to formulate arguments, defend positions and critique counter positions. This process helps learners to actively challenge their understandings by searching out new information and experiences, of which they have little working knowledge, resulting in acquiring multiple perspectives. Clark (1992a; 1992b) successfully facilitated an online debate and, based on this experience, offers the following guidelines for effective online debates: (1) *participation* of learners, an instructor, an impartial coordinator, and an evaluator; (2) *preparation* of a list of issues, criteria, and deadline for a winner to be declared; (3) *coordination* of the proposition, group assignments and channeling of speeches; and, (4) *evaluation* that includes feedback from the evaluators on the issues and process.

3. Multiple information sources. *Multiple sources of information are, essentially, information sets with diverse perspectives and positions on an issue(s).*

The survey participants indicated that it is possible to present multiple information sources on the Web through hypertext links (including video clips, audio clips, documents and other scanned artifacts). However, they also noted that presenting multiple information sources through hypertext links needs to be done with care and purposeful intent. Specifically, the data from this study indicate that it can be "*tricky*" to present conflicting phenomena, as confusion is, as one participant stated "*a looming peril in online learning.*" This potential problem has been well documented in the literature. In particular, it has been argued that links can result in leading learners into random travelling through the Web resulting in cognitive overload and conceptual disorientation. The result is that hyperlinks can create environments that can provide for multiple

information sources, but may also lead to problems precisely due to the amount of information that can be accessed (Collett, et al., 1999; Marchionini, 1988; Roselli, 1991). To overcome this problem it was suggested in the survey data that sequencing of the content, as well as careful and purposeful linking, is necessary to guard against random traveling in Web-based learning. Some of the literature on designing hypertext instruction supports this premise. Jonassen (1988), for example, asserts that hypertext environments should be designed to create structure out of the ill-structure: "The less structured the hypertext is, the less likely users are to integrate what they have learned. Without explicit external organization, many learners have difficulty acquiring new knowledge" (p. 14). Likewise, Lanza (1991) claims that effective learning can occur in hypertext environments, but a clear and comprehensive framework for the studying process is essential.

Clearly, most of the anecdotal literature has insisted that structure is needed in hypertext environments in order to avoid information overload and conceptual disorientation. Yet, empirical research has not always supported this position. Over a decade ago, Marchionini (1988) argued that navigational problems would likely decrease as learners gain experience with hypertext and educators applied common-sense interface designs. Now that the Web is a decade old, it seems that Marchionini may, indeed, be right. Recent studies by Collett, et al. (1999) and Reed and Oughton (1997) have provided evidence that knowledge of hypertext environments can predict a greater use of the learner's ability to navigate, preventing both conceptual disorientation and information overload. Yet, while not stated in these studies, it seems intuitive to maintain (in agreement with the survey data described above) that it is also necessary to

provide links with care and purposeful intent. Specifically, survey respondents indicated that while providing access to multiple information resources on the Web can be effective in facilitating multiple perspectives, care must be taken to avoid a tendency to provide too many links. Without a clear purpose, the result can be confusion for the learners. Moreover, it was also mentioned that simply providing links to Web sites is not the most effective way to include multiple perspectives about the problems or issues presented. Rather, sequencing is essential and the linked information needs to be of good quality and accompanied by annotated hyperlinks in a clear, concise, and comprehensive manner – and needs to relate to the problem(s) and issue(s) presented.

Principle #3:

Higher levels of learning typically involve phenomena that have relevance to the learners. This principle includes the following three constructs: credible authority, actual event, and discourse.

1. *Credible authority. Phenomena that are presented by a credible authority in the field can support relevance, making the issue(s) and problem(s) worthy of study.*

The survey data indicate that there are points in the learning process when inviting an outside expert to contribute timely information and valuable experience can facilitate relevance. This activity seems most effective when learners are asked to apply the ideas presented by the authority in a context that each finds personally meaningful. In addition, Web-based conferencing can provide access to experts that might be inaccessible by other forms of communication. However, the data also indicate that it is not always necessary to have a credible authority in order to facilitate relevance for the learners – nor does a credible authority ensure personal relevance for all students. While the reasons why invited experts do not always contribute to relevance was not revealed in the survey data, there is literature that discusses why this strategy may not always be

effective. Renner (1994), for example, notes that just bringing the expert is not enough. In particular, many instructors make arrangements and then *hope* that the guest will share his/her experience *and* have teaching skills. Unfortunately, this is not always the case, leaving the learners to gain little benefit from the expert's experience(s). For an invited expert format to be successful, the expert's presentation should involve the learners in every phase of the presentation, ensure the presentation fits into the course agenda, and ensure there is productive interaction between the guest and the course participants. To achieve this, instructors should take a pro-active approach and organize an online debate or press conference type format. This kind of format, with prepared questions asked by the learners, can reduce the pressure on the invited guest to try to generate dynamic online discussions in what is typically an unfamiliar environment, and at the same time involve the whole group.

2. Actual event. *The phenomena presented should be related to, or derived from, an actual event.*

The data from the survey indicate that the presentation of actual events also provides empirical validation, which is viewed by many as the hallmark of good science – though how great the need is to present an actual event will vary by subject. The Web can be an excellent medium to facilitate the presentation of actual events in that it has a vast repository of information that includes case histories with raw data. The presentation of case histories can be made even more effective when learners evaluate the event from a personal perspective according to previously agreed upon criteria that includes interpretations and conclusions.

In agreement with the data from the study, literature on the effectiveness of case histories suggests it is an effective instructional strategy for facilitating relevance and higher levels of thinking and learning. However, according to Marsick (1990), simply presenting an actual event tends not be effective: "The key to the case's success is the selection of the right problem situation" (p. 227). While drawing on an actual event is the strength of this method, a case history must also have a complex problem with various participants in the case that hold diverse views. Insofar as possible, the solution(s) and outcome(s) should not be provided in the initial presentation of the case history. Only when learners have reached conclusions should they then test their own results with the results in the actual event. Through this process, case histories can move beyond providing relevance and help learners "analyze the strands of the problem in order to name it, identify and analyze alternative solutions, and think through the steps and possible consequences of implementation" (pp. 226-227). Thus, simply providing Web links to case histories on the Web is not enough. Rather, they should be embedded in the presentation of a complex problem or issue.

3. Guided discourse. *Meaningful understandings created in the learning process should proceed through a guided reasoned discourse, rather than intuition.*

Guided discourse is most often used when the instructor has a specific pedagogical objective, usually to explore the nature of a complex problem, and then investigate alternative solutions. According to Brookfield (1990) adult educators have hailed guided discourse as the instructional method "par excellence," which is in keeping with the survey data. There are a variety of reasons cited in the literature as to why this is considered to be an effective method including its ability to be inclusive, democratic,

respectful of learners, as well as its ability to facilitate problem solving skills, concept exploration and attitude change (Brookfield).

The literature on how successful this method is, in face-to-face settings, generally argues that the effectiveness rests on whether or not instructors have the necessary skill sets. According to Taylor, Marienau & Fiddler (2000), if the discourse is too global and abstract, learners will give unoriginal and standard type responses. To avoid this, Brookfield (1989) (see also Gibbs, 1992) argues that instructors should require learners to reflect on their experiences, using a "critical incident" (e.g., case history) format followed with discussion in order to explore new meanings. Also problematic for many instructors trying to facilitate guided discourse, according to Taylor, et al., is to find the right level of difficulty with learners who have "similar levels of maturity and responsibility, though they need not be matched with regard to depth of knowledge or experience" (p. 303). In addition, instructors must ensure there is sufficient time to develop momentum, which is required for higher levels of thinking, and then come to some resolution. Thus, to be effective – as well as to guard against inattentive participants or those unwilling or unable to participate fully and contribute equally – instructors need to design guided discourse where the purpose is clearly articulated with accountability and assessable outcomes. "Learners need to know in advance the criteria for a quality discussion so they can assess how well they are accomplishing the goal. This means carefully articulating demonstrable results that can be used as criteria" (Taylor, et al., p. 303).

The literature on facilitating online guided discourse reveals comparable findings. For example, comparative studies by Hiltz, Johnson & Turoff (1987) (see also Cooper & Selfe, 1990; Davie, 1989; Harasim, 1987) report similar outcomes and quality in online

versus face-to-face discussions. Research has also revealed that online discourse suffers from many of the same problems as face-to-face discussions. A study by Phillips, Santoro, and Kuehn (1988), for example, found that online discourse is often ineffective because of the instructors' inability to moderate. This brings attention back to the need for instructors to acquire the necessary skill sets to facilitate guided discourse, whether face-to-face or online. The survey data indicate that an instructor with moderating skills can provide opportunities to support reasoned discourse and sustain critical dialogue using Web-based conferencing, which has also been supported in the research on online discourse (e.g., Berge & Collins, 1995; Newman, Webb & Cochrane, 1995; Salmon, 2000).

Principle #4

Higher levels of learning typically include diverse ways of knowing, and can be facilitated in a Web-based environment. This principle includes the following three constructs: inquiry-based learning, problem-based learning and decision-making learning.

1. *Inquiry-based learning. Inquiry-based learning involves a close examination, investigation or probe in a quest for knowledge, data or truths.*

The original work on the inquiry method by Postman and Weingartner (1969) argue that the instructor's attitudes and beliefs have a strong influence on the composition of learning environments. To overcome this influence, they recommend instructors follow six principles, which can create a climate of learner inquiry. The six principles are as follows:

1. rarely tell learners what they ought to know;
2. use questioning;
3. do not accept a single statement as an answer to a question;
4. encourage learner to learner interaction;

5. view learning as a process, not a finished product; and
6. measure success in terms of learner behavioral changes such as increased questioning, relevance of the questions, frequency of learners to challenge givens, willingness to modify their positions, and increased ability to observe, classify, generalize and apply the results in an original way.

The survey participants indicated that inquiry-based learning could be effective at helping students to find external resources to justify their position, which also served to initiate students into the actual practice of scholarship. There were a number of suggestions on how inquiry-based learning could be facilitated on the Web including, for example, posing open-ended questions and providing online links to related resources. However, the most frequently mentioned example was the use of WebQuests. WebQuests are, as the name implies, a unique Web-based activity originally inspired by Bernie Dodge in 1995. Essentially, WebQuests are an inquiry-oriented activity in which information that the learners use comes from the resources on the Internet. WebQuests have six critical attributes that include:

1. an introduction to a complex problem,
2. engaging tasks (doable and interesting),
3. a description of the process with guidance in the forms of concept maps, timelines, or cause-and-effect diagrams,
4. multiple online sources and perspectives of data to discover the non-obvious,
5. followed by evaluation, and
6. conclusions.

The forms that a WebQuest might take are limited only to the instructor's imagination. However, most WebQuests are designed in ways that require learners to work in groups. The groups are provided with a Web document that provides an introduction and background information, as well as group task and information sources (Web links) that are needed to complete the task. The Web resources are anchors pointing to information on the Web, and might include raw data, experts, searchable databases, books, or other related documents available on the Internet. There should also be a description of the process that the learners should proceed through, as well as guidance on how to organize the information they acquire on the Internet (such as a concept maps, timelines, or cause-and-effect diagrams). There also needs to be a conclusion that brings closure to the group activity. The closure activity typically requires the learners to reflect on what they have learned and extend the experience to other domains.

2. *Problem-based learning. Problem-based learning requires learners to explain, decipher or resolve something that is enigmatic, ambiguous, obscure and/or cryptic.*

The data from the survey indicate that problem-based learning can provide a focus and context that encourages students to go beyond the theoretical understanding of new concepts. The most frequent example provided to facilitate this construct was the use of the problem-based method. The problem-based method has been described as "an instructional strategy in which students confront contextualized, ill-structured problems and strive to find meaningful solutions" (Rhem, 1998) and has several distinct characteristics (Barrows, 1985; Stepien & Gallagher, 1993; Taylor, et al., 2000):

1. Reliance on problems to drive the curriculum (the problems do not test skills; they assist in development of the skills themselves).

2. The problems are truly ill-structured (there is not meant to be one solution, and as new information is gathered in a reiterative process, perception of the problem, and thus the solution, changes).
3. Learners solve the problems (teachers are coaches and facilitators).
4. Learners are only given guidelines for how to approach problems (there is no one formula for learner approaches to the problem).
5. Authentic, performance-based assessment (is a seamless part and end of the instruction).

The problem-based method assists learners in acquiring problem solving skills through the process of continually encountering the type of ill-structured problems they will confront within the environments in which they will be functioning after the planned learning activities have ended. According to Rhem (1998), the problem-based method can facilitate higher levels of comprehension, as well as social and knowledge-forming skills. Other benefits of the problem-based method include increased abilities to:

1. clearly define a problem,
2. develop alternative hypotheses,
3. assess, evaluate, and utilize data from a variety of sources,
4. alter hypotheses given new information, and
5. develop clearly stated solutions that fit the problem and its inherent conditions based upon information and clearly explicated reasoning.

While little has been written on the use of the problem-based method in online learning environments, it would seem reasonable to maintain that the Web could be a useful medium in the process. In particular, as aggressive problem-based learning

implementation requires access to ample information, the Web's vast resource base would be very useful. However, it is also possible that the challenges encountered implementing this method in face-to-face settings may become even more intense in online settings. A drawback of the problem-based method is that both learners and instructors may experience discomfort with it. Specifically, instructors often have a fear of "letting go of the helm" and learners often resist assuming greater responsibility. These kinds of problems tend to be magnified in online learning environments due to the transactional distance between and among learners and instructors. To be effective, both learners and instructors must be comfortable with moving from a structured, passive, information-transmission style of learning to a more active mode in which learners assume greater control and seek deeper understandings through a loosely structured format (Taylor, et al., 2000).

3. Decision-building learning. *Decision-building learning requires a position, conclusion or passing of judgment on an issue reached after generating the alternatives, evaluating the choices, and assessing the consequences.*

The most frequently suggested activity for supporting the decision-building process was the Delphi-technique. According to Korhnen (1991), the Delphi-technique as an instructional method is particularly effective when used in combination with the nominal group technique. Specifically, since the Delphi-technique demands closure, it is particularly effective at facilitating decision-building learning activities through the consensus process while using some of the stages of the nominal group technique to structure the learning activities. Seaman and Fellenz (1989) (see also Korhnen) describe the process as beginning with the presentation of a well-formed problem in the form of a question posed to the learners. Learners are then asked to individually generate and

prioritize their ideas about the problem solution. Once generated, learners publicly list their ideas and ranking through a round-robin process until all ideas have been exhausted. The instructor then asks the learners with extreme views to reconsider their responses. It is hoped that this kind of questioning and response presentation will prompt the learners falling outside the group consensus to reflect on issues they might have disregarded as insignificant. Those learners who continue to hold strong convictions are then asked to try to persuade the group to revise their responses in light of the rationale presented. If a convergence of opinion does not occur, then a voting system is initiated and a decision is forced through a numerical ranking process.

Hiltz and Turoff (1978) have argued that this instructional method is most effective in an online environment. In the initial stage of the technique, for example, computer mediated conferencing removes "the uneasiness that sometimes accompanies sitting around a table and looking at one another without talking" (p. 294). It also reduces the elapsed time between consensus rounds and increases the ability for the process to flow steadily and incrementally. Perhaps the most important benefit, however, is that computer mediated conferencing is capable of providing anonymity, which is one of the best techniques to prevent conformity to group pressures. Empirical research conducted by Sheffield and McQueen (1990) has shown that this technique is as effective online as in face-to-face with respect to expressed satisfaction on the technical and socio-emotional aspects and also supports Hitz and Turoff's belief that the process is less time consuming when using computer mediated conferencing.

Principle #5

Higher levels of learning typically include an assessment process that is personally meaningful to each learner. This principle includes the following three constructs: negotiated learning, instructive and performance based.

1. *Negotiated learning. Negotiated learning requires learners confer, advise, consult or discuss with another, or others, in order to exchange views to reach a decision, agreement or resolve differences in terms of assessment.*

Being involved in negotiated assessment gives learners shared ownership in their own learning. Inherent in shared ownership is that both or all give and receive input on the learning process resulting in partial possession by each person and all members of the group. According to O'Donnell and Caffarella (1991), negotiated learning (sometimes referred to as a learning contract) is "a formal agreement written by a learner which details what will be learned, how the learning will be accomplished, the period of time involved, and the specific evaluation criteria to be used in judging the completion of the learning" (p. 134). The primary purpose of negotiated learning is that it can be used to individualize the learning process (Renner, 1994). The advantages of negotiated learning are fourfold (O'Donnell & Caffarella, p. 139):

1. the flexibility of the approach makes it suitable for many learning experiences,
2. the learner is in control of the learning process,
3. it allows the development of instructional design skills by the learner, and
4. learners like the approach.

The survey participants indicated that, when appropriate (which is dependent upon the discipline and objectives), negotiated assessment could be effectively facilitated using the Web. Research has supported this view. For example, research by Marantz and England (1992) on conducting negotiated learning in online environments revealed that when using computer mediated conferencing it is possible to "achieve at least as much, and

often more, than what face-to-face [provides] by way of close collaboration and meaningful mutual learning." However, many of the survey respondents also indicated that there are some serious drawbacks to negotiated learning. In agreement with these data, O'Donnell and Caffarella outline the disadvantages as (p. 146):

1. discomfort with the unknown,
2. quality of the learning,
3. time pressures, and
4. not suitable for all situations.

A suggestion made on the survey to overcome some of the disadvantages was to use the SOLO taxonomy (Biggs, 1996) as a framework for negotiable contracting. The SOLO taxonomy is an orderly way of describing a hierarchy of complexity which learners show in mastery of academic work – arrived at through phenomenographic research by Biggs. The main strength of the SOLO taxonomy is its generality, which is not content dependent, making it useable across a number of subject areas. The SOLO taxonomy has five levels of sophistication, which can be encountered in learners' responses to academic tasks:

1. Prestructural – the task is not attacked appropriately, the student hasn't understood the point;
2. Unistructural – one or a few aspects of the task are picked up and used (understanding as nominal);
3. Multi-structural – several aspects of the task are learned but are treated separately (understanding as knowing about);

4. Relational – the components are integrated into a coherent whole, with each part contributing to the overall meaning (understanding as appreciating relationships);
5. Extended abstract – the integrated whole at the relational level is reconceptualized at a higher level of abstraction, which enables generalization to a new topic or area, or is turned reflexively on oneself (understanding as far as transfer and as involving metacognition).

Using this taxonomy can overcome at least two of the limitations of negotiated learning: discomfort with the unknown and quality of learning. Levels four and five, for example, can be seen to be qualitatively different from the lower levels in that they require the learner to integrate new knowledge and skills into a coherent structure, resulting in the construction of new knowledge, also a characteristic of higher levels of learning.

2. Instructive. *Assessment activities should be designed in a way where they will also be part of the instruction and, as such, can be used as a tool for personal growth. The result is that learners become less dependent on a reward system and assessment becomes more personally meaningful.*

According to Gibbs (in Taylor, et al., 2000), "many conventional assessment methods, including essays, unseen exams, and laboratory reports, allow students to take a surface approach or *even implicitly encourage and reward* such an approach" (p. 309). To move beyond the reward system, more authentic assessment activities tend to be effective at determining whether learners can apply their knowledge and skill to a real (or authentic) task – rather than recalling information, which does not determine whether learners can apply what they have learned. According to Brookfield (1992), "the only educational justification for evaluation is to assist learning" (p. 22). Based on this

rationale, Renner (1994) asserts that assessment activities should be integrated into every learning activity, irrespective of intended learning outcomes.

The survey participants indicated that instructional assessment could be facilitated in a variety of ways on the Web. For example, quoting the learners' contributions from the online transcripts for personal reflection can be effective as it encourages learners to use their own work as part of the instructional process. The most frequent example provided to make assessment part of the instructional process was through the use of embedded assessment. The assumption underpinning embedded assessment is that there are better ways than testing learners to determine what has been learned. When assessment is embedded in the learning process, it means that the authentic task is part of the ongoing instruction. Thus, learners who are engaged in an embedded assessment activity would appear to be doing an instructional activity – but the instructor is, in fact, using the process (or products of the process) to evaluate the learners' understanding and planning for further instruction. According to Shank (1992) (see also Simmons, 1994), alternative assessment – such as embedded assessment – provides a more holistic picture of the learners' understandings. This process is an emergent phenomenon, which is iterative, personal and ongoing. Web-based conferencing could be a very effective medium for facilitating embedded assessment. In particular, the presentation of archived messages could incrementally build on the learners' meaning-making process by providing ongoing formative feedback.

3. Performance based. *Assessment activities should involve a demonstration, exhibit, presentation, or performance in real conditions or authentic simulations.*

Jones, et al. (1996), argue that assessment activities that support engaged learning require learners to "demonstrate their knowledge and skills in authentic tasks, projects, or investigations" (Jones, et al., 1996). Similarly, Reeves (2000) maintains that performance based assessment focuses on the "learners' abilities to apply knowledge, skills, and judgment in ill-defined realistic contexts" (p. 107). In this sense, performance based assessment becomes generative in that the learners construct knowledge through the development of "real" products, services, performances or demonstrations for an audience that cares. Moreover, according to Jones, et al., "the plans, standards and criteria, products, performances, presentations, and debriefing are all instruction at the same time that they are assessment. And vice versa" (p. 10).

The survey participants indicated that the Web could be an appropriate medium for facilitating performance based assessment and using the Web to exhibit student work brings a wider audience for evaluation (e.g., peers, instructors, and experts in the field). These views are in keeping with related literature (see Collett, et al., 1999). Survey participants also indicated considerable success with presentations on the Web, as well as the use of Web-based learning portfolios. Learning portfolios are an instructional activity where learners are required to keep a record of their learning processes, typically based on a learning contract where the learners and instructors negotiate on pre-determined competencies. In a more general sense, Reeves (2000) describes portfolio assessment as "any method by which a student's work is stored over time so that it can be reviewed in relationship to both process and product" (p. 108). One survey participant suggested that portfolios could provide learners with an opportunity to be challenged to accomplish a task that is as close to a real world performance, or authentic activity, as possible.

Again, this is in keeping with related literature (Reeves & Reeves, 1997; Wielenga, Ritzen & Kösters, 2000). According to Wielenga, Ritzen and Kösters, portfolios are also effective at facilitating the following three functions:

1. As a tool to help learners become aware of required competencies, which, in turn, helps them evaluate their own process of development and keep a record of it.
2. As a tool to help learners keep a record of their personal curriculum, including successful learning practices, and goal achievements.
3. As a tool to help learners compile a showcase or curriculum vitae of material they have collected to provide evidence for assessment.

Benefits cited by Wielenga, et al. with Web-based portfolios include:

1. Through hyperlinks, learners can easily show the relationship between different parts of the portfolio and so demonstrate the coherence between different elements in the course.
2. Many learners find it motivating to present themselves on their own Web site.
3. It contributes to the necessary development of future technology skills.
4. Increases communication between and among learners and instructors.
5. Learners can continue to develop their portfolio after finishing their studies and can present themselves to future employers on their own homepage.

In this way the portfolio becomes an instrument in life-long learning. Most important, however, is its use as "an instrument belonging to the student; students use the portfolio to direct their learning process and to reflect on their development and growth" (Wielenga, Ritzen & Kösters, 2000).

Principle #6

Higher levels of learning require learners to assume greater responsibility in the learning process. This principle includes the following three constructs: set standards of excellence, thinking/learning strategies, and focus efforts.

1. *Set standards of excellence. Learners should take charge in setting standards of excellence, defining benchmarks, and selecting learning activities in ways that are meaningful, authentic, challenging, and multidisciplinary to address the phenomena presented.*

The survey participants suggested a variety of ways to help learners in setting standards of excellence, with the most frequent suggestion being self-assessment. Self-assessment involves "a range of different practices in which learners take responsibility for making their own judgments about their work" (Taylor, et al., 2000, p. 64). Typically, the process requires learners to work in collaboration with their instructor, practitioners, and peers; isolated and individual evaluation exercises do not foster self-assessment skills (Taylor, et al.). However, the individual learner does conduct the final assessment. In formal and credentialled settings, a rubric is often constructed as an instructor-led self-assessment tool (Jonassen, Peck & Wilson, 1999). Essentially a rubric is a self-assessment tool, which is particularly effective in evaluating criteria that are complex and subjective, and can be an important tool for effectively facilitating self-assessment. In specific terms, a rubric is a carefully designed ratings chart that is drawn up jointly by the instructor, learners, and – when possible – practitioners. It is possible to facilitate discussions between and among learners, instructors and practitioners to negotiate and/or set standards of excellence using Web-based conferencing.

The benefits of self-assessment have been cited as an active approach that involves the learners in understanding and formulating the criteria used for judgment which, in turn, improves the quality of the learners' work and, more importantly, helps

learners to assume greater responsibility for their own learning. The rationale supporting this assumption is that learners "have a ready-made checklist in their own language that they can use to judge the quality of their work. In addition, they have engaged in a process of questioning what counts as good work, thus becoming involved with deeper questions" (Taylor, et al., p. 65). According to Boud (1995), self-assessment can be used to:

1. self-monitor and check process,
2. promote good learning practices (learn how to learn),
3. self-diagnose and self-remediate, practice alternatives to other forms of assessment,
4. improve professional or academic practice, consolidate learning over a range of contexts,
5. review achievements as a prelude to recognize prior leaning, and
6. achieve self-knowledge and understanding.

It is important to mention that a number of survey respondents expressed concerns with having the learners set standards of excellence. The concerns expressed in the survey data are in keeping with the literature on self-directed assessment. Crowe (2000), for example, cites three major ethical issues in assessment of this nature:

1. learner readiness,
2. evaluation credibility, and
3. power issues.

To resolve these issues, Crowe suggests a middle ground that combines traditional assessment techniques with self-directed assessment techniques – such as triangulated assessment.

2. Thinking/learning strategies. *Learners should be able to draw on a number of ways to accomplish the learning objectives. A repertoire of thinking/learning strategies is essential to fully apprehend the multiplicity of complex problems.*

Related literature asserts that learners should learn how to learn and strive to develop and expand their learning and problem-solving strategies. In particular "the capacity for learning how to learn includes constructing effective mental models of knowledge even though the information may be very complex and changeable" (Jones, et al., 1996, p. 8). When learners acquire a variety of learning and thinking strategies, they can apply, generalize, and transfer knowledge to solve problems creatively. Moreover, they can make connections at higher levels of thinking and learning. The literature on the use of hypertext environments, such as the Web, is also in agreement with this rationale. Specifically, it has been argued that the Web is an excellent medium for helping learners to construct their own mental models. According to King (1996), hypertext environments can provide meaningful relationships between the mind and the nodes in ways that reflect how we think and, as such, can accurately represent our semantic interdependencies between concepts resulting in the facilitation of mental models.

The survey participants noted a variety of ways to facilitate this process on the Web. A number of suggestions were made with respect to how the Web can provide learners with a repertoire of learning and thinking strategies, given its ability to present issues and problems through a variety of media (e.g., text, audio clips, video clips, Java simulations) and a variety of learning methods (e.g., debates, role-plays, case studies,

brainstorming, simulation, etc.). Though the challenge tends to be in not presenting information using a variety of ways for learners to learn and think – rather, the challenge is to get them to *use* a variety of learning and thinking strategies.

3. ***Focus efforts.*** *Learners need to accurately evaluate their strength and weaknesses and determine where to focus their efforts to make the learning process personally meaningful.*

The survey participants pointed out that, when appropriate, establishing where to focus efforts can be effectively facilitated through online collaborative projects where students are forced to prioritize activities. Another example provided was through having students develop an online group project and present the project to the larger community where their feedback guides them in their assessment of where their efforts need to be focused. Literature on group learning is in agreement with these suggestions. Jones, et al. (1996), for example, maintain that collaborative learners need to articulate their ideas and be able to identify not only their own strengths, but also those of others. They also need to define the learning goals and have a holistic view of how their activities will relate to these goals. Likewise, Jonassen, et al. (1999) argue that the Internet's easily accessible and vast resource base offers self-regulated learners an unparalleled source for information. Moreover, "the intentionality is enhanced when a group of learners is committed to the same goals...there are a number of projects that have maintained students' focus by supporting collaborative meaning making among groups of learners" (Jonassen, et al., p. 37). In contrast, there is also literature on collaborative learning using the Web which has criticized the use of the Web for providing a platform which is too vast and non-structured resulting in learning which is unfocused due to many learners' inability to stay on-task when using the Web. This brings attention to the need for

instructors to clearly articulate the goals and objectives, as well as the means to facilitate these aims, to the learners at the onset of the learning activities. Ultimately, however, the key to being effective is related to the ability for the group to regulate each other's performance. This assumption was also articulated in the survey data.

Principle #7

Higher levels of learning typically require learners to build meaning into the issues and problems presented. This principle includes the following three constructs: making sense, generating relationships, reflective deliberation.

1. ***Making sense.*** *The learning process should require learners to compare, classify, induce, deduce, analyze, abstract and evaluate to make sense of the data or information presented.*

From the day we are born, we continuously seek to make sense of what goes on around and within us. As we grow, this meaning making process takes on more complex forms including testing conclusions, making judgments, examining feelings, exploring perspectives, assigning significance to ideas, and noticing the importance of what had seemed inconsequential (Taylor, et al., 2000). Bruner (1990) maintains that we make sense of our environment from experiencing phenomena and interpreting those experiences based on what we already know, reasoning from them, and reflecting on the experiences and the reasoning. Similarly, Mezirow (1990) asserts that "to make meaning means to make sense of an experience" (p. 1). According to Kegan (1982), we are makers of meaning: "it is not that a person makes meaning, as much as the activity of being a person is the activity of meaning-making" (p. 11). Cranton (1996) further asserts that this process is influenced by "personal beliefs and values as well as norms and expectations derived from the sociocultural context" (p. 85). As such, an essential aspect of meaning making is to critically reflect on the process of meaning making itself.

The survey participants suggested that there are a number of ways to facilitate meaning making using the Web. One suggestion was to have learners access related Web sites with a focused perspective and then have the instructor play "devil's advocate" (presenting an alternative perspective in a confrontational manner) in Web-based discussions. The aim of this activity is to force students to carefully analyze the argument presented on these Web sites and to make sense of it from alternate views. Another suggestion was through the use of "starter-wrapper" activities on the Web where students start a discussion, as well as wrap it up. As a starter, the learner is to read a section of the required course material before the rest of his/her classmates, and then write a 200-500 word summary of this chapter and any supplemental instructor handouts. As a wrapper, the student is to provide a 200 or more word summary that connects together, synthesizes, and interrelates all the discussion for that week using Web-based conferencing.

2. Generate relationships. *Learners should be encouraged to be generative, which includes the ability to originate, transform, reshape or reinterpret new information through a different scheme or structure resulting in new understandings.*

With respect to the Web, it has been argued that hypertext environments are effective at facilitating higher levels of learning because they force learners to generate meaning out of the vast amount of information that can be accessed. Specifically, in order to make meaning from the large amount of information, learners are forced to search for patterns (sequencing, prioritizing, categorizing, summarizing, and analyzing) and make meaningful relationships (synthesizing and evaluating). Moreover, when learners are actively engaged in this process the result is the development of higher order thinking skills. The rationale behind these claims is varied. Marchionini (1988), for

example, argues that with its linking capability, hypertext can generate explicit relationships that can detail, clarify, support, refute, define, or illustrate ideas among and between concepts. Likewise, Kearsley (1988) has argued that hypertext can provide a better learning environment as it directs focus to the relationships between ideas and not isolated concepts. According to Jonassen, (1988), the Web appears to be a promising technology that can depict and display relevant knowledge structures.

The participants provided a number of suggestions on how to facilitate the process of generating relationship when using the Web. One example was to have learners access related Web sites on a regular basis and write reflective papers. In these papers, learners must demonstrate that they are generating relationships from the linked information and thinking critically about what they are learning. Another means to facilitating this process is to present links to Web-based databases. Linking to Web-based databases followed by activities where learners interpret the data can help generate relevance and make information meaningful. For example, a suggested activity was to present links to Web-based databases and have the learners construct rules or a classification system, which is based on their observed patterns, resulting in generalization and transference that results in the generation of relationships. Another way to help learners generate relationships is to have them compare and contrast different Web-based databases and infer the effects of a variable(s).

3. ***Reflective deliberation.*** *Learning should be characterized by thoughtful mediation or contemplation that uses the powers of the mind to conceive ideas and/or draw inferences resulting in the expression of carefully considered thought expressed through critical dialogue.*

Laurillard (1993) has articulated the need for reflective deliberation in academic learning. According to Laurillard, there are, essentially, two ways to construct knowledge: through experiencing phenomena (real life experiences) and through reflecting on abstracted phenomena (academic knowledge). If the process of knowledge construction is to be effectively facilitated through academic knowledge, it must be meaningful to the learners; information is made meaningful through reflecting on the relevance to one's world. Yet it is impossible for most instructors to present learners with unique and personally relevant phenomena that are grounded in each of their learner's worlds. Given these constraints, instructors typically present information through rhetorical discourse and text (descriptions of phenomena). In turn, learners must then be able to reflect on the abstracted material presented and make it relevant to their own worlds. To do this, learners must be able to generalize and transfer abstracted information, act on it, and then reflect on their actions. Their reflections must be articulated through language and presented for reasoning, evaluation, feedback and improvement. Hence, both teaching and learning are rhetorical activities. Based on this argument, the process of meaning making in academic environments, then, must be about how to conduct reflective rhetorical activities, which requires skill in using language effectively and persuasively. Instructors must begin this process by using language in ways that help their learners make meaningful relationships between their worlds and the material presented. When abstracted phenomena are presented using language that is effective and persuasive, it facilitates the relevancy, thereby creating the conditions for learners to make meaning of the information presented. Alternatively, learners must be

able to clearly articulate their position, arguments, and interpretation – or reflectively deliberate – on the phenomena presented.

The participants suggested requesting learners to reflect using Web-based conferencing forces many learners to express their views and opinions carefully. Specifically, threaded conferencing software results in reflective deliberation due, precisely, to a posting's permanency and availability for others to view, refer to, and quote. One example suggested was to allow students to reflect on their field or practice experience in comparison to the current literature or information presented by the instructor. This can be facilitated through scaffold discussion and personal reflections of how one may have witnessed or experienced various concepts in practice. Such activities help students understand the diverse, as well as common, ways in which the issues and problems presented are applied in the real world.

Principle #8

Higher levels of learning typically require learners to understand that their own world view is not the only one (nor necessarily the correct one). This principle includes the following three constructs: empathy, negotiable meanings, diversity.

1. *Empathy. It is not enough for learners to know and understand their own worlds; they need to know and understand others. To do so, is to have the ability to reconstruct meanings.*

Learners should be able to identify with others and be understanding of their situations, feelings, and motives resulting in the valuing of diversity and the multiplicity of perspectives. Based on the literature by Jones, et al. (1996), learners should work with others of distinct and different characteristics, abilities, cultures and backgrounds. Specifically, "groups that include males and females and a mix of cultures, learning

styles, abilities, socioeconomic status, and age bring a wealth of knowledge and perspectives to authentic, challenging tasks" (p. 12).

Comments provided by the survey participants suggested that being empathetic of others worldviews may be easier in a Web-based environment, as there may be a broader span of cultures represented through the medium. It was also noted that an effective way to facilitate learners to become empathetic of others' worldviews is through online role-playing. According to Renner (1994), the primary purpose of role-playing is to offer learners the ability to practice the unfamiliar in a safe environment, and acquire a variety of contradictory viewpoints. Other literature on online role-playing also supports this opinion. Collett, et al., (1999) for example, argue that online role-playing can provide an opportunity to expose learners to a variety of perspectives by asking them to assume the role of others with different view points from those with which they may be familiar. There is also literature to support the view that this instructional method addresses students' divergent learning in Web-based environments (Bonk & Reynolds, 1997; Paulsen, 1995). According to Hiltz and Turoff (1978), role playing is one of the most promising instructional methods for computer mediated conferencing. Specifically, they maintain that role playing could probably be done more authentically through computer mediated conferencing than in some of the face-to-face activities, "especially if the students were not able to tell which of the other players were student, faculty, or real-life jobholders playing at their convenience from their own terminals" (p. 309). Collett, et al. also note that role-playing may be more effective in online environments, but for different reasons. Their rationale is that learners are frequently uncomfortable when asked to assume a role in front of their co-learners. Physical characteristics such as age

or gender can also be difficult to overcome in that participants and observers may find they relate to the real person rather than the character being portrayed. When conducted online, learners can be provided with pseudonyms (or alias emails) so that co-learners know each other only as the characters they have been asked to portray. This temporary anonymity not only helps students to play their roles more convincingly, but also helps them – through the role playing – to acquire an understanding of others' worldviews.

2. **Negotiable meanings**. *Learning at a higher level is frequently not about discovering more, but about reshaping or transforming new and existing knowledge. Typically, this is a socio-linguistic process where language is used to negotiate meanings that result in shared understandings. This requires an equitable environment so that the learners can deliberate through discussion with another, or others, in order to negotiate meanings with an equal voice.*

The participants suggested that, whatever the activity, Web-based conferencing was an excellent medium for sharing views. It would seem that Web-based conferencing is a particularly effective medium for this process because the Web does not show the students' skin color, age, height, gender, culture, socioeconomic status, etc. The result is a leveling of the environment that can support more equitable contexts for sharing views. An example from the survey data on how to facilitate the sharing of views and negotiation of meanings included the use of peer support activities (e.g., Teacher Institute for Curriculum Knowledge about Integration of Technology, Bonk, 2000). These kinds of activities require students to share their projects with their peers online, and their peers respond with critiques, suggestions, and support. Another example suggested was the use of case studies followed by open-ended questions, which can be effective at facilitating students to negotiate and develop solutions.

While not supported in the survey data, literature has suggested that brainstorming is an effective medium to create an equitable environment that is necessary for the negotiation of meaning. Jones, et al. (1996) for example, argue that "knowledge-building strategies – such as brainstorming – pool the knowledge and experiences of the group, thereby creating more equitable learning conditions for everyone and giving everyone access to the aggregate knowledge" (p. 11). Hiltz and Turoff (1978) suggest a modification of the brainstorming method for online environments: brainwriting. Brainwriting can be adapted to computer mediated conferencing through writing down an idea and sending the message to a co-learner, who must add to it. The message is posted to co-learners until everyone has commented. Collett, et al. (1999) have also suggested that brainstorming can be effectively facilitated with online conferencing systems. However, they note that one of the characteristics of brainstorming is a spontaneous and rapid pooling of ideas. The time lag inherent in asynchronous text-based interaction can interfere with this process. There is also a tendency in asynchronous interactions to skip over the generative portion of the activity and move into the discussion phase too soon. They suggest that in order to create a sense of synergy in the online environment, synchronous text-based interaction should be used, as synchronous discussions can foster much of the same sense of excitement and dynamic synergy necessary for brainstorming to be effective.

3. *Diversity. To achieve shared understandings, learners must value diversity. This process can be facilitated when learners work with others of distinct and different characteristics, abilities, cultures and backgrounds.*

For this construct, the participants suggested that when heterogeneous groupings are used, students have a tendency to gain a wider perspective on the issues and problems

presented – resulting from the diverse opinions of the group participants. Literature has tended to support this view (Millis, 2001). While there was consensus on the survey that this is an important construct, the comments indicate that this is "easier said than done." It was stated that it is often difficult to form diverse student groupings for two reasons. First, given the textual nature of the Web as a communication medium, it is often difficult to ascertain each student's unique characteristics (e.g., age, gender, skin color, religion, etc.). Second, those students who participate in higher education tend to have similar characteristics and values. Given these two factors, it is often difficult to facilitate heterogeneously grouped learning activities on the Web.

Nonetheless, examples were provided. One suggestion offered was to have the students complete an online learning styles inventory and have the computer automatically select students with different learning styles for group work. However this suggestion would require instructors to have access to an online learning styles inventory program or to have the necessary skills and time to develop such a program. A more practical suggestion made is to have students work in heterogeneous groupings. While acknowledging that this kind of grouping may be difficult in online environments, requesting students to post a biography as an introduction at the onset of the course could also be used to obtain the necessary information for heterogeneous groupings. In agreement with this suggestion, Harasim, Calvert, & Groeneboer (1997) suggest, based on their analysis of data collected over ten years, that this kind of online activity can effectively support diversity of views "specifically through input from all the other online students as well as the instructor" (p. 151). Khan (1997) claims further that the Web allows learners to communicate with others from all over the world. In particular,

learners not only benefit from diverse perspectives of the subject matter, but they also serve as representatives of their own cultures. "The ability to explore and learn about distant cultures and civilizations is facilitated through the Internet. Learners are not limited to individual authors', editors', or instructors points of view" (p. 13). Collis and Remmers (1997) also maintain that the Web is leading to an increase in cross-cultural online communication and interaction.

Principle #9

Higher levels of learning typically require learners to provide evidence of new understandings and ways of thinking. This principle includes the following three constructs: new perspectives, articulating assumptions, and learning strategies.

1. *New perspectives. Acquiring new perspectives requires the ability to understand that there is more than one worldview; it also requires the ability to understand that there may not be a correct one. Rather, there are many worldviews.*

In formal (credentialled) learning environments, learners should be provided with opportunities to demonstrate that they have acquired new and/or multiple perspectives of the phenomena presented. The survey data indicated that there was good consensus for this construct followed by supporting comments. One respondent remarked, for example, that learners should be provided with the opportunity to write about their experiences (where students individually reflect on what the material meant to them) in a summative way so instructors can check for understanding. The survey data also revealed that there are a number of ways that this process can be facilitated using the Web, with the most common example being online presentations and reflective papers.

Presentations usually involve a process where learners are typically responsible for researching a topic and then for presenting their findings to their co-learners. The presentations are generally followed by a discussion of the material presented and could

be enhanced by having small groups of students prepare the presentation. According to Collett, et al. (1999), presentations are well suited to the Web. If the learners are working in groups, they can prepare for the presentation collaboratively through Web-based conferencing and post their material on a Web page. They can then moderate the ensuing discussion and conclude with the student(s) summarizing the discussion. Alternatively, reflective papers (sometimes also referred to as journaling and learning logs) are objective records of events or subjective accounts of impressions. The main purpose of a reflective paper is to help learners make connections between the course material and practice, and to provide an opportunity for the students to record multiple experiences or perspectives acquired during the learning activities. According to Collett, et al., one of the main drawbacks with reflective papers is that learners frequently perceive them to be "busy work." The reason for this being, very often, is that the purpose is not fully explained. Furthermore, as reflective papers are an individual activity, the Web is not well suited for this kind of activity. Rather, word processing software is typically used for reflective papers and submitted to the instructor via an email attachment or as a paper-based assignment. However, reflective papers can also be a collective, or group-based, activity. In this situation, Web-based conferencing could be an appropriate platform for the development of a collaborative reflective paper.

2. Articulating assumptions. *Higher levels of learning often require learners to carefully examine something; that something may include the self. Restated, higher levels of learning require learners to not only reflect about the multiplicity of perspectives on the material presented, but to also reflect on how they are thinking about what they believe, what others believe, and whether their own – or others – actions reflect their beliefs.*

The survey data indicate that this process can be difficult in conventional settings, but even more difficult in Web-based instruction. The problem appears to stem from many learners who "just want to post and be done." While acknowledging that this process is difficult, there are ways that can facilitate this process. One example from the survey data was through providing a contentious or a controversial view on the issues or problems presented and then challenging the learners' current assumptions. Of course, this process would require that the instructor know the learners' current assumptions. Unfortunately, as was noted, this is not always the case and can be difficult to determine – especially in an online environment. Another example provided was through the use of a repertory grid. Repertory grids were originated by George Kelly (1955) and further developed by Philip Candy (1990) for assessing aspects of one's value system. As a learning activity, the purpose of repertory grid development is to raise the level of awareness of a learner's assumptions, as well as a platform for "conscious analysis of those assumptions toward greater self-understanding" (Taylor, et al., 2000, p. 50). Essentially, a repertory grid is an attempt to selectively sample a learner's frame of reference. In its simplest form, it consists of presenting the learner with three items from an array of qualitatively similar elements (e.g., situations from which learners have learned, books they have read, teaching methods experienced, etc.). The instructor then asks the learners to describe in what ways the elements are similar and different. This process is repeated a number of times with different combinations of elements (referred to as triads), producing a series of bipolar descriptors that can be used by the learners to differentiate the items in the array – not just the three used to generate the original grid. The result is a two-way matrix with constructs down one side and the elements on the

alternate side. At this point the learners give a rating to each construct. This process, according to Candy (1991), is a particularly powerful way to enable learners to surface and examine hidden assumptions. Taylor, et al. assert further that, although the main focus of the repertory grid is for personal transformation of perspectives and worldviews, "the end result can be a community where reflective self-awareness is the norm and where people, individually and collectively, are free to become masters of their own destiny" (p. 54). It seems possible that the discussions between the instructor and learners – which is necessary to facilitate the construction, reconstruction, and ratings of the constructs – could be effectively facilitated through Web-based conferencing systems.

3. ***Learning strategies.*** *Learners should be required to provide evidence of their ability to develop and use a variety of learning strategies to produce meaningful understandings.*

When learners can use diverse strategies to learn they, in turn, have the tools to help them understand multiple and conflicting phenomena in order to construct knowledge and produce meanings. Alternatively, instructors need to provide opportunities for learners to demonstrate their ability to use a variety of learning strategies to produce meaningful understandings. According to Jones, et al., (1996), the capacity for learning how to learn includes knowing how to learn in ways that are strategic. This includes knowing how to learn and continuously adapting to the situation to develop and refine a variety of learning strategies: "This capacity for learning how to learn includes constructing effective mental models of knowledge even though the information may be very complex and changeable" (p. 8).

The data from the survey indicate that some participants hold the opinion that Web-based learning does not give the same opportunity for students to demonstrate a

wide range of learning strategies, as does a face-to-face class. For those who agreed that this construct could be facilitated on the Web, there was similarity within the examples provided. The basic gist of most of the comments for those who agreed with this construct was that in order for students to demonstrate their ability to use a variety of learning strategies, instructors must provide a variety of online instructional activities. Paulsen (1995) has developed an online document that describes in detail how to use a variety of instructional methods with computer mediated conferencing. To assess a learner's ability to use a variety of learning strategies, it was suggested that learners be given the opportunity to write about their experience and feelings in a summative way and submit the summary at the end of each standard unit within the course structure. This process is easily facilitated using Web pages that have text boxes with submit forms.

Summary

The open-ended sections of the survey were a most valuable aspect in helping to further our understandings about how to facilitate the principles and corresponding constructs in a Web-based distance environment. Following provides a few highlights of the examples presented for each of the principles.

Based on the participant responses, active and purposeful presentation of complex abstracted phenomena (principle 1) can be facilitated on the Web through the use of case studies, collaborative group project work, and a variety of teaching methods such as voting, gallery tours, brainstorming, semantic webbing, concept mapping, critiques, round robins, gallery tours, discussion groups, learning logs, role-play, nominal group processes, panels, jigsaws, and forums. Multiple perspectives (principle 2) can be facilitated on the Web through guided thematic criss-crossing, online debates, and

hypertext links. Providing relevance (principle 3) to the learners on the Web can be achieved through invited guests/experts, case histories, and guided discussions. Diverse ways of thinking (principle 4) can be facilitated on the Web through WebQuests, problem based methods, and the Delphi-technique. Negotiated learning (principle 5) can be facilitated on the Web through learning contracts, embedded assessment, and learning portfolios. Encouraging learners to assume greater responsibility (principle 6) can be facilitated on the Web through the use of rubrics, a variety of Web-based media (text, audio clips, video clips, Java simulations), and collaborative projects with prioritized activities. Learners can be encouraged to build meaning into the problems presented (principle 7) on the Web through starter-wrapper activities, reflective papers, and scaffold discussions. Learners can be encouraged to understand others' world view (principle 8) on the Web through online role-playing, heterogeneous collaborative group projects, and brainstorming. Learners can provide evidence of new understandings (principle 9) on the Web through online presentations, repertory grids, and a variety of online instructional methods.

Reflections

This section includes my reflections about the research process, what insights were gained with respect to advancing distance education theory, and possible problems with the implementation of these guiding principles in post-secondary institutions.

The purpose of this study was to develop guiding principles that can be used to facilitate higher levels of learning in a Web-based distance education environment. To achieve this purpose, I sought to understand the phenomena that account for what is

known about facilitating higher levels of learning, as well as the inferred properties of the Web as a learning platform. In an effort to identify these elements, it became apparent that there was a need to expand our perspectives of teaching and learning beyond what occurs in traditional face-to-face classrooms. In particular, there is sufficient evidence to suggest the established learning environments, which we are most familiar with, are currently shaping the use of the Web. Yet, many of the traditional face-to-face teaching and learning methods do not make use of the unique properties inherent in the Web's hypertext platform that can facilitate higher levels of learning. Hence, a major barrier to facilitating higher levels of learning when using the Web appears to stem from our own inability to move our thinking beyond our existing practices. To help move my thinking outside established face-to-face classroom activities, I used Zetterberg's model for problem solving and change.

The use of Zetterberg's model served as a useful framework for this process. The framework provided a structure that was controlled and systematic yet had enough flexibility within the steps and structure to adapt to the changes that occurred throughout the study. For example, the aim of this study was originally concerned with not only learning and teaching issues, but also managerial and technical issues. However the individual instructor interviews, and corresponding member checks in step two, revealed that managerial and technical issues were not in need of further investigation. Specifically, many of the instructors selected for the interview had backgrounds other than distance education and little – if any – prior experience in online learning. The results of the interviews revealed that the instructors new to online learning were initially very concerned with adapting to, or coping in, this new environment. A comment made

by one participant at the end of the interview reflects this shared perspective: "*For me, it* [online learning] *was like trying to find my way around a new classroom and trying to figure out how to do the things I do in my face-to-face classroom, and to do so as effectively.*" As this quote indicates, many of the interview participants were focused on "*figuring it out.*" However, during the member checks it became evident that many of the managerial and technical problems discussed in the interviews were not problems or issues in subsequent online courses that these instructors taught. One participant, for example, made the following comment during the member check: "*Did I really say that? Well, now that I've done another online course I'd have to say I don't really see that as a concern anymore.*" Thus, the member checks revealed that the teaching and learning issues were ongoing concerns while the managerial and technical issues were temporary and dissipated once the instructor could figure out how to cope in this new environment. Perhaps equally important, this example provides us with a reminder of the value of doing a member check!

With respect to the use of Zetterberg's framework, I found I could easily change the focus to adapt to this change (focusing only on teaching and learning). In this respect, this study contributes to the literature in the model building process by providing evidence that Zetterberg's steps to problem-solving and change is not only a functional, but also a flexible model.

In addition to accommodating the changes that evolved, the diverse sources of data collection suggested by Zetterberg in steps one, three and five also provided greater reliability of the results. For example, there were two participants in the focus group who dominated certain aspects of the discussion resulting in a limitation of the findings, and

calling into question the first validation phase. However, because there was a two step validation process (the second being the consensus survey), the second validation process ensured that the findings between the focus group and consensus survey were consistent. The outcome was a greater reliability of the data collection process. Similarly, the interquartile ranges on the consensus survey served little value with respect to validation of the constructs presented. Specifically, while almost all survey participants "agreed" or "strongly agreed" with the Likert-type questions, the open ended sections of the questionnaire indicated that there were conditions under which there was disagreement with the constructs.

One aspect of this study that I found troubling was something that was said in the focus group interview. An objective of the focus group was to draw out examples of how to actually apply the guiding principles to the teaching and learning process. We can see in the data analysis section that a few examples were provided (i.e., case studies and simulations). Trying to draw out other examples was difficult and finally one participant stated: "*Perhaps we are not there yet.*" This is a comment that I continue to find unsettling. Specifically, if we are "not there yet" in facilitating higher levels of learning in Web-based distance education, then the question that begs to be asked is "should we be offering Web-based distance education at a university level?" Fortunately, the data from the consensus survey provided many useful examples of how to apply these principles, indicating that there are educators using the Web who "are there." However, there is a second unsettling question that follows the first: "if educational technologists and instructional designers are "not there yet," should they be helping university professors in designing their online learning?" This question brings us back to the problem that was

stated in the first chapter (chapter 1; p. 6): *There is a need to provide guidance in the development of distance teaching and learning activities in ways that effectively uses the Web's unique hypertext platform to support flexible and creative exploration and diverse instructional methods necessary for higher levels of learning.* Moreover, this question also supports Ryder and Wilson's (1995) argument that theory and practical knowledge about Web-based instruction lags behind the technology. The results of this study mark an important step in not only providing guiding principles for facilitating higher levels of learning, but also in helping to close the gap between our understanding of how to use the Web as a technology and as a learning medium.

Finally, the relationships between the results of this study to distance education theory must be reflected upon. As described in the literature review, Michael Moore's theory of transactional distance, which builds upon the work of Charles Wedemeyer, Otto Peters, and Börje Holmberg, is one of a few well-developed, pedagogically based, theoretical frameworks. Randy Garrison, Doug Shale, and Myra Baynton have since built upon this theory and have also made significant contributions. The central premise upon which the theory of transactional distance rests is that distance education is a pedagogical phenomenon with a separation between learners and instructors. What is of concern in this theory is the effect that this separation has on the instruction, the learners, the instructors, the curriculum, and the management of the program (Moore & Kearsley, 1996). The emphasis is on practical outcomes through the development of policies and/or strategies to overcome these separations through instructional design and interaction procedures. While the outcomes of this study are consistent with the need to focus on the pedagogical phenomena, such as instructional design and interaction, they

are inconsistent with the need to overcome the separation between instructors and learners. Although it should be noted that in Moore's theory of transactional distance the kinds of separations that occur between the learners and instructors are not articulated in specific terms (e.g., separation temporal, psychological, cultural, geographical, etc.) Irrespective of the kinds of separation, the data in this study did not reveal a concern for the effects that separation has on the instruction, the learners, the instructors, the curriculum, and the management of the program. Rather, the findings in this study tend to be more consistent with Haughey's (1995) observation that the separation of the instructor and learner, commonly viewed as a "difficulty to overcome," may not be a difficulty at all. Furthermore, viewing separation as a problem tends to overlook the opportunities that distance education can afford the learners, the instructors, and the institutions.

The findings in this study are also somewhat inconsistent with Holmberg's (1989) theory that friendly conversation is the defining characteristic of effective distance education and Garrison and Shale's (1989) framework that places sustained real two-way communication at the core of educational experience, regardless of the separation of the instructor and learner. While the results of this study indicate that two-way communication and conversation are important, the data also indicate that these are not sufficient activities to facilitate higher levels of learning. There is no question that the role of dialogue (i.e., sustained two-way communication and/or conversation) is essential to the interpretive process of meaning making and knowledge construction – and can be developed through group talk among the learners and the instructors. Notwithstanding, the results of this study also indicate that sustained two-way communication and

conversation will not necessarily, in and of themselves, result in higher levels of learning. Rather, achieving higher levels of learning rests on a combination of variables that includes both individual and group learning. Alternatively, the results of this study are more in keeping with a later publication by Garrison (Garriosn & Archer, 2000), which argues that group and individual learning reflects a more complete picture of the learning process. This view is also in agreement with the writing of Anderson, Greeno, Reder, and Simon (2000) who maintain that "individual and social perspectives on activity are both fundamentally important in education" (p. 11). However, the findings of this study probably align most closely with Laurillard's (1996) conversational framework, which recognizes that teaching is a discursive, adaptive, interactive and reflective process. The results of this study not only support Laurillard's framework, but also builds upon it by adding a learning dimension (responsibility, meaning making, reconstruction, and evidence of new knowledge). The result is the system of events in the teaching/learning process.

In terms of Moore's argument of the relationship between structure and dialogue versus learner autonomy, the outcomes of this study may support this argument. Specifically, the principles in this study indicate a need for learners to assume greater responsibility and participation in task selection. However, it is difficult to be certain if this is a strong connection, as Moore's theory does not provide a clear definition of learner autonomy leaving it unclear whether "learner responsibility" is the same as, or a characteristic of, "learner autonomy."

Recommendations for Further Research

Facilitating higher levels of learning in a Web-based distance education environment is not yet well understood. This study argued that the use of a model that encompasses guiding principles can help to clarify our understandings by creating a conceptualization of the system of events without attending to each and every detail – or to see the big picture. An outcome of this study was a representation of the system of events – or the big picture (Figure 3; p. 104) – which occurs in the teaching/learning process. It encompasses the elements (principles and constructs) necessary for higher levels of learning and their interrelationships based on the data collected in this study. It is hoped that this model is capable of representing a Web-based distance learning environment that delineates the principles of teaching and learning as being relevant and makes explicit the relationships among these elements in order to facilitate higher levels of learning.

While the results of the focus group and consensus survey validated the constructs of teaching and learning as essential to the facilitation of higher levels of learning in Web-based distance education, it remains unknown if these principles are functional and practical. As such, the model (Figure 3, p. 104) is still in need of further research. In the end, the usefulness of a model rests in its ability to provide a conceptualization of the real world and its demonstrative, descriptive, and predictive powers by those for whom the model is intended (Stogdill, 1970). As models are constructed to explain the world in simplified terms, the primary value of a model, then, is in its ability to exploit and use it in the quest for a solution of an unresolved question. Further research is needed to determine if the model achieves this aim through an investigation of perceived usefulness by distance practitioners and researchers.

Conclusions

The outcomes of this study extend our understandings of the learning process in the areas of distance education theory, higher levels of learning and Web-based instruction. First, as described in the reflection section, the principles developed in this study make a contribution to our ongoing desire to seek the right mix between structure, dialogue and learner autonomy, as well as provide a greater understanding of the roles of these variables in the facilitation of higher levels of learning. Second, the two-step validation process of the constructs in this study marks a first step in providing empirical evidence of elements that facilitate higher levels of learning in a Web-based distance education environment. Finally, the examples provided in the open-ended sections of the consensus survey contribute to our understandings of the learning activities that can effectively facilitate higher levels of learning in a Webbed environment.

Few would argue against the view that educators need to use theoretical principles of learning to guide instruction. However, in agreement with Lanza (1991), it is not easy to apply theoretical principles to practice. As such, how easily the principles of this study can be applied is in need of investigation. In particular, while the model presented in this study represents a distance education environment that delineates certain principles as being relevant to higher levels of learning, many of the principles and constructs can be interpreted and understood in a variety of ways – as is evident by the data collected in the open-ended sections of the consensus survey. Moreover, many of the policies and regulations currently governing post-secondary institutions may act as barriers to the implementation of certain principles developed in this study. For example, proctored

exams are mandatory in many undergraduate courses, making some of the alternative assessment strategies suggested in the survey data difficult to implement.

However it is likely that the most insurmountable barrier may be imposed on us by ourselves, through our inability to let go of a desire to replicate traditional and established learning environments and an ensuing obsession to prove there is no significant difference.

REFERENCES

Alexander, S. (1996). Teaching and learning on the world wide Web. *Proceedings of AusWeb '97* [On-line]. Available: http://elmo.scu.edu.au/sponsored/ausWeb/ausWeb95/papers/education2/alexander/

Allen, T. H. (1978). *New methods in social science.* New York, NY.: Praeger.

Anderson, J. R., Greeno, J. G., Reder, L. M., & Simon, H. A. (2000). Perspectives on learning, thinking, and activity. *Educational Researcher, 29*, 4, (11-13).

Anderson, T., Picard, J., & Kanuka, H. (1999). *Distance and distributed education task force report.* Edmonton, AB: University of Alberta.

Asher, J. W. (1976). *Educational Research and Evaluation Methods.* Boston: Little, Brown and Company.

Banks, K. (1998). *Chickering and Gamson's seven principles of good practice.* [online]. Available: http://www.kelley.iu.edu/isWeb/teachln/gd-prin.htm

Barrows, H. (1985). *Designing a Problem Based Curriculum for the Pre-Clinical Years.* New York: Springer Publishing Company.

Bates, A. (1998). *Developing, designing and delivering technology-based distributed learning.* [online]. Available: http://itsm.scstudies.ubc.ca/565f/canada/block1/distrubted.html

Bates, A. W. (1995). *Technology, open learning and distance education.* New York: Routledge Studies in Distance Education.

Bates, T. (1997). The future of educational technology. *Learning Quarterly, (1)* 2, 7-16.

Bates, T. (1998). *What is distributed learning.* [Online]. Available: http://itesm.cstudies.ubc.ca/565f/canada/block1/distributed.html

Beadle, M. E. (1996). Strategies for a communication course using the Internet. *Techtrends, March,* 17-20.

Bendar, A. K., Cunningham, D., Duffy, T. M. & Perry, J. D. (1992). Theory into practice: How do we Link? In T. M. Duffy & D. H. Jonassen. (Eds.), *Constructivism and the technology of instruction: A conversation* (pp. 18-34). Hillsdale, NJ: Lawrence Erlbaum Associates, Publishers.

Bereiter, C. (1992). Constructivism, socioculturalism, and Popper's world 3. *Educational Researcher, 23*(7), 21-23.

Berenfeld, B. (1996). Linking students to the infosphere. *T.H.E. Journal, 23,* 76-83.

Berge, Z. L. (1995). Facilitating computer conferencing: Recommendations from the field. *Educational Technology, 35*(1), 22-30.

Berge, Z. L. & Collins, M. (1995). Computer-Mediated Communication and the Online Classroom in Distance Learning. *Computer Mediated Communication Magazine, 2*(4). [online]. Available: http://www.ibiblio.org/cmc/mag/1995/apr/berge.html

Berners-Lee, T. (1990). *Information management: A proposal* [Online]. Available: http://www.w3.org/pub/WWW/History/1989/proposal.html

Berners-Lee, T. & Cailliau, R. (1990). *World Wide Web: Proposal for a hypertext project* [Online]. Available: http://www.w3.org/pub/WWW/Proposal.html

Bernhardt, S. A. (1993). The shape of text to come: The texture of print on screens. *College Composition and Communication, 44*(2), 151-175.

Biggs, J. (1996). Enhancing teaching through constructive alignment. *Higher Education, 32,* 347-364.

Blanchette, J. (1999). Textual interactions handbook: Computer mediated conferencing. In D. Collett (Ed.), *Learning Technologies in Distance Education* (pp. HB65-HB96). Edmonton, AB: University of Alberta Press.

Bloom, B. S. (1956). *Taxonomy of educational objectives: Cognitive Domain.* NY: David McKay.

Bonk, C. J. (2000). *Teacher Institute for Curriculum Knowledge about Integration of Technology.* [online]. Available: http://www.indiana.edu/~tickit/

Bonk, C. J. & Reynolds, T. H. (1997). Learner-centered Web instruction for higher-order thinking, teamwork, and apprenticeship. In B. Khan (Ed.), *Web-based Instruction* (pp. 167-178). Englewood Cliffs, NJ: Educational Technology Publications.

Bonwell, C. C. & Eison, J. A. (1991). Active Learning: Creating excitement in the classroom. *ERIC Digest.* ERIC Clearning House on Higher Education, Washington, D.C.: George Washington University, Washington, D.C. (ERIC Document Reproduction Service No. ED340272). [online]. Available: http://www.ntlf.com/html/lib/bib/91-9dig.htm.

Borsook, T. & Higginbotham-Wheat, N. (1991). Interactivity: What is it and what can it do for computer-based instruction? *Educational Technology, 31*(10), 11-17.

Boud, D. (1995). *Enhancing learning through self-assessment.* London: Kogan Page.

Boyd, R. & Apps, J. (1980). *Redefining the discipline of adult education.* San Francisco: Jossey-Bass.

Brindley, J. E. (1995). Learners and learner services: The key to the future in open distance learning. In J. M. Roverts & E. M. Keough (Ed.), *Why the Information Highway? Lessons from Open and Distance Learning* (pp. 102-125). Toronto, ON: Trifolium Books.

Brown, J. S., Collins, A., & Duguid, P. (1989). Situated cognition and the culture of learning. *Educational Researcher, 18,* 32-42.

Brookfield, S. D. (1992). Giving helpful evaluations to learners. *Adult Learning,* June, 22.

Brookfield, S. D. (1991). Discussion. In M. W. Galbraith (Ed.), *Adult Learning Methods* (pp. 187-204). Malabar, FL: Krieger Publishing Company.

Brookfield, S. D. (1990). Using critical incidents to explore learners' assumptions. In J. Mezirow & Associates (Eds.), *Fostering critical reflection in adulthood: A guide to*

transformative and emancipatory learning (pp. 173-193). San Francisco: Jossey-Bass.

Burnham, B. & Walden, B. (1997). Building adult instruction on the changing foundation of technology. *National University of Institute Lifelong Learning Conference Proceedings, February,* 18-20.

Byrnes, R., Debreceny, R., & Gilmour, P. (1995). The development of a multiple-choice and true-false testing environment on the Web. *Proceedings of AusWeb '97* [Online]. Available: http://elmo.scu.edu.au/sponsored/ausWeb/ausWeb95/papers/education3/byrnes/

Candy, P. C. (1990). Repertory grids: Playing verbal chess. In J. Mezirow and Associates (Eds.), *Fostering critical reflection in adulthood: A guide to transformative and emancipatory learning.* San Francisco: Jossey-Bass.

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

Caracelli, V.J. & Greene, J. (1993). Data analysis strategies for mixed-method evaluation designs. *Educational Evaluation and Policy Analysis, 15*(2), 195-207.

Cervero, R. (1988). *Effective continuing education for professionals.* San Francisco: Jossey-Bass.

Cervero, R. & Wilson, A. (1991). Use of Argyris case method to develop consulting skills. *Performance Improvement Quarterly, 4*(1), 31-42.

Chambers, J. A. (1992). The learning revolution: electronic classrooms. *Interactive Learning International, 8*(4), 291-195.

Chambers, J. H. (1992). *Empiricist research on teaching. A philosophical and practical critique of its scientific pretensions.* London: Kluwer Academic Publishers.

Chen, H-C, Lehman, & Armstrong, P. (1991). Comparison of performance and attitude in traditional and computer conferencing classes. *The American Journal of Distance Education, 5*(3), 51-64.

Chia, R. (1998). *Complex thinking in 'Eastern' thought: Non-presence, decenteredness and the unspeakable.* Paper presented at CSTT/ESRC 'Language of complexity' workshop at Keele University on 25 September,1998. [online]. Available: http://www.keele.ac.uk/depts/stt/cstt2/comp/chia.htm

Chickering, A. W. & Ehrmann, S. C. (1996). Implementing the seven principles: Technology as lever. *AAHE Bulletin, 49*(2), 3-6. [online]. Available: http://www.aahe.org/technology/ehrmann.htm.

Chickering, A. W. & Gamson, Z. (1987). Seven principles for good practice in undergraduate education. *AAHE Bulletin, 39*(7), 3-7.

Chizmar, J. F. & Williams, D. B. (1997). *Internet delivery of instruction: Issues of best teaching practice, administrative hurdles, and old-fashioned politics.* Paper presented at the 1997 CAUSE annual conference. [online]. Available: http://www.cause.org/information-resources/ir-library/html/cnc9703/cnc9703.html.

Christensen, C. R. (1987). *Teaching and the case method: Text, cases, and readings.* Boston, Harvard Business School.

Clark, G. (1996). *Glossary of CBT/WBT terms* [Online]. Available: http://www.clark.net/pub/nractive/alt5.htm.

Clark, R. (1994). Media and Method. *Education Training Research and Development, (42)*3, 7-10.

Clark, R. E. (1994). Media will never influence learning. *Educational Technology Research and Development, 42*(2), 21-29.

Cohen, V. B. (1985). A reexamination of feedback in computer-based instruction: Implications for instructional design. *Educational Technology, 25*(2), 33-37.

Collett, D., Kanuka, H., Blanchette, J., & Goodale, C. (1999). *Learning technologies in adult distance education.* Edmonton, AB: University of Alberta Press.

Collis, B. & Pals, N. (2000). A model for predicting an individual's use of a telematics application for a learning-related purpose. *International Journal of Educational Telecommunications, 6*(1), 63-103.

Collis, B. & Remmers, E. (1997). The world wide Web in education: Issues related to cross-cultural communication and interaction. In B. Khan (Ed.), *Web-based instruction* (pp. 149-158). Englewood Cliffs, NJ: Educational Technology Publications.

Comber, T. (1996). Building usable Web pages: An HCI perspective. *Proceedings of AusWeb '97* [Online]. Available: www.scu.edu.au/sponsored/ausWeb/ausWeb95/papers/hyertext/comber/

Conklin, J. (1987). Hypertext: A survey and introduction. *IEEE Computer, 20*(9), 17-41.

Cooper, H. & Dorr, N. (1996). Conducting a meta-analysis, in Frederick T. L. Leong and James T. Austin, *The Psychology Research Handbook (Eds.),* Thousand Oaks, CA: SAGE Publications.

Cooper, M. M. & Selfe, C. L. (1990). Computer conferences and learning: Authority, resistance, and internally persuasive discourse. *College English, 52*(8), 847-869.

Corry, M. D. (1998). Mental models and hypermedia user interface design. *Educational Technology Review, Spring/Summer,* 20-24.

Cranton, P. A. (1996). *Professional development as transformative learning.* San Francisco: Jossey-Bass.

Cranton, P. A. (1989). *Planning instruction for adult learners.* Toronto, ON: Wall & Emerson, Inc.

Crossman, D. M. (1997). The evolution of the World Wide Web as an emerging instructional technology tool. In B. H. Khan (Ed.), *Web-based Instruction* (pp. 19-24). Englewood Cliffs, NJ: Educational Technology Publications.

Crow, J. L. (2000). Evaluation of adult learners: Ethical issues. *New Horizons in Adult Education, 14*(3), 4-10.

Dajani, J. S., Sincoff, M. Z. & Talley, W. K. (1979). Stability and agreement criteria for the termination of Delphi studies. *Technological Forecasting and Social Change,* 13, 83-90.

Dalkey, N. C. (1972). *Studies in the quality of life.* Lexington, MA.: Lexington Press.

Daniel, J. S., & Marquis, C. (1983). Interaction and independence: Getting the mixture right. In D. Sewart, D. Keegan, & B. Holmberg (Eds.), *Distance education: International perspectives.* Beckenham, Kent: Croom Helm.

Darkenwald, G. & Merriam. S. B. (1982). *Adult education: Foundations of practice.* Cambridge: Harper & Row.

Davie, L. (1989). Facilitation techniques for the on-line tutor. In R. Mason and A. Kaye (Eds.), *Mindweave: Communications, computers, and distance education* (pp. 74-85). Oxford: Pergamon Press.

Davies, I. K. (1978). Educational technology: Archetypes, paradigms and models. In J. H. Hartley & I. K. Davies (Eds.), *Contributions to an Educational Technology, Volume 2.* (pp. 9-24). New York: Kogan Page.

December, J. (1994). Challenges for a Webbed society. *Computer-Mediated Communication Magazine, 1*(2) [Online]. Available: http://sunsite.unc.edu/cmc/mag/1994/nov/Websoc/html

Diamond, E. & Bates, S. (1995). The ancient history of the internet. *Forbes American Heritage Magazine, 46*(6) [Online]. Available: http://kt3b.stu.marist.edu/net/history.htm

Dick, W. & Carey, L. (1990). *The systematic design of instruction* (3rd ed.). New York: Harper Collins.

Dickson, K. (1997). *Seven principles for good practice in undergraduate education.* [online]. Available: http://cougarnet.byu.edu/tmcbucs/fc/fulltxt/7pr_int.htm.

Dillon, A. & Gabbard, R. (1998). Hypermedia as an educational technology: A review of the quantitative literature on learner comprehension, control, and style. *Review of Educational Research, 68*(3), 322-349.

Dodge, B. (1995, 1997). *Some thoughts about Webquests.* [online]. Available: http://edWeb.sdsu.edu/courses/edtec596/about_Webquests.html.

Dryden, L. M. (1994). Literature, student-centered classrooms, and hypermedia environments. In C. Selfe & S. Hilligoss (Eds.), *Literacy and computers: The complications of teaching and learning with technology* (pp. 282-304). New York: Modern Language Association of America.

Duin, A. (1988). Computer-assisted instructional displays: effects on students' computing behaviours, prewriting, and attitudes. *Journal of Computer-Based Instruction, 15(2),* 48-56.

Dumas, J. S. (1988). *Designing user interfaces for software.* Englewood Cliffs, NJ: Prentice Hall.

Eklund, J.(1996). Cognitive models for structuring hypermedia and implications for learning from the world-wide Web. *Proceedings of AusWeb '97* [Online]. Available: http://elmo.scu.edu.au/sponsored/ausWeb/ausWeb95/papers/hypertext/eklund/index.html

El-Tigi, M. & Branch, R. M. (1997). Designing for interaction, learner control, and feedback during Web-based learning. *Educational Technology, May-June,* (23-30).

English, J. M. & Kernan, G. L. (1976). The prediction of air travel and aircraft technology to the year 2000 using the Delphi method. *Transportation Research, 10*(1), 1-8.

Evans, T. D. (1991). An epistemological orientation to critical reflection in distance education. In T. D. Evans and B. King (Eds.), *Beyond the Text: Contemporary Writing on Distance Education* (pp. 237-263). Australia: Deakin University Press.

Evans, T. D. & Nation, D. E. (1989). Critical reflections in distance education. In T.D. Evans and D. E. Nation (Eds.), *Critical Reflections on Distance Education.* (pp. 237-263). London: Falmer.

Evans, T. D. & Nation, D. E. (1992). Theorising in open and distance learning. In A. Tait (Ed.), *Key Issues in Open Learning.* Essex, UK: Longman.

Fabro, K. R. & Garrison, D. R. (1998). Computer conferencing and higher-order learning. *Indian Journal of Open Learning, 7*(1), 41-53.

Filipczak, B. (1996). Engaged! The nature of computer interactivity. *Training, (33)*11, 53-58.

Garrison, R. (2000). Theoretical challenges for distance education in the 21st century: A shift from structural to transactional issues. *International Review of Research in Open and Distance Learning, 1*(1), 1-17.

Garrison, R. (1987). The role of technology in continuing education. *New Dimensions for Continuing Education.* San Francisco, CA: Jossey-Bass Publishers.

Garrison, R. D. & Archer, W. (2000). *A model of meaningful learning activities in higher education: Thinking ahead to desired learning outcomes.* [online]. Available: www.extension.ualberta.ca/faculty/garrison/model-meaningful.pdf

Garrison, R. & Shale, D. (1987). Mapping the boundaries of distance education: Problems in defining the field. *American Journal of Distance Education, 1*(3), 13-24.

Geertz, C. (1973). *The interpretation of culture.* New York, NY: Basic Books.

Gibbs, G. (1992). *Improving the quality of student learning.* Bristol, UK: Technical and Educational Services.

Glesne, C. & Peshkin, A. (1992). *Becoming qualitative researchers: An introduction.* White Plains, NY: Longman.

Glover, K. S. (1994). How expert systems can make hypertext more useable. *Technical Communications, 6,* 628-634.

Gokhale, A. A. (1995). Collaborative learning enhances critical thinking. *Journal of Technology Education, 7*(1). [online]. Available: http://scholar.lib.vt.edu/ejournals/JTE/jte-v71/gokhale.jte-v7n1.html

Gold, L. & Maitland, C. (1999). *What's the difference? A review of contemporary research on the effectiveness of distance learning in higher education.* Washington, DC: The Institute for Higher Education Policy.

Golden, P. A., Beauclair, R., & Sussman, L. (1992). Factors affecting electronic mail use. *Computers in Human Behavior, 8,* 297-311.

Graf, D. (1991). A model for instructional design case materials. *ETR&D, 39*(2), 81-88.

Guay, T. D. (1995). *Hypertext Paradigm* [Online]. Available: http://hoshi.cic.sfu.ca/~guay/Paradigm/Hypertext.html

Guba, E. G. (1981). Criteria for assessing the trustworthiness for naturalistic inquiries. *ERIC/ECTJ Annual Review Paper, 29*(2), 75-91.

Hammond, R. J. (1997). A comparison of the learning experience of telecourse students in community and day section. In proceedings of *Distance Learning Symposium.* Orem, UT: Utah Valley State College.

Harasim, L., Calvert, T., & Groeneboer, C. (1997). Virtual U: A Web-based system to support collaborative learning. In B. Khan (Ed.), *Web-based instruction* (pp. 149-158). Englewood Cliffs, NJ: Educational Technology Publications.

Harasim, L. (1991). Teaching and learning on-line: Issues in computer-mediated graduate courses. *Journal of Educational Communication, 16*(2), 117-135.

Haughey, M. (1995). Distinctions in distance: Is distance education an obsolete term?. In E. Keough & J. Roberts (Eds.), *Why the information highway? Lessons from open and distance learning* (pp. 2-14). Toronto, ON: Trifolium Books.

Haughey, M. & Anderson, T. (1988). *Networked learning: The pedagogy of the Internet.* Toronto, ON: Chenelière/Mcgraw-Hill.

Hedberg, J., Brown, C. & Arrighi, M. (1997). Interactive multimedia and Web-based learning. In B.H. Khan (Ed.), *Web-based Instruction* (pp. 47-58). Englewood Cliffs, NJ: Educational Technology Publications.

Hein, G. E. (1991). *Constructivist learning theory.* The Museum and the Needs of People CECA (International Committee of Museum Educators) Conference Jerusalem Israel, 15-22 October 1991.

Heines, J. (1985). Interactive means active: Learner Involvement in CBT. *Data Training, 4*(4), 48-53.

Henke, H. (1997). *Evaluating Web-based instruction design* [Online]. Available: http://scis.nova.edu/~henkeh/story1.htm.

Hill, R. B. (1996, November). Using Web pages to teach communication systems: Internet connection optional. *The Technology Teacher,* 22-26.

Hillman D. C. A., Willis E. J., & Gunawardena, C. N. (1994). Learner-interface interaction in distance education: An extension of contemporary models and strategies for practitioners. *American Journal of Distance Education, 8*(2), 30-42.

Hiltz, S. R. & Turoff, M. (1987). *The network nation: Human communication via computer.* London: Addison-Wesley Publishing Company.

Hiltz, S. R. & Turoff, M. (1978). *The network nation: Human communication via computer.* London: Addison-Wesley Publishing Company.

Hofer, B. & Pintrick, P. (1997). Development of epistemological theories: Beliefs about knowledge and knowing their relation to knowing. *Review of Educational Research, 67*(1), 88-140.

Holmberg, B. (1995). Theory and practice of distance education. (Routledge Studies in Distance Education). New York: Routledge.

Holmberg, B. (1989). *Status and trends of distance education (2nd ed.).* Lund: Lector Publishing.

Internet encyclopedia. (1996). *Internet history* [Online]. Available: http://nswt.tuwien.ac.at:8000/Connected/index.html

Jackson, M. (1997). Assessing the structure of communication on the World Wide Web. *Journal of Computer Mediated Communication, 3*(1) [Online]. Available: http://jcmc.mscc.huji.acil/vol13/issue1/jackson.html

Jacobson, M. J., Maouri, C. , Mishra, P., & Kolar, C. (1996). Learning with hypertext learning environments: Theory, design, and research. *Journal of Educational Multimedia and Hypermedia, 5*(3/4), 239-281.

Jewett, F. (1997). *A case study in the benefits and costs of interactive television network.* Seal Beach, CA: The Chancellor's Office, California State University.

Jonassen, D. H., Peck, K. L., & Wilson, B. G. (1999). *Learning with Technology.* Upper Saddle River, NJ: Prentice Hall.

Jonassen, D. H., Dyer, D., Peters, K., Robinson, T., Harvey, D., King, M., & Loughner, P. (1997). Cognitive flexibility hypertexts on the Web: Engaging learners in meaning making. In B. H. Khan (Ed.), *Web-Based Instruction* (pp. 119-134). Englewood Cliffs, NJ: Educational Technology Publications.

Jonassen, D. H. (1996). *Computers in the classroom: Mindtools for critical thinking.* New Jersey: Englewood Cliffs.

Jonassen, D. H., & Welsh, T. (1993). *Designing Environments for Constructive Learning (Eds.).* New York, NY: NATO Scientific Affairs Division.

Jonassen, D. H. (1991). Evaluating constructivistic learning. *Educational Technology, 31*(10), 28-33.

Jonassen, D. H. (1990). Thinking technology: Toward a constructivist view of instructional design. *Educational Technology, 30*(9), 32-34.

Jonassen, D. H. & Grabinger, R. S. (1989). Problems and issues in designing hypertext/hypermedia for learning. In D. H. Jonassen & H. Mandl (Eds.), *Designing hypermedia for learning*. New York: Springer-Verlag.

Jonassen, D. H. (1988). Designing structured hypertext and structuring access to hypertext. *Educational Technology, (28)*11, 13-16.

Jones, B. F., Valdez, G., Nowakowski, J., & Rasmussen, C. (1996). *Plugging in: Choosing and using educational technology.* Washington, DC: Council for Educational Development and Research North Central Regional Educational Laboratory. [online]. Available: http://www.ncrel.org/sdrs/edtalk/toc.htm.

Jones, T. & Schieman, S. (1995). Learner involvement: A review of the elements of more effective distance education. *Canadian Journal of Educational Communications, 24*(2), 97-104.

Kanuka, H. (1999). Individualized learning handbook: Web based instruction. In D. Collett (Ed.), *Learning Technologies in Distance Education* (pp. HB26-HB64). Edmonton, AB: University of Alberta Press.

Kanuka, H. & Anderson, T. (1999). Using Constructivism in Technology-Mediated Learning: Constructing Order out of the Chaos in the Literature. *Radical Pedagogy, 2*(1) [Online]. Available: http://www.icaap.org/RadicalPedagogy/content/vol1.1999/issue2/02kanuka1_2.html

Kanuka, H. & Kreber, C. (1999). Knowledge construction in the virtual classroom. *Proceedings of the Canadian Association for the Study of Adult Education,* June, 1999, Sherbrooke, Quebec.

Kaufman, D. (1989). *Post-Secondary distance education in Canada: Policies, practices and priorities.* Athabasca: Athabasca University, Canadian Society for Studies in Education.

Kearsley, G. & Shneiderman, B. (1998). *Engagement theory: A framework for teaching technology-based teaching and learning.* [online]. Available: http://home.sprynet.com/sprynet/gkearsley/engage.htm.

Kearsley, G. P. (1988). Authoring considerations for hypertext. *Educational Technology. (28)*11, 21-24.

Kegan, R. *The evolving self: Problem and process in human development.* Cambridge: Harvard University Press.

Kelly, G. A. (1955). *The psychology of personal constructs (2 vols).* NY: Norton.

Kennedy, W. A. (1997). *Teaching tip: The seven principles of good teaching practice.* [online]. Available: http://www.admin.mtu.edu/ctlfd.week12.htm

Keyes, J. (1994). *The McGraw-Hill Multimedia Handbook.* New York: McGraw-Hill.

Khan, B. (1997). Web-based instruction (WBI): What is it and why is it? In B. H. Khan (Ed.). *Web-Based Instruction* (pp. 5-18). Englewood Cliffs, NJ: Educational technology Publications.

King, K. L. (1996). *Usability of hypertext: Factors affecting the construction of meaning.* Unpublished master's thesis, New Jersey Institute of Technology, New Jersey.

Klemm, W. R. & Snell, J. R. (1996). Enriching computer-mediated group learning by coupling constructivism with collaborative learning. [online]. Available: http://www.usq.edu.au/electpub/e-jist/klemm.htm

Korhonen, L. J. (1991). Nominal group technique. In M. W. Galbraith (Ed.), *Adult Learning Methods* (pp. 247-269). Malabar, FL: Krieger Publishing Company.

Koschmann, T., Myers, A., Feltovich, P., & Barrow, S. (1994). Using technology to assist in realizing effective learning and instruction: A principled approach to the use of computers in collaborative learning. *Journal of the Learning Sciences, 3*(3), 227-264.

Krol, E. (1994). *The whole Internet user's guide and catalog.* Sebastpol, CA: O'Reilly & Associates Inc.

Lacey, C. A. & Merseth, K. K. (1993). Cases, hypermedia and computer networks: Three curricular innovations for teacher education. *Journal of Curriculum Studies, 25*(6), 543-551.

Laden, B. & Ells, R. (1996). *Effective use of the Web for education: Design principles and pedagogy* [Online]. Available: http://Weber.u.washington.edu/~rells/workshops/effective/index.html

Lanza, A. (1991). Some guidelines for the design of effective hypercourses. *Educational Technology, (31)*10, 18- 22.

LaQuey, T. & Ryder, J. (1992). *The Internet Companion: A beginner's guide to global networking.* Reading, MA: Addison-Wesley.

Laudon, K. C., Traver, C. G. & Laudon, J. P. (1996). *Information technology and society* (2nd ed.). Toronto, ON: International Thomson Publishing Company.

Laurillard, D. (1993). *Rethinking university teaching: A framework for the effective use of educational technology.* New York: Routledge.

Laurillard, D. (1997). Learning, teaching, technology: Putting first things first. *AAHE Bulletin, 49*(1), 3-6.

Lave, C. A. & March, J. G. (1975). *An introduction to models in the social sciences.* New York, NY: Harper Row.

Lindstrom, R. L. (1994). *The business week guide to multimedia presentations.* Berkeley, CA: Oxford University Press.

Linstone, H. A. & Turoff, M. (1975). *The Delphi method.* Don Mills, ON: Addison-Wesley Publishing Company.

Lippitt, G. L. (1973). *Visualizing change: Model building and the change process.* Fairfax, VA: NTL Learning Resources Corporation, Inc.

Lynch, P. J. (1995). *Web Style Manual.* Yale Center for Advanced Instructional Media [Online]. Available: http://info.med.yale.edu/caim/StyleManual_Top.html

MacNeil, A. J. (1998). *Case Study Method and Electronic Meeting System for Principal Preparation.* [Online]. Available: http://www.coe.uh.edu/insite/elec_pub/HTML1997/el_macn.htm

Maddux, C. D. & Johnson, D. L. (1997). The World Wide Web: History, cultural context, and a manual for developers of educational information-based Web sites. *Educational Technology, September-October,* 5-12.

Marantz, B. and R. England. (1992). Closing the distance: a CMC learning contract tutorial. *DEOSNEWS* 2(4).

Marchionini, G. (1988). Hypermedia and learning: Freedom and chaos. *Educational Technology, (28)*11, 8-12.

Marland P., Patching, W., Putt, I. & Putt, R. (1990). Distance learners' interactions with text while studying. *Distance Education, 11*(1), 71-91

Marsick, V. J. (1990). Case study. In M. W. Galbraith (Ed.), *Adult Learning Methods* (pp. 225-246). Malabar, FL: Krieger Publishing Company.

Martin, E. D. & Rainey, L. (1993). Student achievement and attitude in a satellite-delivered high school science course. *The American Journal of Distance Education, 7*(1), 54-61.

Martin, J. (1990). *Hypermedia documents and how to create them.* Englewood Cliffs, NJ: Prentice-Hall.

Martino, J. P. (1972). *Technological forecasting for decision making.* New York, NY: American Elsevier Publishing Company.

Masoner, M. (1988). *An audit of the case study method.* NY: Praeger.

Matejka, J. K. & Cosse, T. J. (1981). *The business case method: An introduction.* Richmond, VA: Robert F. Dame.

McGreal, R. (1998). Integrated distributed learning environments (IDLEs) on the Internet: A survey. *Educational Technology Review, Spring/Summer,* 25-31.

McManus, T. (1996). *Special considerations for designing Internet based instruction.* [Online]. Available: http://ccwf.cc.utexas.edu/~mcmanus/special.html

Means, B. (1994). Introduction: Using technology to advance educational goals. In B. Means (Eds.), *Technology and education reform: The reality behind the promise* (pp. 1-21). San Francisco, CA: Jossey-Bass.

Merrill, M. D. (1991, May). Constructivism and Instructional design. *Educational Technology,* 45-53.

Mezirow, J. (1990). *Fostering critical reflection in adulthood: A guide to transformative and emancipatory learning.* San Francisco: Jossey Bass.

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

Millis, B. J. (2001). *Managing—and Motivating!—Distance learning group activities.* [online]. Available: http://www.tltgroup.org/gilbert/millis.htm

Miser, H. J. (1993). A foundational concept of science appropriate for validation in operational research. *European Journal of Operational Research, 66*(2), 204-215.

Mitchell, T. R. (1978). *People in organization: Understanding their behavior.* New York, NY: McGraw Hill Book Co.

Moiduser, D., Nachmias, R., Lahav, O., & Oren, A. (2000). Web-based learning environments: Current pedagogical and technological state. *Journal of Research on Computing in Education, 33*(1), 55-76.

Molenda, M. (1991). A philosophical critique of the claims of "constructivism." *Educational Technology, (31)*10, 44-48.

Moore, M. & Kearsley, G. (1996). *Distance education: A systems view.* New York: Wadsworth Publishing.

Moore, M. (1991). Editorial: Distance education theory. *The American Journal of Distance Education, 5*(3), 1-6.

Moore, M. (1990). Recent contributions to the theory of distance education. *Open Learning, 5*(3), 10-15.

Moore, M. G. (1989). Three types of interaction. *American Journal of Distance Education, 3*(2), 1-60.

Moore, M. G. (1988). Telecommunications, internationalism and distance education. *American Journal of Distance Education, 2*(1), 1-7.

Moore, M. G. (1973). Towards a theory of independent learning and teaching. *Journal of Higher Education,* (44), 661-679.

Muffeletto, R. (1997). Reflections on designing and producing and Internet-based course. *Techtrends, March,* 50-53.

Nelson, T. H. (1967). Getting it out of our system. In G. Schechter (Ed.), *Information retrieval: A critical review.* Washington, D.C: Thompson Books.

Nichols, (1995). *Formative evaluation of Web based training.* [Online]. Available: www.ucalgary.ca/%7Egwnichol/formeval/formeval.html

Nichols, G. (1997). Formative evaluation of Web based training. In B. H. Khan (Ed.), *Web-Based Instruction* (pp. 369-374). Englewood Cliffs: NJ: Educational Technology Publications.

Nielsen, J. (1993). *Hypertext and hypermedia.* Boston, MA: Academic Press.

Nipper, S. (1989). Third generation distance learning and computer conferencing. In R. Mason and A. Kaye (Eds.), *A mindweave: communication, computers and distance education.* Oxford: Pergamon.

Norton, P. (1999). *Computing fundamentals* (3rd ed.). New York: Glencoe McGraw Hill.

Nowlen, P. (1988). *A new approach to continuing education for the business and the professions: The performance model.* NY: Macmillan Publishing Company.

O'Donnell, J. M. & Caffarella, R. S. (1991). Learning contracts. In M. W. Galbraith (Ed.), *Adult Learning Methods* (pp. 133-160). Malabar, FL: Krieger Publishing Company.

O'Sullivan, E. & Rassel, G. R. (1989). *Research methods for public administrators.* New York, NY: Longman.

Patton, M. Q. (1990). *Qualitative evaluation and research methods* (2nd ed.). London: SAGE Publications.

Paulsen, M. F. (1995). *Online report on pedagogical techniques for computer-mediated communication.* [online]. Available: http://www.hs.nki.no/~morten/cmcped.htm

Perkins, D. N. (1991). What constructivism demands of the learner. *Educational technology, (31)*10, 19-21.

Peters, O. (1983). Distance teaching and industrial production: A comparative interpretation in outline. In D. Stewart, D. Keegan, & Homberg (Eds.), *Distance Education: International Perspectives.* London: Croom Helm.

Pfeiffer, J. W. & Ballew, A. C. (1988). *Using case studies, simulations, and games in human resource development.* San Diego: University Associates, Inc.

Phillips, G. M., Santoro, G. M., & Kuehn, S. A. (1988). The use of computer-mediated communication in training students in group problem-solving and decision-making techniques. *The American Journal of Distance Education, 2*(1), 38-51.

Piaget, J. (1969). *The mechanisms of perception.* London: Routledge & Kegan Paul.

Postman, N. & Weingartner, C. (1969). *Teaching as a subversive activity.* NY: Delta Books.

Quinlan, L. A. (1996). Customizing Web documents for the classroom: An example from Lakeville High School's advanced composition class. *Techtrends, March,* 27-30.

Quinlan, L. A. (1997). Creating a classroom Kaleidoscope with the World Wide Web. *Educational Technology, May-June,* 15-22.

Ramsden, P. (1992). *Learning to teach in higher education.* London: Routledge.

Reed, W. M. & Oughton, J. M. (1997). Computer experience and interval-based hypermedia navigation. *Journal of Research on Computing in Education, 30*(1), 38-52.

Reeves, G. & Jauch, L. R. (1978). Curriculum development through Delphi. *Research in Higher Education, XIX*(2), 31-35.

Reeves, T. C. & Reeves, P. (1997). Effective dimensions of the interactive learning on the World Wide Web. In B. H. Khan (Ed.), *Web-based Instruction* (pp. 59-66). Englewood Cliffs, NJ: Educational Technology Publications.

Relan, A. & Gillani, B.B. (1997a). Web-based information and the traditional classroom: Similarities and differences. In B. H. Khan (Ed.), *Web Based Instruction.* Englewood Cliffs, NJ: Educational Technology Publications.

Renner, P. (1997). *The art of teaching adults: How to become an exceptional instructor and facilitator.* Vancouver, BC: The Training Associates.

Resnick, L. B. (1987a). Learning in and out of school. *Educational Researcher, 16*(9), 13-20.

Resnick, L. B. (1987b). *Educational and learning to think.* Washington, DC: National Academy Press.

Rhem, J. (1998). Problem-Based Learning: An Introduction. *The National Teaching And Learning Forum, 8*(1). [online] Available: http://www.ntlf.com/sample/pbl.htm

Ritchie, D. C. & Hoffman, B. (1997). Incorporating instructional design principles with the World Wide Web. In B. H. Khan (Ed.), *Web-Based Instruction* (pp. 135-138). Englewood Cliffs, NJ: Educational Technology Publications.

Roselli, T. (1991). Control of user disorientation in hypertext systems. *Educational Technology, (31)*12, 42-46.

Rugen, L. (1993). *In search of understanding: The case for constructivist classrooms.* Alexandria, VI.: Expeditionary Learning Outward Bound, Inc.

Russell, T. (1999). *The no significant difference phenomenon.* Chapel Hill, NC: Office of Instructional Telecommunications, North Carolina State University.

Ryder, M. & Wilson, B. (1995). From local to virtual learning environments: making the connection [Online] Available: http://www.cudenver.edu/~mryder/aera95.html#note1

Salmon, G. (2000). *E-moderating. The key to teaching and learning online.* London: Kogan Page.

Schön, D. (1983). *Educating the reflective practitioners.* San Francisco: Jossey-Bass.

Seaman, D. F. & Fellenz, R. A. (1989). *Effective strategies for teaching adults.* Columbus, OH: Merrill Publishing Company.

Shank, G. (1992). Educational semiotic: threat or menace? *Educational Psychology Review, 4*(2), 195-221.

Shearin, Jr., E. T. (1995). *Development of a definition and competencies for network literacy: a Delphi Study.* Unpublished doctoral dissertation. North Carolina State University, North Carolina.

Sheffield, J. & McQueen, R. J. (1990). Groupware and management education: Matching communication medium to task requirements. *In proceedings of the Third Guelph Symposium on Computer Mediated Communication,* 181-192. Guelph, ON: University of Guelph.

Shneiderman, B. (1998). *Designing information-abundant Web sites: issues and recommendations.* Academic Press [Online]. Available: ijhcs.open.ac.uk/shneiderman/shneiderman-nf.html.

Simmons, R. (1994). The horse before the cart: assessing for understanding. *Educational Leadership*, February, 1994, 22-23.

Souder, W. E. (1993). The effectiveness of traditional versus satellite delivery in three management of technology Master's Degree programs. *The American Journal of Distance Education, 7*(1), 37-53.

Spiro, R. J. & Feltovitch, P. J. (1997). Cognitive Flexibility, Constructivism, and Hypertext: Random Access Instruction for Advanced Knowledge Acquisition in Ill-Structured Domains. [online]. Available: http://phoenix.sce.fct.unl.pt/simposio/Rand_Spiro.htm

Spiro, R. J. & Jehng, J. C. (1990). Cognitive flexibility and hypertext: Theory and Technology for the Nonlinear Multidimensional Traversal of Complex Subject Matter. In D. Nix & R. J. Spiro (Eds.), *Cognition, Education, and Multimedia: Exploring Ideas in High Technology.* Hillsdale, NJ: Lawrence Erlbaum Assoc.

Spiro, R. J., Feltovich, P. J., Jacobson, M. J. & Coulson, R. L. (1991). Cognitive flexibility, constructivism, and hypertext: Random access for instruction for advanced knowledge acquisition in ill-structured domains. In T. Duffy & D. Jonassen (Eds.), *Constructivism and the Technology of Instruction.* Hillsdale, NJ: Lawrence Erlbaum.

Starr, R. M. (1997). Delivering instruction on the World Wide Web: Overview and basic design principles. *Educational Technology, May-June,* 7-15.

Steinberg, E. R. (1989). Cognition and learner control: a literature review, 1977-1988. *Journal of Computer-Based Instruction, (16)*4, 117-121.

Steinberg, E. R. (1991). *Computer-assisted instruction: a synthesis of theory, practice, and technology.* Hillsdale, NJ: Lawrence Erlbaum Associates, Inc., Publishers.

Stepien, W.J. & Gallagher, S.A. (1993). Problem-based Learning: As Authentic as it Gets. *Educational Leadership, 50*(7), 25-28.

Sterling, B. (1993). Internet. *The Magazine of Fantasy and Science Fiction,. 2*(5) [Online]. Available: gopher://oak.zilker.net:70/00/bruces/F_SF_Science_Column/F_SF_Five_

Stewart, D. W. & Shamdasani, P. N. (1998). Focus group research: Exploration and discovery. In L. Bickman & D. J. Rog (Eds.) *Handbook of applied social research methods* (pp. 505-526). London: SAGE Publications.

Stogdill, R. M. (1970). Introduction: The student and model-building. In Ralph M. Stogdill, (Ed.), *The process of model-building in the behavioral sciences,* (pp. 3-13). Columbus, OH: Ohio State University Press.

Stritch Information Exchange II resource Guide (1995). *A brief history of the Internet* [Online]. Available: http://www.stritch.edu/userguide/intro.html#History

Taylor, K., Marienau, C. & Fiddler, M. (2000). *Strategies for teachers and trainers. Developing Adult Learners.* San Francisco: Jossey-Bass.

Tersine, R. J. & Riggs. W. E. (1976). The Delphi technique. A long range planning tool. *Business Horizons, 19*(2), 51-55.

Tobias, S. (1991). An eclectic examination of some issues in the constructivist-ISD controversy. *Educational Technology, (31)*10, 41-43.

Uhl, N. P. (1983). Using the Delphi technique in institutional planning. In Uhl, N.P., (Eds). *Using Research for Strategic Planning*, pp. 81-94, no. 37. San Francisco, CA.: Jossey-Bass.

Underwired. (1997). *History of the Internet* [Online]. Available: http://www.underwired.com/report/history.html

Van Dijk, T. A. & Kintsch, W. (1983). *Strategies of discourse comprehension.* New York: Academic Press.

Vygotsky, L. (1962). *Thought and language.* (E. Hanfman & G. Backer, Trans.) Cambridge, MA: M.I.T. Press (Originally published in 1934).

Wadsworth, B. (1978). *Piaget for the classroom teacher.* New York, NY: Longman.

Walley, P. (1989). Models of hypertext structure and learning. In D. H. Jonassen & H. Mandl (Eds.), *Designing hypermedia for learning.* New York: Springer-Verlag.

Wampler, K. S. & Serovich, J. M. (1996). Meta-analysis in family therapy research, in Douglas H. Sprenkle & Sidney M. Moon, (Eds.), *Research Methods in Family Therapy.* New York, NY: The Guildford Press.

Weise, E. A. (1995). User control in hypermedia instructional applications. *Technical Communication Quarterly, 4*(1), 23-34.

Weller, H. (1988). Interactivity in microcomputer-based instruction: Its essential components and how it can be enhanced. *Educational Technology, February*, 23-27.

Wendell, K. (1997). *Internet history* [Online]. Available: http://tdi.uregina.ca/~ursc/internet.history.html

Wielenga, D., Ritzen, M., & Kösters, J. (2000). *EFA's Digital Portfolio System.* [online]. Available: http://www.efa.nl/publicaties/publiexplo/english/portfol2.html

Williams, V. & Peters, K. (1997). Faculty incentives for the preparation Web-based instruction. In B. H. Khan (Ed.), *Web-Based Instruction* (pp. 107-110). Englewood Cliffs, NJ: Educational Technology Publications.

Willis, B. & Dickinson, J. (1997). Distance education and the World Wide Web. In B. H. Khan (Ed.), *Web-Based Instruction* (pp. 81-84). Englewood Cliffs, NJ: Educational Technology Publications.

Willis, B. (1993). *Distance education a practical guide.* Englewood Cliffs, NJ: Educational Technology Publications.

Wilson, B., Teslow, J., & Osman-Jouchoux, R. (1995). The Impact of Constructivism (and Postmodernism) on ID Fundamentals. In B. B. Seels (Ed.), *Instructional Design Fundamentals: A Review and Reconsideration* (pp. 137-157). Englewood Cliffs NJ: Educational Technology Publications.

Winn, W. (1991). The assumptions of constructivism and instructional design. *Educational Technology, (31)*10, 38-40.

Wood, P. (1995). Meta-analysis in Breakwell, G, N, Hammond, S. & Fife-Schaw, C.. *Research methods in psychology.* Thousand Oaks, CA: SAGE Publications Inc.

Yang, C-S. & Moore, D. (1996). Designing hypermedia systems for instruction. *Journal of Educational Technology Systems, 24*(1), 3-30.

Zetterberg, H. L. (1962). *Social theory and social practice.* New York, NY: Bedminster Press.

Zhu, E. (1996). *Hypermedia interface design: The effects of the number of links and the granularity of nodes on students' information searching and learning performance.* Indiana University Doctoral Dissertation: Bloomington, IN.

Zirkin, B. & Sumler, D. (1995). Interactive or non-interactive? That is the question!!! An annotated bibliography. *Journal of Distance Education, 10*(1), 95-112.

Appendix A: Definition of Terms

Browser: Short for Web browser, a software application used to locate and display Web pages. Three of the most popular browsers are Netscape Navigator, Microsoft Internet Explorer, and Spyglass Mosaic. All of these are graphical browsers, which means that they can display graphics as well as text. In addition, most modern browsers can present multimedia information, including sound and video.

HTML: Short for HyperText Markup Language, the authoring language used to create documents on the World Wide Web.

Hypertext: A special type of database system in which objects can be creatively linked to each other in ways that reflect our semantic interdependancies. Hypertext has two elements: nodes and links.

Internet: A global network of networks connecting more than a million computers using TCP/IP.

Links: The electronic connections to and from the units of information within hypertext are *links*.

Nodes: Documents or units of information within hypertext are the *nodes*.

User Interface: The junction between a person using a computer (user) and a computer program. An interface is a set of commands or menus through which a user communicates with a program. The user interface is one of the most important parts of any program because it determines how easily a program can be used.

Web Based Learning: the use of the Web as a learning environment, a communication medium, and/or an instructional tool in the learning process.

Web Site: A collection of World Wide Web pages.

World Wide Web: A system of Internet servers that support specially formatted documents. The documents are formatted in a language called HyperText Markup Language (HTML) that supports links to other documents, as well as graphics, audio, and video files.

Appendix B: Focus Group

Informed Consent for '*focus group*'

Title of the Project: A Model for Developing Effective Web Based Learning In Adult Distributed Education

1. This section provides an explanation of the study in which you will be participating:

a) The study in which you will be participating is in partial fulfillment for my Ph. D.
b) The purpose of this study will be to identify and validate the essential principles that result in effective Web based learning according to adult and higher education instructors. The essential principles identified in this study will be used to develop a validated model in Web based instruction for adult and higher education learning communities.
c) If you agree to participate, you will be requested to do the following.
   - Fill in and sign the consent form.
   - Participate in a focus group.

   Your responses, together with the other participants, will be used in the development of a preliminary model for planning effective Web based learning in post-secondary institutions. Your participation in the research will take approximately two hours in total.

2. This section describes your rights as a research participant:

a) Your role in this research project is explained here. You may ask questions about the research procedures and these questions will be answered. Questions may also be directed to Heather Kanuka via email at: heather.kanuka@ualberta.ca
b) Individual participant data gathered for this research is confidential. Only the researchers and other group members will have access to your individual participant data gathered through the group interview. In the event of publication of this research, no personally identifying information will be disclosed.
c) Your participation is voluntary. You are free to stop participating at any time, or to decline to answer any specific question(s).
d) A summary of the research will be posted on the researcher's Web site at the completion of the study. The researcher will email the URL to each participant.
e) This study involves minimal risk; that is, no risks to your physical or mental health beyond those encountered in the normal course of everyday life.

3. This section indicates you are giving your informed consent to participate in the research:

   Participant: I agree to participate in this research by Heather Kanuka, as an authorized part of the education and research program of the University of Alberta under the supervision of Dave Collett, Ph. D.

   I understand the information read by me. I have received answers to my questions I had about the research procedure. I understand and agree to the condition of this study as described. I understand that I will receive no compensation for participating.

   I understand that my participation in this study is voluntary and that I may withdraw from this study at any time by notifying the researcher.

I have read and understand the conditions of this research study and agree to participate.

Signature: _____ **Name:** _____
(please print)

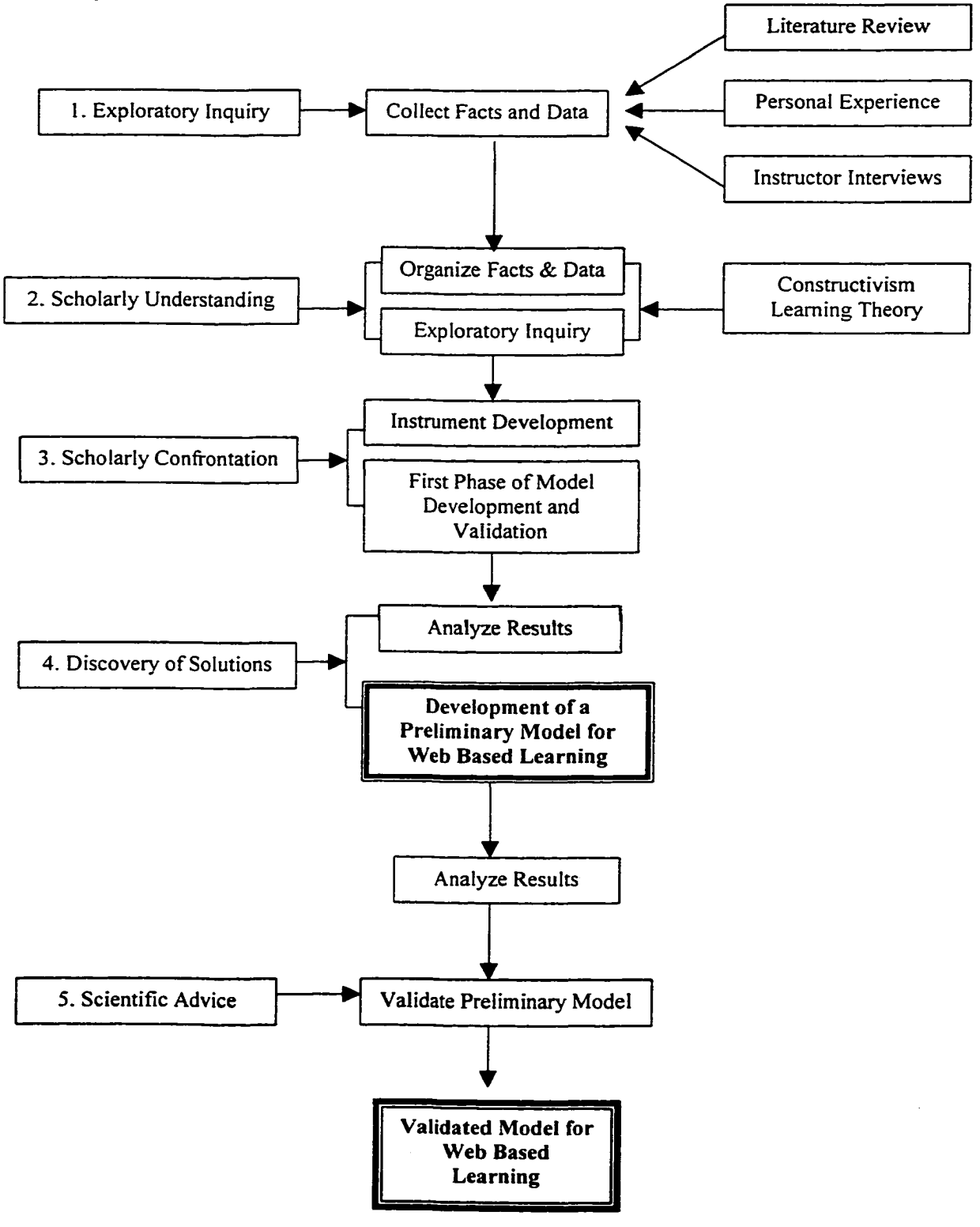
Date: _____

MODEL BUILDING PROCESS

The essence of a model is the relationship between simplified elements and the real world (a complex situation).

PRINCIPLE (a complex situation)	ELEMENTS	PROCESS (relationship)

The question: *How can we consider principles of teaching and learning to facilitate the design of Web-based learning?*



PRINCIPLES AND CONSTRUCT DESCRIPTORS

PART I: TEACHING PRINCIPLES AND CONSTRUCTS

A. Presentation of abstracted phenomena

***Ill-Structured** – An ill-structured format should not be confused with "non-structure". Ill-structured presentations are intentional (there is an aim and objective) and is organized. However, the content is presented with little guidance and few headings forcing the learners to create their own structure.

* **Engaging** – Abstracted phenomena should be presented in a way that will draw the learners into the learning process through attracting and holding their attention and become passionate about the issues presented.

Interactive – Interactive learning can be described as an active intellectual participation between and amongst the learners, instructors, and the subject matter.

Strategic – A careful plan of action intended to accomplish the intended outcomes. A repertoire of teaching/facilitating strategies is essential in achieving the planned learning objectives

Complex problems – A problem that is enigmatic and ambiguous with no one or right solution is presented to the learners. Complex problems typically have the following characteristics: unique, unstable, uncertain, value conflicting and cut across a number of disciplines resulting in no single vantage point.

B. Multiplicity of perspectives to be fully apprehended

Multidisciplinary – A multidisciplinary approach to teaching will involve the relating to, or making use of, several disciplines (or branches of knowledge) at once.

Conflicting phenomena – The presenting of two or more occurrences, circumstances, or observable events that are contradictory.

Multiple sources – a set of information sources with diverse perspectives and positions on an issue.

C. Relatedness for meaningful understandings

Authentic – Phenomena presented that are based on actual events and presented by a credible authority in the field making the issues worthy of study.

Experiential – The phenomena are related to or derived from experience or an actual event.

Discursive – Conclusions proceed through a reasoned discourse rather than intuition.

D. Diversity of instructional methods

Inquiry based – A close examination, investigation or probe in a quest for knowledge, data or truths.

Problem solving – To explain, decipher or resolve something that is enigmatic, meaningless, incomprehensible and/or unintelligible.

Decision making – A position, conclusion or passing of judgment on an issue reached after generating the alternatives, evaluating the choices, and assessing the consequences.

E. Meaningful assessment

Shared ownership – Being involved in negotiable contracting for assessment gives learners shared ownership in their own learning. Inherent in shared ownership is that both or all give and receive resulting in partial possession by each person and all members of the group.

* **Motivating** – Learners are not dependent on a reward system; assessment is personally meaningful and used as a positive tool for personal growth.

Equitable – A state, quality, or ideal of being just, impartial and fair. With respect to the learning/teaching process, assessment is also culture fair.

Performance-based – Involving a demonstration, exhibit or performance in real conditions or authentic simulations.

PART II: LEARNING PRINCIPLES AND CONSTRUCTS

A: Assume greater responsibility

Goal setting/task selection – Learners take charge in setting standards of excellence, defining benchmarks, and selecting learning activities in ways that are meaningful, authentic, challenging and multidisciplinary to address the issues presented.

* **Non-reward based** – Learners are not dependent upon a reward structure (such as grades) from others.

Learning/thinking strategies – Learners can draw on a number of ways to accomplish the learning objectives. A repertoire of thinking/learning strategies is essential to fully apprehend the multiplicity of complex problems.

Self-assessment – Learners accurately evaluate their strengths and weaknesses and determine where to focus their efforts to make the learning process personally meaningful.

B. Meaning making into abstracted phenomena

Inquirer – The process whereby learners question, examine, query, explore, investigate or reconsider a question, make discoveries, and/or acquire information.

Generative – The ability to originate, transform, reshape or reinterpret new information through a different scheme or structure resulting in new understandings.

Reflective – Characterized by thoughtful mediation or contemplation that uses the powers of the mind to conceive ideas and/or draw inferences resulting in the expression of carefully considered thought.

C. Reconstruction of meaning

Diversity – Learners work with others of distinct and different characteristics, abilities, cultures and backgrounds. It is not enough to know and understand their own worlds; they need to know and understand others in order to reconstruct meanings.

Negotiated – Deliberating through discussion with another or others in order to come to terms or reach a mutual agreement

* **Equitable** – Learners negotiate in ways that have equity, are just, culture fair and impartial.

Empathic – The identification and understanding of others situation, feelings, and motives resulting in the valuing diversity and the multiplicity of perspectives.

D. Evidence of new knowledge

New and multiple perspectives – This requires decentration, which is the ability to understand that one's own world view is not the only one, nor necessarily the correct one; rather it is one of many.

Increased value of diversity – Through new and conflicting information, new cognitive structures are created or recreated, which enable learners to rethink prior understandings of phenomena.

Producer – Learners develop tools to help them understand abstracted phenomena and construct meaningful understandings to the world in which they live. In order to construct knowledge, learners must produce meaning.

* Based on feedback, these constructs were agreed as being non-essential to the model.

Appendix C: Consensus Survey

Date

Dear _____,

I am asking for your help in a research study of significance for education researchers and practitioners who are using the Web to facilitate learning. The purpose of the study is to identify and validate the conditions that result in higher levels of learning when using the Web for instruction at colleges and universities.

The survey has two purposes: (1) to validate the identified Web conditions for higher levels of learning, and (2) to identify examples of how to implement these conditions. The survey will require approximately 20 – 30 minutes of your time. Upon completion of the study a summary of the findings will be posted on a Web site. I will email the URL to each participant.

As an expert in the field, your participation in this study is greatly appreciated.

Thank you for your assistance,

Heather Kanuka

Informed Consent Form

Title of the Project: Web-based Teaching and Learning for Adult and Higher Education: A Model for Distance Learning

Investigator: Heather Kanuka, University of Alberta, 7-104 Education Building North, Edmonton, Alberta, T6G 2G5, Email: heather.kanuka@ualberta.ca. Phone: (780) 430-7930

1. This section provides an explanation of the study in which you will be participating:
   a) The study in which you will be participating is in partial fulfillment for my Ph. D.
   b) The purpose of this study is to identify and validate the essential principles and elements that result in effective Web-based learning according to adult and higher education instructors. The essential principles identified in this study will be used to develop a validated model in Web-based learning for adult and higher education distance learning communities.
   c) If you agree to participate, you will be requested to do the following:
      - Fill in and sign the consent form.
      - Provide demographic data.
      - Fill in and return the survey.

2. This section describes your rights as a research participant:
   a) Your role in this research project is explained here. You may ask questions about the research procedures and these questions will be answered. Questions should be directed to Heather Kanuka via email at: heather.kanuka@ualberta.ca
   b) Individual participant data gathered for this research are confidential. Only the researcher will have access to your individual participant data gathered through the survey. In the event of publication of this research, no personally identifying information will be disclosed.
   c) Your participation is voluntary. You are free to stop participating at any time, or to decline to answer any specific question(s).
   d) A summary of the research will be posted on the researcher's Web site at the completion of the study. The researcher will email the URL to each participant.
   e) This study involves minimal risk; that is, no risks to your physical or mental health beyond those encountered in the normal course of daily activities.

3. This section indicates you are giving your informed consent to participate in the research:

   Participant: I agree to participate in this research by Heather Kanuka, as an authorized part of the education and research program of the University of Alberta under the supervision of Dave Collett, Ph. D., Professor Emeritus (dave.collett@ualberta.ca).

   I understand the information read by me. I have received answers to my questions I had about the research procedure. I understand and agree to the condition of this study as described. I understand that I will receive no compensation for participating.

   I understand that my participation in this study is voluntary and that I may withdraw from this study at any time by notifying the researcher.

I have read and understand the conditions of this research study and agree to participate.

Signature: _____ **Name:** _____

(please print)

Date: _____

e-mail: _____

Instructions

The study is concerned with: higher education, Web-based environments, and higher levels of learning.

This survey has these two purposes:

(1) To investigate the opinions of experts about creating the conditions necessary to facilitate higher levels of learning in Web-based learning environments.

This section of the survey requires a response to a Likert-type opinion scale, which will determine the extent of agreement with the proposed condition.

(2) To identify examples of how to carry out these elements in Web-based learning environments.

This section of the survey requires a brief statement providing an example, or a brief explanation for disagreement.

The survey will require approximately 20 – 30 minutes of your time.

The conditions were identified through group interviews with educational technologists and Web-based instructional designers, instructors who have had experience using the Web for learning, and the literature. The data were used to develop a tentative model. The first validation phase for the tentative model was completed with a small sample of practitioners who have had experience using the Web to facilitate learning. This is the second validation phase, which involves a larger and more diverse population sample of experts knowledgeable in the area of Web-based teaching and learning.

Please feel free to add any additional comments beside each question or to use the comment sections at the end of each page.

Thank you very much for your assistance.

Higher levels of learning typically involve complex abstracted phenomena, and can be facilitated in a Web-based environment by...

	Agree	Somewhat agree	Somewhat disagree	Disagree	Don't know
...including enigmatic, ambiguous and/or **complex problems** where learners must generate a number of possible solutions.	☐	☐	☐	☐	☐
...using collaborative/cooperative learning strategies for **interactive** participation (i.e., active intellectual participation between learners, instructors, and subject matter).	☐	☐	☐	☐	☐
...developing a strategic plan of action that will include a **repertoire of teaching methods** to accomplish the intended outcomes.	☐	☐	☐	☐	☐

If you agree with the above statements, please provide an example (or examples) of a Web-based activity that can support these claims. If you do not agree, please explain why.

Higher levels of learning typically include diverse and/or multiple perspectives about the issue(s) or problem(s) presented, and can be facilitated in a Web-based environment by...

	Agree	Somewhat agree	Somewhat disagree	Disagree	Don't know
...using a **multidisciplinary** approach of the phenomena presented (i.e., making use of several disciplines at once).	☐	☐	☐	☐	☐
...presenting two or more opposing views and/or **conflicting phenomena.**	☐	☐	☐	☐	☐
...providing **multiple information sources.**	☐	☐	☐	☐	☐

If you agree with the above statements, please provide an example (or examples) of a Web-based activity that can support these claims. If you do not agree, please explain why.

Higher levels of learning typically involve phenomena that have personal relevance to the learners, and can be facilitated in a Web-based environment by...

	Agree	Somewhat agree	Somewhat disagree	Disagree	Don't know
...presenting phenomena through a **credible authority** in the field.	☐	☐	☐	☐	☐
...presenting phenomena that are related to, or derived from, an **actual event** (i.e., case studies based on real world occurrences).	☐	☐	☐	☐	☐
...guiding reasoned **discourse** among instructors and learners (i.e., sustained discussion to generate meaningful understandings).	☐	☐	☐	☐	☐

If you agree with the above statements, please provide an example (or examples) of a Web-based activity that can support these claims. If you do not agree, please explain why.

Higher levels of learning typically include diverse ways of knowing, and can be facilitated in a Web-based environment by...

	Agree	Somewhat agree	Somewhat disagree	Disagree	Don't know
...presenting **inquiry-based** learning activities (i.e., an investigation or probe for knowledge, data, or truths).	☐	☐	☐	☐	☐
...presenting **problem-based** learning activities (i.e., attempts to explain, decipher or resolve something that is enigmatic, ambiguous, and/or cryptic).	☐	☐	☐	☐	☐
...presenting **decision-building** activities (i.e., arriving at a position or passing of judgment on an issue reached after generating the alternatives, evaluating the choices, and assessing the consequences).	☐	☐	☐	☐	☐

If you agree with the above statements, please provide an example (or examples) of a Web-based activity that can support these claims. If you do not agree, please explain why.

Higher levels of learning typically include an assessment process that is personally meaningful to each learner, and can be facilitated in a Web-based environment by...

	Agree	Somewhat agree	Somewhat disagree	Disagree	Don't know
...using **negotiable** contracting, peer assessment, and/or self assessment.	☐	☐	☐	☐	☐
...developing assessment activities in a way where they will also be used as part of the **instructional process**.	☐	☐	☐	☐	☐
...selecting assessment activities that involve a demonstration, exhibit, presentation or **performance**.	☐	☐	☐	☐	☐

If you agree with the above statements, please provide an example (or examples) of a Web-based activity that can support these claims. If you do not agree, please explain why.

Higher levels of learning typically require learners to assume greater responsibility in the learning process, and can be facilitated in a Web-based environment by...

	Agree	Somewhat agree	Somewhat disagree	Disagree	Don't know
...soliciting discussions among learners and instructors to negotiate and/or **set standards of excellence.**	☐	☐	☐	☐	☐
...requesting learners to draw on a repertoire of **thinking/learning strategies.**	☐	☐	☐	☐	☐
...supporting dialogue among learners and instructors in order to establish where to **focus efforts.**	☐	☐	☐	☐	☐

If you agree with the above statements, please provide an example (or examples) of a Web-based activity that can support these claims. If you do not agree, please explain why.

Higher levels of learning require learners to build meaning into the issues and problems presented, and can be facilitated in a Web-based environment by...

	Agree	Somewhat agree	Somewhat disagree	Disagree	Don't know
...providing activities where learners must **make sense** out of the information and/or data presented (i.e., compare, classify, induce, deduce, analyze, abstract and evaluate).	☐	☐	☐	☐	☐
...providing activities where the learners must **generate relationships** from the data and/or information presented.	☐	☐	☐	☐	☐
...encouraging learners to engage in expressive **reflective deliberation** through critical dialogue.	☐	☐	☐	☐	☐

If you agree with the above statements, please provide an example (or examples) of a Web-based activity that can support these claims. If you do not agree, please explain why.

Higher levels of learning typically require learners to understand that their own world view is not the only one (nor necessarily the correct one), and can be facilitated in a Web-based environment by...

	Agree	Somewhat agree	Somewhat disagree	Disagree	Don't know
...developing activities where learners are encouraged to understand and **value others world views.**	☐	☐	☐	☐	☐
...requesting learners to **share views and/or negotiate meanings** in order to facilitate shared and equitable understandings.	☐	☐	☐	☐	☐
...encouraging learners to **work with others of diverse characteristics,** abilities, and backgrounds.	☐	☐	☐	☐	☐

If you agree with the above statements, please provide an example (or examples) of a Web-based activity that can support these claims. If you do not agree, please explain why.

Higher levels of learning typically require learners to provide evidence of new understandings and ways of thinking, and can be facilitated in a Web-based environment by...

	Agree	Somewhat agree	Somewhat disagree	Disagree	Don't know
...providing opportunities for learners to demonstrate they have acquired **new and/or multiple perspectives** of the phenomena presented.	☐	☐	☐	☐	☐
...providing opportunities for learners to become explicit about their **assumptions**.	☐	☐	☐	☐	☐
...providing opportunities for learners to demonstrate their ability to **use a variety of learning strategies** to produce meaningful understandings.	☐	☐	☐	☐	☐

If you agree with the above statements, please provide an example (or examples) of a Web-based activity that can support these claims. If you do not agree, please explain why.

Do you have any additional comments regarding this topic?

Demographic Data

1. I have used the Web to facilitate learning activities for _____ years.

2. I have taught approximately _____ courses where I have used the Web in some way to facilitate learning activities.

3. I have taught _____ courses where the Web was the only communication tool used to communicate with students.

4. I have published in the area of Web based teaching and learning.

   ☐ yes

   ☐ no

   If yes, please check all that apply:

   ☐ books

   ☐ refereed journals

   ☐ non-refereed journals

   ☐ Other, please specify

   _____

Thank you for taking the time to complete this survey.

Appendix D: Survey Results to Open Ended Questions

Responses to open ended questions

Question #1

Problems that involve complex tasks, including active group solutions, such as developing a list of strategies for effective teaching practices empower students to prioritize solutions and make collaborative judgments.

Brainstorming in a chat about problem-solving methods or possible means of implementation of learning.

Complex problems can be facilitated in a Web-based environment by having students develop their own case-based problems – based on their own world experiences (see http://www.indiana.edu/~caseWeb/). Interactive participation can be facilitated in a Web-based environment by having students collaborate online with cases they generate based on their experiences. A repertoire of teaching methods can be facilitated in a Web-based environment such as: brainstorming, role play, creative writing, simulations, journals, semantic Webbing, nominal group processes, guided questioning, debates, and case based reasoning.

Ill-structured problem-solving in a collaborative learning environment is particularly well supported through the use of cognitive tools, including CMC, the access to a world of information sources, and the ability to work collaboratively with others across time and space.

I use threaded discussion forums to support collaborative project work, share and critique each other's work in progress, and synchronous tools for immediate feedback on academic issues.

I have recently used Symposium (Centra software) which is a dataconferencing tool and was able to plan for a wide range of activities including voting, conversation, 'theory bursts', as Web safari (guided) and presentation of visual representation, synchronous online chats, questions that privately checked for understanding, etc.

Email experts about the problem under investigation. Have students work in email groups to formulate their questions before contacting the expert.

I have my networking students collaboratively design a LAN for a small office, in which there is no one correct solution given the variety of equipment, cost available.

Since contexts in which knowledge is to be applied are so varied, I try to get students to discuss how any proposed solution would or would not work in their own workplace context and give reasons for their answers.

I've learned that running extensively with only one or two learning activities gets boring and adults (as well as kids) thrive on and pay more attention to variety.

Using a question requiring a response at the higher levels of the SOLO taxonomy, and when interactive, same, but with CMC with small groups. A repertoire of teaching methods would include directed reading, CMC within and between groups, and individual research. Assessment would be self, peer, and instructor based.

I present a problem on the Web followed by a variety of Web links. My students must access the links to get the information to generate possible solutions.

Have students write a case study based on their own experiences

Web conferencing can support interactive participation.

It is possible to support a repertoire of teaching strategies (you should read Paulson's one alone, one to one, one to many, and many to many techniques).

Case studies with reflective questions for discussion.

There are many teaching methods that can be used with Web conferencing: learning contracts, apprenticeships, internships, lectures, debates, simulations, role plays, case studies, discussion groups, brainstorming, forums, group projects, panels, jigsaws, cognitive networks, etc.

CMC can facilitate interactive participation.

Formation of groups or study teams.

Projects that are complex and somewhat ambiguous.

Using case studies where 'essential' information is missing can be effective – as very often getting the students to ask the right questions is as important as getting them to find solutions. Guess it depends on what you want them to learn.

An inquiry assignment requiring learners to explore Web resources and report back.

Complex problems - Ambiguity in Web-based courses leads only to confusion, and distracts the learning. In Web-based learning no opportunity to explain, communicate or enhance through visual cues exists. The material needs to be rather more straightforward than in a classroom in order to achieve higher levels of learning.

The items are stated in such an ambiguous and/or jargon-laden manner that I find it difficult to agree or disagree, although I lean toward agreement. To accomplish higher levels of learning within any type of learning environment, the most important component is the task (or tasks) that students are challenged to accomplish. The task(s) should be authentic, i.e., as close to a real world performance or activity as possible.

Question #2

Providing as many perspectives as possible via online readings and resources, though not necessarily conflicting perspectives (perhaps just complementary).

Multiple perspectives (i.e., conflicting phenomena) can be facilitated on the Web through online debates. Just providing links with multiple information sources alone will not facilitate multiple perspectives. Instead, use a 'smartWeb' class (see http://php.indiana.edu/~cjbonk/paper/smart_paper.html). Whether multiple perspectives can be supported through a multidisciplinary approach depends on how the disciplines are mixed.

We have designed and delivered a Web-based course in palliative care which involves doctors, residents, nurses, pharmacists, theologians, and social workers. The participants work in teams with cases to assess patients, develop a care plan, and explore affective issues. They are facilitated by Pall Care 'experts' in each group and by a consulting panel.

In a 'writing for new media' course we have planned an online chat to debate the idea of new media writing and moral coherence.

A social studies methodology course, the "Virtual Field Trip" provides five different 'lenses' through which to interpret problems of practice. These include video, audio, text, links, etc., to reflect the views of teachers, kids, experts, curriculum committees, peers, etc.

Have students access video clips, audio clips, documents and other scanned in artifacts and Web links to provide a variety of perspectives on the problem or issue being studied.

I guess it depends, in some classes grounding in the knowledge base of a particular discipline is the primary and maybe only educational goal.

Cognitive dissonance elicited through debate is not only energizing, but also forces participants to examine not only their opponents but also their own assumptions and arguments.

Multiple information sources are generally useful, but academics can go overboard with diversity, thus clouding students ability to come to conclusions of their own.

Multi-disciplinary approach I have a problem with. I might be teaching at a high level within a discipline and making little use of related disciplines. Yet I would still want to bring multiple perspectives to bear on the work. In some cases I would strongly agree with the statement, in others I would not.

Can use CMC to present conflicting phenomena.

Providing links to other Web sites simply because 'they are there' can make students feel overwhelmed by all the information. Many end up just not using the links. Online controversial discussions where the learners use an 'alias' with CMC and an assigned position can not only be fun but can get the students to understand other and multiple views.

Multiple information sources – you can lead them to sources, but they need to know what they are expected to do with them.

Careful and intentional linking can link to Web sites from a cross section of disciplines.

Linking to Web sites that present opposing views is a good way to present conflicting phenomena.

Care in this is needed not to link to too many Web pages – but is possible to present multiple information sources from both within and across disciplines.

Not sure about multiple information sources – I've seen too many sites with too many links. Many Web pages seem to be linking to other Web pages just to link, without a purpose. Students need a 'reason' for the links in order to be useful at facilitating multiple perspectives. So yes, it can, but only with care and purpose.

Have students take different sides on an issue and defend them can be a good way to have learners acquire multiple perspectives. Just linking for the sake of linking can often be unproductive in the learning process.

Ask learners to note different disciplines, backgrounds or different sources.

Multidisciplinary approaches - Web-based learning needs to have a greater use of multidisciplinary approaches to offset some of the inherent drawbacks of the medium

Conflicting phenomena - Opposing views are fine to present but it is very risky to present conflicting phenomena in Web-based instruction. Confusion is a big barrier to on-line learning.

Multiple information sources - Sequencing is very important in Web-based learning. On-line learners appear to do more of the assigned readings than in-class learners. If an instructor is planning on presenting complex material it is ABSOLUTELY NECESSARY that the materials supplied be extremely good and articulate the information in a clear fashion. This information should be presented before any attempt is made to tackle the complex issue.

The items listed above are all positive aspects of effective Web-based learning environments, but one of them is as important as the task orientation.

Question #3

Getting participants to talk with each other about the feasibility of implementing learning, as well as introducing examples generated by those who have previously been through the implementation process.

Personal relevance can be supported through a credible authority with practitioner experts and actual events – using case studies (see http://php.indiana.edu/~cjbonk/paper/holycow.html) and discourse – but instructors need to assist in this process.

In one of my courses we have a different expert available every week that the students may interview online about their area of expertise.

We have developed a hybrid kind of Web Quest on social and cognitive constructivism at the graduate level. The course includes evaluation of real Web sites and course designs. We also use case studies.

One of our courses is an introduction to inquiry methods in Nursing research, and another is a Nursing theory course. These courses are entirely discussion based and the content therefore is based on understanding stories of practice from a practice community.

Create virtual field trips to a site that provides glimpses into the particular phenomena as it unfolds.

Having an authority speak doesn't necessarily insure 'personal relevance' but it does help students judge between various interpretations or 'truths'.

Actual events – again, this varies by subject, but the concrete sequential types among us really like to see the theory in action and empirical validation is the hallmark of most good science. But I imagine there are topics in theology and cosmology that are worthy of study even though they are not derived from real world events.

Discourse, this is important, but as research has shown, professional development students often just want to compare and contrast and not get down into knowledge creation – an important role of the teacher.

Credible authority – this might be true if the students were asked to apply the ideas of the credible authority in a context each student found personally meaningful.

Actual event – again, the students would have to evaluate the actual event from a personal perspective according to previously agreed upon criteria.

Discourse – by guiding a CMC discussion.

Conferencing on the Web can give students access to experts from the field (anywhere in the world) who have first hand experience.

There are a lot of case histories on the Web and these are one way for students to access an actual event.

Access to statistics – the raw data – can give students access to the 'real' thing – and THEY can draw their own conclusions from the data (interpret the data). Then, have them defend their interpretations or have them see how many ways the data can be interpreted.

Question posing can facilitate guided discourse.

Having students read and discuss issues in the news.

Lots of real Web sites out there. Guided discourse through threaded discussions, email, groups, etc.

The use of a credible authority is always useful.

Guiding reasoned discourse - This is a tricky one to manage. Sustainability is a problem. It appears that whenever a professor enters the on-line discussion it has a tendency to stop the discussion and yet if the professor allows the discussion to go on with very little input the professor is accused of not being "there" This is the result, in my opinion, of the different academic level, and the lack of visual presence on the Web. Professors, usually, have a very formal writing style, because of their academic training. Most learners use the Web and email in a very casual, conversational manner and are therefore put off by the formality of the responses. This is a facet of teaching on-line that is difficult and has received very little attention.

Once again, I find it difficult to disagree with any of these. They are akin to the positive aspects of any good learning environment, there is nothing about them that requires the Web.

Question #4

Asking questions and having students form responses.

The problem based method is, of course, best at facilitated by using problem-based learning, yes?

The delphi-technique works well in the decision-building process.

One course uses a project-based approach in which participants customize modules and activities to help them develop a project. The learning is supported through conversation through threaded discussions.

An undergraduate psychology course that requires the students to support (or not) cognitive theory with evidence from their readings and from their experiences. This is done through threaded discussions.

Organizing course content around the investigation of key problems related to the phenomena under investigation.

The problem based method, and maybe also case studies, are effective at supporting problem solving skills.

Decision making with a consensus activity (Delphi method). WebQuests for inquiry based learning. Case studies for problem based learning or pbl.

The Web is great for searching and finding external resources to justify one's position. Inquiry based learning also serves to initiate learners in the actual practice of scholarship. Problem based learning provides a focus and context that forces students' to go beyond the theoretical understanding of new concepts. I'm not sure that decision-building is much different from problem solving, but I always like activities that force a final action.

Inquiry-based learning – by posing open ended questions and providing online links to appropriate resources, students can be engaged in ways they find personally meaningful through their choice of subject(s) as they meet the objective(s).

Problem-based learning – by providing rich online problems. Plans Science at UBC and Biology at Laval are doing this.

Problem-base learning can be done with pb method and threaded discussions.

Decision building – particularly through CMC, preferably using a group participant as a small group moderator.

Inquiry based learning can be done through Web Quests.

Authentic case studies can facilitate problem solving skills.

The delphi method can be effective as a decision building activity (where students take a position then must defend their position if different from the group – or try to persuade the group to see take the alternate view).

There is no reason why the pbl method can't be used online and WebQuests are very effective for inquiry based learning.

In the MBA program, use of case studies, such as HBS.

Problems are well presented with a case study approach and reflective questioning.

Negotiable contracting - I have had very little luck with this technique. When I tried to do some peer evaluation it was greeted with outright hostility. I suspect that it was because there is very little sense of community within an online class. I further suspect that the learners did not trust their fellow classmates and felt vulnerable

Assessment as part of the instructional process - I would be really interested in this aspect and sharing this info if there are any suggestions. I have used debates to achieve this, at least I think I achieved it????????

Assessment through performance - I have had quite some success with presentations.

Once again, I find it difficult to disagree with any of these. They are akin to the positive aspects of any good learning environment, there is nothing about them that requires the Web.

Question #5

Involving students in the decision-making activities, such as group projects helps students to become part of the process.

Use of self-reporting as well as a portfolio approach, in which best practices are compiled by the participant over a lengthy period of implementation.

Personally meaningful assessment works well with peers (see http://php.indiana.edu/~cjbonk/paper/smart_paper.html) and putting student work on display brings in more audiences for evaluation (see http://www.indiana.edu/~tickit/gallery.htm). But assessment is still tricky in Web instruction.

My students propose a project and set the criteria in consultation with me.

Virtual field trip has students developing a learning centre in collaborative groups, based on the problem-based learning they do together. They journal throughout the activity and consider both activities as possible teaching strategies in their own classrooms.

Our use of assessment techniques are limited on the Web. I do not use 'tests' all that often, but there are times when it is appropriate. So, I must ask my students to come in for a proctored exam because I cannot do this on the Web. There are also times when I want to assess my students' verbal skills and abilities to 'spontaneously' respond in 'real time'. This too cannot be done on the Web.

Students design an advocacy Web site as their assessment, and as the problem around which they build their investigations of design and instructional design.

I do not use negotiated contracting because, in my experience, students have a tendency to try to negotiate for the least amount of work possible, or negotiate projects in areas where they already have the information available. While this isn't always true for every class and student, it tends to be the typical scenario in my experience.

Imbedded assessment results in assessment where it is also used as part of the instructional process. Works the same on the Web as in face-to-face.

Require students to create Web-based projects that are appropriate for use with a specific curriculum topic and age level and demonstrate those completed projects for their peers.

I always let students choose their own final term assignments, but haven't had as good experience with peer assessment, as it often forces students into socially awkward positions which they might not be willing to participate in.

A good assessment has an instructional component. I like to use reflection on CMC participation with quotes from the transcripts as a way to motivate participation and have students learn from their own work.

Performance assessment – this is the most difficult problem in WWW based instruction, but important so that students learn to appreciate and learn from peers and share the accumulated knowledge.

Negotiable contracting – again using CMC and SOLO taxonomy as a framework for such activities.

Assessment as part of the instructional process – by having peers provide constructive formative feedback.

Assessment through performance – this is strongly dependent on the discipline and the objectives for the course but, where appropriate, this would be an important and authentic assessment activity.

Imbedded assessment is the only way I how to use assessment as instruction.

Students can 'publish' their work on a Web page for the world to assess.

We use peer evaluations in classes with group work. We use the same peer evaluation process online as in the classroom.

The last one (performance) is most akin to what I mean by the task orientation being more authentic than academic. There are many examples of Web-based learning environments that require the development of a Web-based portfolio.

Question #6

Self-management plans and learning contracts.

Allowing online discussion to be guided by participants' needs and interests, within the overall framework of the curriculum.

How well students can 'set standards of excellence' depends on the students and the class.

Setting standards of excellence is different for each learner. Self-assessment is effective at getting students to set their own standards of excellence. The SOLO taxonomy by Biggs could be used to evaluate individual students against their peers for the purpose of ranking and assigning grades.

A history course which is a combination of classroom seminar and threaded discussions involves peer assessment of discussion.

I have a finance course that uses a number of cognitive tools such as discussions, plus individual work, collaborative development of a financial plan, self-assessment activities, etc. Both procedural knowing and critical thinking skills are emphasized. Based on a series of case-studies.

This happened in a course as they develop plans and present them in their groups and then to the larger community.

Use the conference forum in WebCT as a discussion and negotiation venue for students and instructors.

Having students set their own standards of excellence – I think this is important to be open to student suggestions and critique, but I do not waste a great deal of time forcing students to do my job!

Learning strategies – this is often implicit – I'm not sure most teachers are clear about the differences in thinking strategies, I usually just focus on the resolution of the problem and let the problem and context reveal the variety of thinking necessary to produce good solutions.

Focusing efforts – through forcing collaborative projects students are forced to prioritize activities.

Setting standards of excellence – See previous remarks on SOLO taxonomy. Also set practical limits on the amounts of evidence provided in meeting objectives whether as text attachments or lengths and frequencies of postings in CMC.

Thinking/learning strategies – by using the online analog of classroom assessment strategies.

Focus efforts – I sense a danger here that the focus is becoming more on process than on the discipline. The answer will depend very much on the subject under consideration.

The Web can provide learners with a repertoire of learning strategies through its ability to present using a variety of media such as video, audio, and text.

Are thinking and learning strategies the same? Don't know how to answer this.

There are so many ways to present information on the Web (text, audio clips, video clips, java simulations) that it is easy for learners to draw on a repertoire of learning strategies. The trick is to get them to use a variety of learning strategies.

Accomplished by using threaded discussions in a meaningful way.

Once again, I find it difficult to disagree with any of these. They are akin to the positive aspects of any good learning environment, there is nothing about them that requires the Web.

Question #7

Giving scenarios and letting learners analyze.

Allow participants to reflect on implementation (the good and the bad) and then perhaps give them the flexibility to re-try some implementation effort, with the understanding that others in the group will be moving on with their efforts.

Students can be encouraged to 'make sense' through 'starter-wrapper' activities on the Web (see http://php.indiana.edu/~cjbonk/paper/smart_paper.html) and reflective deliberation can be facilitated through 'field reflections' (see http://php.indiana.edu/~cjbonk/paper/smart_paper.html).

In a finance course the participants gathered data to recommend a financial plan to their clients.

I did a Women's studies course on the Web as pop culture in a feminist framework.

Require reflective papers on a regular basis throughout the course as part of the course grade. Require these papers demonstrate that learners are generating relationships from the information presented and thinking critically about what they are learning.

I sometimes play 'devil's advocate' in discussion to force students to carefully analyze the argument to make sense of it.

Raw data available on the Web can be used as an activity where learners must try to compare, classify, induce, deduce, analyze, abstract and evaluate in ways that can be useful in their work-related environments.

Asking students to construct rules from a variety of data is a good way to force generalization and transference resulting in generating relationships.

Analysis of data in spreadsheets, interpretation of data in graphs, etc. Extrapolating from the data provided to design additional experiments to test hypotheses generated from the initial data.

Comparing and contrasting between different data sets is a way to get students to generate relationships – and infer the effects of a variable in generating two data sets.

Links to Web based databases and having learners interpret the data, can force learners to generate relevance and make the data 'meaningful'.

Forcing learners to carefully express their thoughts can result in reflective deliberation.

There are many databases on the Web that instructors can use to have their students access, compare, contrast, classify, etc., where they must make sense of the data – or make it meaningful, useable.

Setting standards of excellence - While I agree with the premise I find that learners have very little understanding of the learning process (of course, that is why they are here) and certainly very little understanding of standards of excellence as it is connected with their responsibility. This lack of understanding appears more blatant in on-line learning

Focus efforts - This is crucial in on-line learning. The planning process should be more specific. Goals and objectives need to be articulated in clear and concise fashion.

These are all sound pedagogical strategies.

Question #8

Any group assignment – with the use of NetMeeting or similar products.

Mix abilities, backgrounds, and values to gain a wider perspective on various problems. Again, give participants the freedom to probe particular issues without necessarily trying to re-direct the conversation right away.

Understanding and valuing others world views might go over the students heads. But can get students to share views and/or negotiate meanings through using Ticket (see http://www.indiana.edu/~tickit) and can encourage students to work with other of diverse characteristics by doing service teaching and reflect using conferencing on the Web.

In a Pall Care course, first offering, everyone simply deferred to the docs, whose 'word was law'. In the second version, we redesigned the case-based group activities to circumvent this.

Put students in groups where each have to negotiate and develop a solution that has a variety of aspects.

But many cultures clash, and many participants are hesitant to contribute.

Using the conference forum in WebCT can allow for critical dialogue.

Role playing can be useful at getting students to be empathetic of others wold views. Open ended discussions are good at getting students to share views and/or negotiate meanings.

Empathic of others world views – I think this may be possible but I am uncomfortable with the concept of assessing levels of empathy in traditional instruction let a lone Web-based forms.

CMC can facilitate sharing views and negotiating meaning from a given situation. Online forums can help participants reflect on the process they each went through in achieving consensus.

Diverse characteristics –is often difficult to form diverse student groupings for two reasons. First, given the textual nature of the Web as a communication medium, it is often difficult to ascertain each student's unique characteristics (i.e., age, gender, skin color, religion, etc.). Second, those students who participate in higher education tend to have similar characteristics and values. Given these two factors, it is difficult to facilitate this kind of learning activity on the Web.

To encourage learners to work with others of diverse characteristics I suppose you could have groups automatically selected on the basis of responses to an online learning styles inventory if you accept that such a thing has significance in learning specific subjects.

Linking to Web sites of others culture, race, religion, etc., can provide students with opportunities to begin to understand others of diverse characteristics.

Because the Web does not show each other's color, age, height, gender, etc., it can result in a leveling of the environment that is conducive for sharing of views.

We accomplish this in a course on Global Business.

Empathetic of others world views - This may be easier sometimes in a Web-based environment as there may be a broader span of cultures represented through the medium of the Web.

Share views - The one thing that amazed me in my last class was the depth of private matters that students would share. This maybe explains why chat rooms have such a large subscription. There is something easy about telling someone you can't see some very private matter.

These are all sound pedagogical strategies.

Question #9

Learner presentations and discussions.

At some point I think, especially if there is a lot of use of chat for brainstorming/reflection, participants have to be given the opportunity to write about their experience and feelings in a summative way. I use check for understanding forms that are submitted at the end of each standard (unit) in which participants can individually reflect on what the material/implementation meant to them.

Students can use learning logs to reflect on their learning – or to thinking about how they are thinking (metacognition).

Variety of learning strategies - Web-based learning does not give the same opportunity for students to demonstrate a wide range of learning strategies as does an in-class situation.

Instructors can help learners to use a variety of learning strategies by designing the instruction with a variety of teaching strategies. In this way, it forces learners to use a variety of learning strategies (See M. Paulsen's work for how to facilitate a variety of learning methods online).

Providing a variety of learning activities - other than the same old tired, true-blue, end-of-unit reflective questions for discussion that so many online instructors use – can provide opportunities for learners to demonstrate their ability to use a variety of learning strategies.

Getting students to be explicit about their assumptions is difficult on the Web as most students just want to post and be done.

A controversial course in Islam which includes issues of slavery, religious cleansing, and so on. Students develop a new view if Islam that has them challenging the Western media's portrayal of it. One of the outcomes is the examination of their own beliefs about Islam and politics from their own political or religious perspectives.

Reflective papers or some form of learning log can be very effective for providing these kinds of opportunities.

It is useful to predicate request for input by asking for examples from their study or text which show any new gains in knowledge.

Using a variety of learning strategies – like the earlier question about different thinking strategies, not sure how important it is to use different learning strategies – especially if the task or problem doesn't require it.

Students can maintain an online journal to record their reflections on how their world views might, or might not, have changed.

I find using a repertory grid (see Philip Candy) is very effective at having students become explicit about their assumptions.

A journal provides a place for learners to reflect on why they adopted a specific learning strategy and why it did or did not work.

These are all sound pedagogical strategies.