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Technology as a tool for inclusion in multicultural classrooms

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ABSTRACT

For this project-based thesis, the focus was to create an equitable online course Web site for adult learners. The design framework for the Masters of Arts in Education (MAE) online class called Technology as a Tool for Inclusion in Multi-cultural Classrooms incorporates Universal Design for Learning (UDL) principles and The World Wide Web Consortium (WC3) basic access guidelines, to create an equitable online environment. In other words, through copying and pasting the content and instruction from the original course documents into the course Web site, and incorporating UDL principles, the course Web site accommodates adult learners capacities that exist in connection between their inherent qualities of their three brain networks and digital media. For example, Rose and Meyer (2000) write that to support UDL principles the recognition network provides multiple, flexible methods of presentation; to support the strategic network there are multiple, flexible methods of expression and apprenticeship; and to support the affective network there are multiple, flexible options for engagement. As well, the World Wide Web Consortium (1999) developed W3C, to include interoperable technologies (specifications, guidelines, software, and tools). Moreover, by bases the design framework on UDL principles and W3C basic access guidelines will create an equitable online learning environment for adult learners through eliminating barriers to learning. It is my hope that this course Web site will inspire educators to eliminate barriers to learning, and create an equitable learning environment that supports learners.

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In essence, I would like to thank Dr. Bob Hughes, who believes in creating equitable educational environments for diverse learners using technology. He believed that I could use what the Center for Applied Computing (CAST) that has researched and developed, Universal Design for Learning (UDL), as well as WC3 basic access guidelines to use technology to support equitable learning environment. Through understanding concepts, such as "situated learning" and "critical pedagogy", I found I had a foundation to implement these theories with technology in the design of an online course Web site for adults. I believe by applying the guidelines of UDL to learning environments that all learners can have equitable access to tools and activities where they can become legitimate peripheral participants in communities of practice.

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CHAPTER ONE

Introduction

Adult learners always bring their unique learning characteristics to the online environment. Moreover, adults have special needs and requirements as learners compared with children and adolescents. Therefore the design of the Masters of Arts in Education (MAE) online class called Technology as a Tool for Inclusion in Multi-cultural Classrooms is structured to support adult learners. Through implementing the design framework established by the Center for Applied Special Technology (CAST), which has done research on ways to use technology to expand opportunities for diverse learners, has found that the principles of universal design, drawn from architecture and product development, are useful for developing effective educational tools. Moreover, the development of UDL learning tools and teaching strategies requires an understanding of the ways learners may differ. CAST has examined individual differences within a framework and found through neurological research three brain systems: recognition, strategic, and affective. Through implementing Universal Design for Learning (UDL) principles, such as digital media and brain research, adult learners are supported in an online learning environment. In addition, The World Wide Web Consortium (W3C) develops interoperable technologies (specifications, guidelines, software, and tools) to lead the Web to its full potential. W3C is a forum for information, commerce, communication, and collective understanding. Therefore, WC3 basic access guidelines written by the World Wide Web Consortium (1999), have served as a foundation upon

which to build new options, features, and supports that more closely meet the needs of adult learners, as well as individuals with disabilities.

Moreover, Rose and Meyer (2000) write that research has been conducted to support the implementation of UDL to increase access for all learners. Specifically, the National Center on Accessing the General Curriculum (NCAC) created the UDL framework to increase access to the general education curriculum for all learners. NCAC is working on making UDL a reality by working on changing four areas: policy and legal issues, curriculum design, teacher preparation and training, and consensus building among varied stakeholders. Furthermore, CAST, with the help of the National Center on Accessing the General Curriculum (NCAC) has received funding from the U.S. Department of Education and others to create an Internet-based service with access to tools and resources for UDL implementation to support UDL methods and materials. As well, it is apparent that there are more options and resources that are now available for adults in online learning environments. For example, Harasim (2000) writes that the first online course began in 1981 with mini-courses. At this time no one had ever tried teaching a course online, or studied in an online course, but what was realized was new approaches to online education and online collaboration. Also, Harasim (1989, 1990) writes that new online learning environments began to be depicted by a unique combination of attributes, such as group communication, time independence, place independence, text-based/media-enriched messaging, and computer-mediated environments. Although online courses have been around since 1981, it is apparent that new models are emerging, and the resources are now available. Online learning environments can better accommodate diverse learners who vary in background, learning

styles, abilities, and disabilities by providing flexible materials and learning experiences that suit adult learners, as well as support their ability to learn.

The Purpose

As a parent with children, a part-time job, and many other responsibilities associated with living, my weekly schedule was already under a time constraint. With my children's school schedules, and my part-time job there wasn't much time to consider taking traditional classes. In other words, as a non-traditional student I needed to take online classes, which would enable me to go to school, and continue with my already busy weekly schedule. My option, it seemed was to take online classes. Consequently, what I found after taking the initial online class was that it didn't meet my needs as an adult learner. For example, in the first online class I took, the material was too complicated and I needed tutorials to help me understand the depth of information. Also, the class web site didn't provide tutorials so I had to go and see the teacher face-to-face to ask for clarity about the work. In my second online class, it would have been better if the teacher was more friendly, as well as available for correspondence through e-mail or the telephone. When I called or e-mailed to ask her questions about the online course she seemed to become irritated and short. Other students had similar complaints after taking this online class with this teacher.

In the third online class in which I enrolled, the class was much more organized and met some of my needs as an adult learner. For example, the material was laid out in a direct and easy to read sequential format. Also, there were scheduled chat sessions, where there were links to sources of information, and resources available to help with

understanding and comprehension. Also, there were books and articles that were downloadable that connected to assignments. While there were a lot of different types of activities that included being self-motivated, goal oriented, and collaborative, I wasn't using what I now recognize as my three brain networks and in the process of accessing information and for effective engagement. I now understand that effective engagement is using media or tools that supports those three brain networks: i.e., the affective, strategic and recognition networks in the brain. Recognition networks are specialized to sense and assign meaning to patterns we see, while strategic networks are specialized to generate and oversee mental and motor patterns, and affective networks evaluate patterns and assign them emotional significance and (Rose and Meyer, 2002, p. 12). While my third online course was better organized and better suited to my needs, it could have taken advantage of this concept to better meet my learning needs.

Rose and Meyer (2002) believe that the importance of helping learners thrive in any learning environment is to consider the three brain networks when selecting media and tools. Similarly, for adult students to be successful in an online environment, they need the necessary media and tools that are universally designed for diverse learners. Also, to better understand an adults learning abilities, would be to understand the way adults learn.

Keri (2002) cites Nemecek (1997) who writes, adult learners are interested in learning not for the sake of knowledge, but for the application of learning and its relevance to daily experiences (2002, p.31). Also, Keri (2002) cites Candy (1981), Howell, (2001), Robles, (1998), and Sullivan, (1999), who believe that instruction for adult learners must have strategies that encourage learners to express their opinions, share

their life experiences, and engage in open discussion (p. 31). To take into consideration the way adults learn, as well as to understand learners' abilities through the supports that current media and tools provide can create an equitable learning environment.

As a non-traditional adult student taking online classes, it was apparent to me that facets of media, materials, and e-mails were useful. While the online classes had some supports and scaffolds, they could have been set up to include alternative media and tools based on the research in neuroscience where discoveries have shown that there are three primary networks that are distinguishable or connected and sometimes working alone and (Rose and Meyer, 2002, p. 12). In addition to designing an online class for adults that scaffold and support the three brain networks, classes should be set up for individuals with different backgrounds, learning styles, abilities, disabilities, and within different learning contexts (Rose and Meyer, 2002, p. 70). Moreover, in some of the online classes I took, I had access to information, but it didn't necessarily mean that I had equitable access to learning.

Therefore, this project will transform the Masters of Arts in Education (MAE) online class called Technology as a Tool for Inclusion in Multicultural Classrooms to one that incorporates Universal Design for Learning (UDL) for adult online learners. Through the implementation of new media, setting goals, and individualizing instruction, students will progress and learn in a new universally oriented classroom. The goals for this new online classroom are to eliminate barriers and facilitate learning by adding flexible teaching practices and media to the curriculum. Such flexibility in teaching practices and media will help adults become more engaged in learning. This will help the course incorporate all three-brain networks and eliminate barriers to learning.

CHAPTER TWO

Literature Review

The literature of "situated learning" and "critical pedagogy" suggests that taking a situated approach to designing an online learning framework creates a more equitable learning environment for adults. For example, Lave and Wenger (1991) describe that culturally, and historically we are situated learners; in other words, we are apprentices to learning, and the idea of apprenticeship needs to be re-evaluated within pedagogical frameworks. In addition, Banks and Banks (2004) cite Giroux (1983), who describes critical pedagogy as a way to "explore how pedagogy functions as a cultural practice to produce rather than merely transmit knowledge within asymmetrical relations of power that structure teacher-student relations" (p. 241). In other words, students shouldn't just reproduce knowledge, but contest it, and construct new knowledge every day. In this literature review, I will describe the importance of using situated learning and critical pedagogy to design an online framework for adults, who will be able to situate themselves in online environments that promote their ability to learn.

Situated Learning

Lave and Wenger (1991) describe situated learning, as knowledge that is learned through active participation between a person and a community of practice, where the person is engaged in an activity, as well as defined by the world. Situated learning does not seem to only have to do with "thought, action, and social relationships," or the context in which the person is situated, but it has to do with all of these ideas (1991, p.32). For an

apprentice learner to be in a situated learning experience would entail belonging to a community of practice in "thought, action, and social relationships" (1991, p.32).

In addition, Lave and Wenger (1991) believe legitimate peripheral participation, is a type of learning that happens at a specific cultural and historical time, where one is first an apprentice to a specific community of practice. In other words, a community of practice accepts this person in as an apprentice. Then, other members of the community of practice model how to problem solve and develop solutions through knowledge transference. In this collaborative framework, the apprentice learns how to become a fully engaged member of a community of practice, while "knowing and learning" about a specific "social practice" (Lave and Wenger, 1999, p. 24). Through the engagement and collaboration of "new knowledge," new legitimate identities will emerge from participating in relational activities, which will help to develop legitimate peripheral participation. In essence, the creation of identities there will enable new knowledge and skills that can transform communities of practice (Lave and Wenger, 1999). To have legitimate participation in a community of practice would be to first understand the importance of peripheral participation, then to design an online learning environment where participants will be legitimately included to grow individually in knowledge formation and acquisition, as well as developing their identities within social relationships.

Through taking a situated approach for adults in an online learning environment, the design framework will promote active participation within a community of practice. The design framework will situate adults in an online learning environment that will promote engagement through "thoughts, actions, and social relationships" (Lave and Wenger, 1999, p. 32). Furthermore, a teacher takes this situated approach to designing an online learning

environment, then adult learners will begin to actively participate and be engaged in an activity peripherally, and then will learn that through practice and engagement, and acceptance from other members, to become legitimate peripheral participants. By becoming legitimate peripheral participants within a community of practice, adult learners will continue to collaborate and negotiate while learning and gathering knowledge within a community of practice. By taking a situated approach for adults to learn and gather knowledge while participating, new identities will emerge. As new identities emerge through legitimate peripheral participation, adult learners will transform their identities, through knowledge collaboration and negotiation within a design framework that takes a situated approach to learning.

Situated Approach to Designing Instruction

Brown and Duguid (1992) believe that one way to transform teaching instruction is by "legitimizing theft," in other words, by using a situated approach to designing teaching instruction through recognizing that within taking a situated approach to designing for teaching instruction, knowledge can be taken from more than simply teaching instruction. The way to legitimize theft within a situated approach to teaching instruction is for designers to recognize and understanding certain oppositional terms, such as "instruction verse learning," "explicit verse implicit," "individual verse social," and "systems narrowly construed verses systems broadly construed" so that teaching instruction can become transformitive. In the following paragraphs, I will describe these oppositional terms.

Brown and Duguid (1992) describe "instruction verse learning." They explain that just because students do not learn what is being taught, does not mean that nothing was

learned. By shifting our view from the belief that learning is the end result, the design of the learning environment can help learners to "steal" the knowledge they need. Next, the term "explicit and implicit knowledge" implies that the learner needs both. The teacher designs the framework and ensure it's outcomes, not the learner, by designing to ensure that implicit knowledge, as well as abstractions are a part of the design framework. Then, the term "individual verse social," means that even if the individual receives instruction, there needs to be a social context. Without a social context the student may feel confusion and disillusion. Furthermore, "systems narrowly construed verses systems broadly construed" means that it is most beneficial to "steal" when the narrow system is used to connect to the broader material, technological, or social system. In addition, Brown and Duguid (1992) cite Lave and Wenger (1991), who believe that learning with instructional technology needs to stress the social, rather than just the physical nature of situatedness. In other words, designers and instructors need to allow for knowledge "theft" in many different aspects of situated learning.

Therefore allowing for "theft" is by recognizing that student's learn more than what is being taught, in other words students learn through both explicit and implicit knowledge acquisition, as well as a social context to ground the instruction. Also, through designing for "theft" in many different aspects of learning is to design an online environment that encourages learners to develop abilities to learn.

Epistemic Beliefs of Adult Learners

Marra (2002) describes an ideal online environment, where learners feel encouraged to develop their own epistemic beliefs, which promotes their abilities to learn. In other

words, through research, the design of learning instruction can steer a learner into certain beliefs about their abilities to learn that may promote black or white thinking, or can steer a learner to develop new beliefs through the exploration of multiple perspectives, and then to more complex thinking within an ideal online design framework. Furthermore, one of the ways to connect a learners' epistemic perspective with instruction, is to design the online environment to encourage learners to think beyond either black or white. Some of the ways to affect learner's epistemic beliefs are to provide scaffolds and supports for a learner's intellectual development.

Marra (2002) cites Gardner (1998), who describes that the current or future online environments would have to have scaffolds and supports for a learner's intellectual development. Yet, the current online environments "simply replicate the worst of face to face methodologies" (p. 18). This is the reason that the framework that seems to promote certain epistemic beliefs is still simple. In other words, although learners showed strengths in a certain areas, they could not handle complex issues, such as "interpersonal communication, teamwork, applied problem solving, time management, setting priorities, and taking initiative" (p. 18).

Marra (2002) describes that research has been written that describes how frameworks of instructional methods affect a learners' epistemic beliefs about their ability to learn. The idea of the research was to have learners move from simple beliefs to a more complex set of beliefs, through the exploration of different perspectives. In other words, Marra cites Jonassen (2000), Marra et al (2000), and Stephenson & Hunt (1977), who describe that the current state of online learning environments which help move learners to develop their own epistemic perspectives about their abilities to learn would include

modeling, designing, and decision making in a supportive and problem solving environment.

In contrast, Marra and Jonassen (2000) describe four ways that may limit an online environment in promoting a learners belief in their abilities to learn, such as the inability to represent knowledge in multiple ways, lack of distributed tools to support meaning making, inability to encourage deep and critical thinking, and a lack of flexible and multiple forms of assessments.

Therefore, to further develop adults epistemic perspective of their abilities to learn would be to design an online framework for adults that includes multiple representations of knowledge, distributed tools, encourages deep thinking and alternative assessments, and contains instructional strategies. In the following paragraphs are six components of theoretical research that describes the influences of adult learning that will aid in the design of alternative strategies to accommodate adults learning experience in an online environment.

Theories on Adults Learning

Donaldson (1999) developed a model from several theories about adult learning, which influence learning. The first component explains that adults have prior experience and personal biographies. In other words, adults have had prior experiences in the real world such as formal schooling or social and cultural contexts of adult life as work, family, and community members. Additionally, Donaldson (1999) cites Kasworm (1995), (1997), Merriam & Caffarella, (1999) who believe this will influence adults initial interactions within the college environment, through their motivations, self-esteem, self-confidence,

responsibility, and intent. These influences will set the stage for how adults will experience and use their surroundings or the life-world environments to make meaning from their experience. Moreover, Donaldson (1999) cites Cupp, (1991), Donohue and Wong (1997), Nunn, (1994), Sheehan, McMenamin and McDevitt, (1992) who believe that the "psychosocial and values orientations" component explains that a lack in confidence or low skill set will make adults work harder in school by being more serious, and having a clear purpose. Next, the "connecting classroom" component describes ways in which adults use the classroom and their interactions with students and faculty for learning. In other words, adult student's satisfaction with the college's academic environment, such as faculty concern for students, faculty accessibility, and quality of instruction plays an important role in learning outcomes.

In addition to adult student's satisfaction with the college's academic environment, Donaldson (1999) cites Kasworm (1997) who found that adults perceived the classroom as the "main stage for the creation and negotiation of meaning for learning, for being a student and for defining the college experience" (p. 7). Also, adult students compensate for their time restrictions by using class related learning and their relationships with faculty and other students as the strong influences in their learning experience.

As well as adults perceiving the classroom to be the central place for learning, along with their time restrictions, Donaldson (1999) writes about the next component called "adult cognition," where the focus is on the knowledge structures and learning processes which help bring adults to college, as well as to out of class activities. This component of the model contributes to the outcomes learners experience in college because recognizing the importance of the context for learning, it refers to the in-class and out-of-class social

contexts, language, and other learning tools, which all contribute to the knowledge structure and processes. In other words, Donaldson (1999) cites Brown and Duguid (1991) and Wilson (1993), who believe adults adapt to multiple communities of practice. In essence, communities of learners, family members, workers, and as community citizens are some of the ways adults adapt.

Since adults adapt to multiple communities of practice, Donaldson (1999) cites Kasworm (1997) who believes this component shows us that the way adult learners adapt to multiple communities of practice is through the way knowledge is structured within a classroom. In other words, the way knowledge is structured can affect the way adult learners negotiate, make meaning, which can also affect their social and psychological relationships with instructors. As well, adult learners also employ complex metacognitive decisions about their approaches to study, learning, and balancing the many demands on their time. Also, once students begin taking classes their interactions within communities of practice influence their cognition.

The interactions adults have within their communities of practice influences their cognition, such as the environment in which they occupy. As well, Donaldson (1999) explains that the following component called the "life-world environment" component is a component that refers to the different contexts in which adults work and live and are defined by the roles they occupy, such as work, family, and community settings. This component includes the social settings outside the college environment, as well as the people adults depend on for support for their college learning activities. Also, Donaldson (1999) cites Kasworm (1997) who believes these settings are where adults construct meaning for what they are learning in the class environment. To explain this, Donaldson

(1999) cites Kasworm (1995) who believes involvement for adults occurs across many environments, and is not limited to the college environment. Also, Kasworm (1995) believes that the difference for adults is that curricular activities means engagement in work, family and is "self-directed learning projects outside the confines of the college setting and beyond particular course assignments" (p. 24).

In addition, Donaldson (1999) describes the next component as the "outcomes for adults" component model, which explains how the outcomes that come from an adult's learner's college experience are differentiation of learning, support, and goal orientation. As well, Donaldson (1999) cites Kasworm (1997) who recognizes different forms and levels of outcomes for adult learners, such as separate and unique knowledge structures, usage of what adults already know, integration and transformation of different communities of practice, and where they are able to integrate what they have learned throughout different contexts in which they are engaged. According to Kasworm (1997), there is a need to explore alternative definitions of outcomes for adult learners because an online framework for adults to learn would highlight the outcomes, such as the conditions or experiences that help adults to stay involved, barriers to involvement for adults, the extent that adults connect to learning and their real life, and the influences that help adults to learn.

Therefore, Donaldson (1999) believes some questions to consider when designing an online class are making sure the courses accommodate adults lifestyles, which may create a need to design an online learning environment that portrays real world settings. As well, the course should address real world problems or practices that are based on family life, problem based learning activities, and opportunities for peer teaching, as well as create learning that will benefit the community. These models seem to confirm a need for

alternative strategies that accommodate adults learning experience in an online learning environment.

Similarly, Keri (2002) believes adults learn through expressing their opinions, sharing their experiences, and engaging in discussion. As well, instructors teaching adults should respect their values and beliefs. Moreover, adult learning styles should guide instructional strategies, because adults are independent and self-directed, have experiences that they can use for learning, have social and work roles, and usually take an interest in what is being taught. Furthermore, Keri cites Cranton (1992), who writes that adult's characteristics are "autonomous and self-directed, goal directed, want relevance in learning material, practical and problem solvers, and have life experience" (p. 31).

In contrast, adult online learners experience limitations in current online environments. These limitations include "limited forms of knowledge representation, assessment techniques predominantly limited to quizzes of objective items, and the lack of support for distributed tools for meaning making" (Keri, 2002, p. 27). As a result, the use of current online learning environments are not adequately support adult online learners. In essence, adults need goals that have relevance to everyday experiences, as well as the opportunity to express their opinions, share their life experiences, and engage in open discussions (Keri, 2002).

Critical Pedagogy

To begin to analyze current pedagogical frameworks of power, access, and change would be to start with two ways of thinking, described by Banks and Banks (2004). One way comes from the Frankfurt School, and the other from the work of Paulo Freire. The

Frankfurt school focuses on "human agency and the lived experience of the way consciousness is formed within class struggles" (Banks and Banks, 2004, p. 242). In contrast, Freire (2004) believes that "oppressed people must develop a consciousness that will help them denounce structures in society that are dehumanizing, and do something to socially transform the structure" (p. 242).

Giroux (1983) writes that Freire wants people to develop a consciousness, and a discourse that analyses culture and power. One of the ways to develop a discourse is to have schools be a place where students can contest through a critical discourse, a lived experience. Another way is to understand that "knowledge, discourse, and power intersect and produce historical practices of moral, and social regulation" (1983, p. 198). In other words, the idea behind analyzing knowledge, discourse, and power are to produce moral and social regulation that can help to develop a consciousness, which will help people develop a discourse that will socially transform oppressive structures. Moreover, Freire's believes that there is a need to have a situated learning experience where the learner produces, contests, and is legitimated within every day learning environments, which will then help transform oppressive structures. Consequently, Giroux cites Simon (1986), who describes schools as places that "establish the conditions under which some individuals and groups define the terms by which others live, resist, affirm, and participate in the construction of their own identities and subjectivities" (p. 199). Furthermore, Freire (2004) shares models that contain dehumanizing discourses of oppressive pedagogical structures, as well as hope for a more humane development of a new discourse that can be socially transformative.

Freire (2004) describes discourses of the oppressive pedagogical structure of

schools. For example, Freire writes about a discourse announces that there is a, "humanizing pedagogy that tries to cut the chains of oppressive educational practices of advocating the dialectic dialogue by having oppressed students share their experiences and upsets, but does not equip them with the necessary tools to unveil the root causes of oppression" (2004, p. xx). Also, in the following discourse, Freire believes in a "dialectic dialogue" where through the context of education, students can be in a "dialectical relationship with the reading of the world, and the rewriting of the world" (2004, p. 70). Next, Freire believes that students need access to knowledge in the particular area they are studying, so that they can understand themselves critically (p. 74). As well, Freire sees technology as something that should be in constant service to human beings (p. 85). Furthermore, Freire wants situated learning to contain activities that are available for "human beings to leave their marks as subjects not just as objects," where they can "socially make and remake themselves," and learn to have a have vision that would entail "decision and rupture" (2004, p. 108).

In addition to critically analyzing dehumanizing educational practices, Freire has hope for human beings because they are able to "produce intelligence in the world and to communicate that intelligence, by comparing, deciding, and evaluating," which he believes creates ethical beings (2004, p.108). In essence, we are able to "reinvent ourselves and to dream of a better world" (Freire, 2004, p.108). Freire (2004) describes models of dehumanizing oppressive structures and discourses within schools, to have new socially transforming discourses, which can be constructed through an analyzing his models and creating a new discourse.

Through analyzing Freire's models, a new transformational design framework can

take place that serves adults in an online learning environment, and which promotes a dialogic dialogue. In other words, through designing a framework that has the necessary tools that adults can access through technology for knowledge acquisition, adults will be situated in an environment that promotes a socially transformational discourse.

Meaning and Interpretation of Digital Information

Kraidy (2002) analyzes some implications for education, which stresses the importance of focusing on the meaning and interpretation of information instead of on gathering or memorizing information. Consequently, through the ideas of non-linear information access, parallel data processing, and information visualization it will be apparent that education needs to focus more on the meaning of information, rather than on the information itself. In the following paragraphs I will describe the meanings and interpretations of these implications.

First, Kraidy (2002) describes linear media which is designed to be used in a predetermined, structured order, with little user flexibility, such as books and lectures, whereas non-linear media such as hypertext provide multidimensional access to information for individualized and customized learning. In constrast, hypertext provides users access to a virtual reality in which to seek information in exchange for active involvement with the medium and even with other people using it. In this electronic interactive media the burden of instructional initiative is placed largely on the student, making participation unavoidable. The idea is that the level of participation of interactivity that results from the use of computers in a learning environment varies depending on the technology and on the user. To enhance the user's level of participation would be to

understand the importance of situating the user with the proper technology for equitable engagement.

Next, Kraidy (2002) describes parallel data processing, which does not rely on factual knowledge but in the student's ability to understand the implications of given sets of information. Although computers capacity to store and process amounts of information is greater than human performance allows, so analytical capabilities will aid in the expansion of processing more information. Therefore, huge data banks can be compared, analyzed, paired, and structured allowing individuals to conduct large studies with little effort. As a result, the context in which human kind structures knowledge becomes redefined.

Kraidy (2002) cites Perraton (2000) who states "some computer projects have been designed to shift the curriculum in the direction of practical learning of information, handling and communication skills rather than over concentrating on memory" (p. 35). For example, Kraidy (2002) points out that one of the consequences of dealing less with the quantity and more with the quality of information is that individuals will have to focus even more on developing analytical skills to extract meaning from contextual information.

Kraidy (2002) believes that the ability to instantly retrieve extra information through embedded electronic links is another aspect of parallel data processing, which is relevant to education. For example, hypertexts are texts that contain these kinds of links and they are core to interactive media. In other words, the notion of an endless space is a virtual place is created because hypertextuality, suggests the simultaneous presence of additional texts.

Kraidy (2002) describes that parallel information will results in cognitive flexibility because of the combination it includes customized access to multiple modes of information. Kraidy (2002) also cites Spiro & Jehng (1990) who push the educational value of the

multidimensionality of hypertext because they believe it works well in the instruction of complex, and ill-structured subject matters. Also, they believe that individualized access to information via hypertext allows for cognitive flexibility, defined as "the ability to spontaneously restructure one's knowledge, in many ways, in adaptive response to radically changing situational demands, both within and across knowledge application situations" (p. 165).

Kraidy (2002) seems to push the ideas of Spiro and Jehng (1990) in regard to parallel data processing because they attribute benefits of cognitive flexibility to the ability of digital media to represent information along multiple rather than single conceptual dimensions, and to the ability of the user to assemble and retrieve the information.

In addition, Kraidy (2002) believes that computerized access to information needs to be analyzed in terms of our ability to visualize information. The author describes our culture as a largely visual one because not only have computers become increasingly graphical, but also a great variety of other media have been used for visual representation. In addition, digital imaging has made rendering images, much easier. For example, it is now easier to make use of colors, shapes, and graphics on the computer screen than it is in print.

Moreover, Kraidy (2002) believes that with the use of technology, individuals situate themselves in virtual environments, which reinforces how abstract our understanding of information has become. However, technology has also created a return to visualization of information, which offers an opportunity to render abstract concepts physically. Accordingly, the usage of computers in teaching and learning, in terms of their impact on our ability to process parallel data, access information in a non-linear order, and

visualize information, that digital information is contributing to shaping people's mode of cognition. In other words, because there is so much data storage available, knowledge generation will depend more on the quality of the research interpretation than on the amount of processed data.

Through understanding how technology has enhanced the way adults can now situate themselves in technological environments, adults have an opportunity to learn in online environments that focus more on the meaning of information, rather than on the information itself. By understanding these implications in technological environments adults will now have the opportunity to situate themselves in online environments that supports the quality of meaning and interpretation of information, rather than the quantity of data gathered or of memorizing information.

Theories That Support Interactivity in Distance Education

McDonald (2002) believes that we are overlooking important design implications when we try to make distance education the same as face-to-face education. The author reviews current learning theories that shows interactivity is considered to be a critical characteristic of education. McDonald (2002) also believes that discussion and various other forms of group learning have emerged as important teaching methods because of an increased emphasis on constructed learning, in which the focus is now on a creative community of learners. In other words, the emphasis is away from linear ways of thinking toward multiple perspectives of reasoning in context. Through the interaction in-group learning, participants have opportunities to create thoughts, share those thoughts with others, and hear others' reactions. This provides support and mutual feedback that promotes

self-understanding and an experimental base for learning. Namely, group analysis, debate, and shared perspectives help to develop conceptual learning and higher order thinking. In addition, McDonald (2002) believes that interaction between teaching and learning participants instills emotional involvement and feelings of personal relations that contribute to learning pleasure, which supports student motivation and therefore helps learning and increases student satisfaction and success.

McDonald (2002) believes that distance education is creating new learning practices that may not be possible in traditional education. In addition, McDonald (2002) cites Ruberg and Sherman (1992) who believe that computer mediated communication is providing new media which give new insight into the complexity and power of face-to-face interaction. In addition, to reaching learners as a distance, distance education designs are being used to enrich, improve, and expand face-to-face instruction, which results in new educational practices.

McDonald (2002) cites Mason and Kaye (1990) who found three differences to an interactive online environment. First, the online environment doesn't distinguish between distance education and traditional, place-based education because of the opportunity for discussion, collaboration, and the potential for building a sense of community among participants. Next, it allows for more give and take between learners, and the organization, which affects the traditional roles of teaching, administrative, and support staff. Also, online education provides access to peers, creating a network of scholarships through intellectual exchange, collective thinking, collaborative endeavors, and socialization. Also, by using data and evidence, it shows how these findings can bring positive impacts for online education.

McDonald (2002) believes that new learning theories and teaching methods such as constructivism and collaborative learning can have an impact on distance education and face-to-face education. In other words, constructivist theories of learning highlight the social nature of knowledge, claiming meaning is constructed as the result of social interaction. Whereas, the collaborative learning theory is based on social and intellectual interaction that relies on participants sharing information, insights, personal experience, and perspectives with the hope of gaining appreciation and understanding of other views and potentially creating new knowledge with sustained interaction. McDonald (2002) believes that online education can accomplish this and it also supports social negotiation of ideas, providing multiple perspectives on a given topic and access to a vast array of information.

McDonald (2002) cites McComb (1993) who believes online education has three characteristics: as asynchronous communication, efficient information access, and increased social distance. Asynchronous online education avoids schedule conflict and provides contact and control, and allows time for research and personal reflection. Also, it allows time to write, which helps with reflection, learning, analysis, synthesis, and evaluation. Also, efficient access to information includes course information, updates, corrections, and resources that can be posted, and participants can access the Internet for information. In addition, having all the discussion digitalized helps with later reflection, elaboration or comment. Furthermore, online education increases social distance, which helps with feelings of democracy, because the focus is taken off the messenger and placed on the message board creating an equitable environment of appearance, race, gender, educational background, or social status. One last positive impact of online education is that it offers an interactive community that supports the social, affective and cognitive

aspects of learners.

Distributed Learning is Enhancing Interactive Technologies

Bernard et al. (2002) believe that distributed learning is enhancing interactive technologies in learning environments. Therefore, designers are thinking about new types of designs that re-examine how knowledge and skills are acquired, how learning in such contexts occurs, and how to do online instruction. There is an arising importance now to think differently about knowledge and learning, while creating a sense of community. In essence, collaborative online learning seems to work well in technological learning environments. For example, Bernard et al. (2002) cite Abrami and Bures (1996) believe that collaborative online learning will help with complex and higher-level concepts and skills. As well, Bernard et al. (2002) cite Bernard & Lundgren-Cayrol (in press, 1994) who describe that a collaborative environment should be the focus of distributed learning through interactions, which helps learners, understand and negotiate diverse knowledge, skills and attitudes. In addition, motivation to participate and confidence are all key components of the experience. Also, learners need to function in diverse roles as exchanges of knowledge and skills evolves through answering and explanations, and challenge and justification.

Bernard et al. (2002) cites Bernard & Lundren-Cayrol (1994) who believe that in order for collaborative online learning to take place, each learner must feel a part of a learning community. In other words, a place where their contributions add to a common knowledge place, and a community is felt through social interaction. A way to design a collaborative online learning environment is to understand Vygotsky's (1986) theory of

social constructivism. For example, to prepare for collaboration the learners instructional needs would be assessed, through collecting student data. Having these kinds of data will help in the designing and implementation of distributed educational materials and experiences.

Bernard et al. (2002) believes the next step in designing a collaborative learning environment is to teach the skills and behaviors that are essential for collaboration, such as preparatory assignments, conducting interviews with fellow students to help students with working with their peers and helping them to gain experience with conferencing in an online environment. Next, learner's motivation to learn and acquire skills is an important design element. Bernard et al. (2002) cites Bures, Abrami and Amundsen (2000) who found three aspects of motivation that have to do with learning: goal orientation (reasons for participating), self-efficacy (beliefs about oneself) , and outcome expectations (beliefs about the usefulness of computer conferencing). To help students have motivational preparation, an effective learning environment would include technical support (Bullen, 1998) and a tutor (Bernard and Lundgren-Cayrol, in press, 1994).

Furthermore, Bernard et Al (2002) cite Palloff and Pratt (1999) who also believe in creating a positive social climate and sense of community. Bernard et al. (2002) cite Fabro and Garrison (1998) who believe that learning collaboratively is a social process, and to create a community of learners they recommend free and easy access to a conference system, collaborative research, involvement in a democratic environment, space for only students to converse, one face-to-face group meeting. In addition, Bernard et al. (2002) believes that a positive learning environment will help learners to become independent, which will create a legitimate need to collaborate.

Bernard et al. (2002) believes that the constructivist model is the most appropriate model in an online collaborative distributed educational environment. In this model Bernard et al. (2002) cite Tam (2000) who believes that learners should be expected to be self-motivated, self-directed, collaborative, participatory and active constructors of their learning. In other words, Bernard et al. (2002) believes that constructivist strategies begin with problem-based learning. Problem-based learning begins with authentic (Fogerty, 1997), ill-structured (Spiro et al. 1991) and open ended problem (Koschmann et al. 1996). Learners are supposed to work in small groups, negotiating roles, finding resources, collecting data, looking for literature, going through information, finding solutions, agreeing on solutions, and providing solutions. Through using this constructivist strategy of problem based learning, Bernard et al. (2002) cite Norman and Schmidt (1992) who show that there is evidence that it promotes more motivation, creates better problem solvers and self-direction, learn and recall information, and integrate acquired knowledge into solutions.

Bernard et al. (2002) believe that if designers use the potential of distance education, and with incorporating collaborative learning strategies, learners will be able to take advantage of a wider range of technologically supported learning opportunities. Enhanced learning can occur because designers can design with the learners needs in mind.

Therefore, distributed learning is enhancing interactive technologies through new ways of designing online environments that adhere to learners needs in a collaborative learning environment. One of the ways that will support the design of a collaborative online learning environment is to recognize that skills and knowledge are acquired differently within communities of practice. In other words, collaborative learning is recognized to

work well within technological environments since within a collaborative learning environment students feel a part of it, learn skills, behaviors, motivation, goals, self-efficacy, and outcomes while in a social climate. In addition, the constructivist model supports collaborative learning because learners are expected to be self-motivated, directed, collaborative, and use problem based learning. The new design framework for adult in an online learning environment will have interactive technologies that will allow for collaborative learning where adults will acquire skills and knowledge through small groups, negotiating roles, finding sources, collecting data and literature, information, and finding solutions. Through this problem solving approach within an interactive environment adults will solve problems through self-direction, learn and recall information, and integrate their skills and knowledge into solutions. Similarly, distributed learning is helping to support collaborative and interactive learning for adults through a technology first framework.

Designing With Distributed Learning and Technology

Harvey (2002) believes that by combining ideas of distributed learning and technology could help with designing online learning with technology as the central aspect. Designers could then break from the limits of the present framework to fully realize the potential of online technologies. He shows us that since online courses only resemble face-to-face methodologies, such as in their tools, activities and assessment that a new design framework would blend technology with pedagogical methodologies to guide the strategies and approaches of design. Therefore, Harvey (2002) cites Hopper (2001) who believes that because the present online courses do not guarantee that learning has taken place, it is important to create an "authentic online pedagogy". Harvey (2002) cites Dede (1997) who

believes that we need an alternative design model that can take advantage of technological innovation, such as distributed learning, because he believes that distributed technologies are reshaping instruction. As well, he believes that distributed learning shows us a distinctive form of distance learning in which learners share in the same virtual experiences with technology, participate while separated from one-another in time and space, and communicate by sharing personal representations with the learning opportunities that distributed media provides.

Harvey (2002) describes that the idea of distributed online learning using technologies shows that knowledge is dispersed for many people, people can create personal representations, and there can be a democratic discussion from those representations. The usage of this knowledge is to design online learning where learners have much more control over content that they viewed at a given point, but also the authority and responsibility for how the course operated would be distributed to the students. Harvey (2002) cites Dede (1996b), who believes that distributed learning holds promise as the building block of a new framework that would be an alternative to a solely instructor-controlled online course. The idea is to change perspective to one where technology serves the design to technology as the starting point for the design.

Moreover, Harvey (2002) suggests a model that is based on technology driving the design for an online course. For example, the model would acknowledge that every person involved in the online course has a valid and unique knowledge base. In other words, a designer would not seek to transmit information, but to create ways to share each of the learner's knowledge bases to have a better understanding. As well, as make the different views of the learners the foundation of the course.

Harvey (2002) believes that the learners, not the instructors would be able to have control over the course content. In other words, the learners would provide their personal experience and knowledge, and interpretations of this knowledge to the benefit of the rest of the classmates. Instructors become members of the course alongside learners. Lastly, in this new model, online technology would be capable of using distributed learning as a format for learning. The basic idea of this model is to move beyond treating online courses like they have the same methodologies as face-to-face classroom environments, and to structure online learning with the technology first approach.

According to Harvey (2002), to design an online learning environment with technology serving the learner, as well as being the central aspect to the design framework, will help change the current face-to-face instructional framework. Through using distributed learning to reshape the design in an online environment, learners will have more control, authority and responsibility. Distributed learning will help situate the learner within a framework where learners share experiences with technology, participate, and communicate within the learning opportunities that distributed media provides.

Situated Learning, Vygotskian Thought, and Community of Practice Interrelate With Designing an Online Environment

Hung and Chen, and Der-Thanq (2001) describe notions of situated cognition, Vygotskian (zone of proximal development, cultural development, and the nature of signs and tools), and learning from the community of practice perspective. From these notions, principles on learning through which design considerations are relevant to online learning environments have been conceived. The design principles are centered around *situatedness,*

commonality, interdependency, and infrastructure. Furthermore, these design principles can help to construct current online learning environments that can support the need to transform traditional rules that are used in designing online learning environments. By understanding situated cognition, Vygotskian thought, and communities of practice, it will be apparent what makes an online community of practice thrive.

To begin with, Hung and Chen, and Der-Thanq (2001) cit Brown et al, (1989) who believe that learning from a community of practice perspective is similar to situated cognition because the social practice and activity structures blend with cognition and learning. In essence, Hung and Chen, and Der-Thanq (2001) cite Brown and Duguid (2000) who synthesized learning as demand driven, a social act, and helps to form an identity. Therefore, the perspective of learning, demand driven, suggests the need to not over emphasize the force feeding type of learning where learners cannot make sense of applications for such knowledge provided to them and problems are faced in the context of the situation, and demand is created for the learner to solve the problem through which performance is based on successful solutions. Next, the perspective of learning as a social act, emphasizes the importance of how people socially construct meanings and appropriate social cultural norms based on situated cognition. In other words, learners eventually acquire skills of the trait, held by the community of practice. Then, the third perspective of learning is identity formation, which takes place through appropriation of the beliefs, values, and skills required in a practice. As well learners acquire a lens for seeing meanings that are identified within a community of practice. These above notions that describe learning are not new. Vygotskian thought relating to situated cognition and communities of practice, provide grounding to the three perspectives of learning.

Consequently, Hung and Chen, and Der-Thanq (2001) believe the data and information on situated cognition implies that the activities of person and environment are parts of a mutually constructed whole. In other words, "Knowledge is not just a mental state, but an experienced relation of things, and it has no meaning outside of such relations" (Dewey, 1910/1981, p. 185). Therefore, mind is perceived as an aspect of person and environment interacting, where activity involves a transaction between person and environment that change both (Dewey and Bentley, 1949). This process is a series of interactional cycles (Bateson, 1972, 1979). So learning should occur within contexts allowing for interactional and dialectical "struggles in cognition whether with other individuals, artifacts, ideas, tools, and problems (Hung in press, 2001; Hung and Wong, 2000).

Furthermore, Hung and Chen, and Der-Thanq (2001) believe that if we adopt the ideas of situated cognition, that its' the history of a relationship that causes an outcome, not the actions of one or another party alone. This historical focus of situated cognition matches with Vygotskian thought because according to Vygotsky (1978, 1981, 1997) studies should consider what the environment means for the child and the child's relationship to the various aspects of environment which adds up to the dialectical relationship. This relationship is defined by the child's needs and goals, which is defined by the forms of social practice that relates the child to the objective environment and defines what that environment means for the child. In other words, the situated perspective helps define things that emerge from within the process of acting and inquiring (Bredo, 1994).

Vygotsky's historical method of development stresses that we need to concentrate not only on the product of development, but on the very process by which higher forms are

established, to discover its nature and its essence. According to Vygotskian thought, even when mental functioning is carried out by an individual acting in isolation, it is inherently social, or sociocultural, in that it incorporates socially evolved and socially organized tools (Bruner, 1996, Wertsch, 1998).

Moreover, Hung and Chen, and Der-Thanq (2001) believe that situated cognition in an online learning environment may be a possible platform for situated or contextual learning. In other words, online learning environments are not constrained by specific locations and classrooms, but can be a part of various learning situations. In contrast, in current forms of traditional learning, knowledge is being abstracted out of the context to the classroom and situated meanings are lost, so the notions of learning from the communities of practice perspective brings back this emphasis of embedded learning.

Hung and Chen, and Der-Thanq (2001) write about Vygotsky and communities of practice, where Vygotsky identified two tasks as a basic analysis to a child's psychological development. Also, Vygotsky applied these two tasks to a broad range of issues. The two tasks are to analyze a social situation that defines a child's life, and to analyze the psychological structures that develop in connection with this mode of life. This is the foundation of Vygoskian thought, which is the genetic law of cultural development that theorizes the social in connection with the psychological. Also, Vygotsky offers three propositions concerning the genetic law of cultural development, which are the Zone of Proximal Development (ZPD), the role of sign and tool mediation. Hung and Chen, and Der-Thanq (2001) write that the ZPD (instructional settings where the social, and the individual are brought together) that the so called psychological tools, such as speech, and signs have a meditational function.

Hung and Chen, and Der-Thanq (2001) continue to explain the ZPD which is the distance between the child's actual development level as determined by "independent problem solving and the higher level of potential development as determined through problem solving" under adult guidance or in collaboration with capable peers (Vygotsky, 1978, p. 86). Learning could involve interactions between novices (learners) and mature practitioners (more capable and knowledgeable individuals within the communities of practice (ZPD) framework (Hung, 1999).

Hung and Chen, and Der-Thanq (2001) believe that the ideal learning situation would be recognizing individual current levels of cognition and creating personalized instruction for the learner within the ZPD. As well, the recent notion of cognitive apprenticeship is one such instructional approach used within the ZPD (Brown et al, 1989). In addition, Vygotsky argues that the higher mental functions rely on the mediation of behavior by signs and sign systems, mostly speech. In other words Vygotsky saw signs as a special type of stimuli that are used as psychological tools; tools that are directed towards the mastery of control of behavioral processes, either someone else's or one's own. Some examples of psychological tools are language, art, counting, writing and so on. In essence, Vygotsky argued that "a sign is always originally a means used for social purposes, a means of influencing others, and only later becomes a means of influencing oneself" (1981a, p. 157). In any event, Vygotsky focused mainly on the sign of language, he argued that the main function of speech, both for the adult and for the child, is the function of communication, social contact, and influencing surrounding individuals (1978). In other words, through social interaction and communication through tools, there is a form of self-regulation of behavior through reflection in action. Through such a process, internalization

and learning occurs.

Hung and Chen, and Der-Thanq (2001) cite Hung (1999) who believes that the use of tools in any cultural practice is socially constructed by the individual and by the culture with the person or learner who is already more competent within the ZPD in the use of tools and culturally appropriate goals.

Hung and Chen, and Der-Thanq (2001) continue to show findings that institutions and communities are identifiable by their activities, practices, and tools used. In other words, communities of practice are also connected by socially constructed beliefs and ways of thinking. What we consider real and authentic within a community of practice is framed by its culture and demands. In other words, their meanings are socially constructed through negotiations among present and past members of different degrees of expertise.

Through describing these theoretical groundings of situated cognition, Vygotskian thought, and communities of practice, there are implications to designing an online learning environment. To begin with situatedness is described as learning that has rich cultural and social contexts, as well as implicit and explicit knowledge, as well as being reflective. Some design considerations would be to use the Internet to have a common platform, so that learners can access the online learning environment in their situated contexts, as well as be portable, project based, and focus more on quality rather than on quantity. Next, commonality is described through learning helps to form an identity through membership to a community, as well as learning is a social act through using language, signs, and tools. In short, the design considerations for commonality are making the environment interesting and interactive through the usage of tools, mediated discourse through collaboration and communication, and scaffolding that contains common expressions used by the community.

Then, interdependency is described as learning, which is socially distributed through people and tools, and dependent on engagement. As a result, the design consideration are to create interdependences between novice and expert, allow for the diversity of expertise, personable environments, as well as keep track of history, profile, and progress, and personalize strategy and content. To sum up, infrastructure is learning that happens through an activity that is appropriate and structured. As well design considerations should allow for structures and tools set up to help create learning, and have the possibility to change traditional procedures that were held back through space and time.

Therefore, the theoretical groundings of situated cognition, Vygotskian thought and communities of practice dependent through the design framework on the four principles can transform the traditional framework in online learning to a more vibrant online learning environment. To create an online learning environment that helps adults to thrive would be to allow for more than the traditional framework, and to look beyond the product of development to the process, such as the social, sociocultural, and the socially organized tools (Bruner; Wertsch, 1998). In essence, through understanding Vygotskian thought, analyzing the social environment of learning and the psychological structures that aid development will help to create the Zone of Proximal Development (ZPD), with sign and tools within an online learning environment. Furthermore, the ZPD for adult learners will have the potential to move beyond their current level of development through using signs as a psychological tool, to influence others, and then to influence oneself (Vygotsky, 1981a). As well, design considerations for adults in an online learning environment will have social interaction, communication through tools, self-regulation, and reflection in action so that learning occurs. After all, the design infrastructure will have a structural dependency, as

well as design considerations that have tools to set up and help learning, have the possibility of change and connection within situatedness, commonality, interdependency, and infrastructure, and allow for ongoing transformation in online communities.

Universal Design for Learning (UDL)

Rose and Meyer (2000) write that Universal Design for Learning (UDL) emerged from architectural design when federal legislation required universal access to buildings from individuals with disabilities. While architects designed buildings with universal accessibility and through the construction of buildings for people with disabilities, they found it also helped individuals that needed ramps or other devices. Through this architectural principle of universal design, which was adapted from the field of architecture and applied to education, UDL became a strategy to eliminate barriers in learning.

Hitchcock, Meyer, Rose, and Jackson (2002) describe that in the early 1990's, the Center for Applied Special Technology (CAST) began to apply the concept of universal design to curriculum materials and methods and created the term Universal Design for Learning (UDL). For twelve years CAST has been researching, developing, and designing flexible curricular materials and methods to overcome barriers for all learners. In addition, Hitchcock, Meyer, Rose, and Jackson (2002) site Yell and Shriner (1997) who write that since the Individuals with Disabilities Education Act Amendments of 1997, students with disabilities are entitled to access, participate, and progress within the general education curriculum. Rose and Meyer (1998) believe that the flexibility of computers make curricula more accessible and useful for all students to learn. Therefore, universal design was found

to offer students the flexibility that supports individual differences in recognition, strategic, and affective networks.

To take into consideration diverse approaches and materials to achieve optimal learning, Rose and Meyer (2000) believe that instruction, materials, and assessment for each of the brain networks must be addressed. Therefore, the way technology can assist diverse individuals in their own unique learning processes is through the flexibility of computers, such as their versatility and customizability. Within a universally designed framework, Rose and Meyer (2000) first describe that the recognition network of the brain would benefit from alternative representations of content that enable us to identify and interpret patterns of sound, light, taste, small and touch (p. 13). As well, these networks help us to recognize voices, faces, letters, and words, as well as style and intonation (p. 13). Therefore, a potential barrier for *recognition networks* is that presentations and materials fail to provide examples. As well, Rose and Meyer (2000) believe that the *strategic network* would benefit from multiple options for expression and control. In other words, through strategic networks we plan, execute, and monitor our internal generated mental and motor patterns (p. 21). In addition, Rose and Meyer (2000) believe that *affective networks* would benefit from options that promote engagement, interest, and motivation. In other words learning requires interaction with the external world with varied materials, tools, people, and contexts (p 29).

Dolan, Hall, Banerjee, Chun, and Strangman, (2005) believe that the theoretical framework Universal Design for Learning can design access both content and learning for diverse students from the onset. In other words, a computerized read-aloud is a valuable tool for realizing a universal design approach toward assessment. Moreover, the text-to-

speech read-aloud provides students with consistent readings free of misleading intonation. As well, the use of text-to-speech can increase continuity between instruction and assessment, by creating more options during test taking. Therefore, text-to-speech offers supports through strategically interacting, engaging with an assessment and by offering individualized, independent, and self-paced access to tests.

Pisha and Coyne (2001) write that an overhaul of curricula, methods, and materials to redesign materials and instructional approaches was needed. The National Council for the Social Studies (1994) developed a project that created an online content area of a history textbook that uses multimedia technology to meet the needs of diverse students. To begin with, the text was enhanced with built in supports and customizable features, assignments and pedagogical procedures that take advantage of this flexibility, as well a formative evaluation from the High School students on how to construct digital text books with details and recommendations. In addition, basic access guidelines by the World Wide Web Consortium (1999), served as a foundation upon which to build new options, features, and supports. Some of the results from injecting flexibility into a digital learning environment are making available a launch page for each chapter, with options for presentation of text, images, and other content elements, provide options to view text, images, charts, sidebars, include both text and graphics in each icon and keep links consistent, outline each chapter, embed video clips, and consistent appearance.

Dalton, Pisha, Eagleton, Coyne, and Deysher (2002) show the positive impact of computer-supported versus traditional strategy instruction on the reading comprehension of middle school students who were identified as struggling readers, a CD-ROM research prototype called Thinking Reader that has embedded decoding, strategy, vocabulary and

self-assessment supports into digital version of age-appropriate novels. Universal Design for Learning provided the conceptual foundation for Thinking Reader. The text to speech feature allows students to read age appropriate text that was about their decoding level, and at their interest level. Also, the embedded strategy prompts required frequent interactions with the text and involved students in writing their thoughts and feelings throughout the novel. Also, opportunities to exercise choice and control were greater in the computer-supported environment, and the electronic work log was a reminder to students of their efforts, and progress.

Therefore, Dalton and Pisha (2001) write that since new tools such as classroom computers offer options for capturing, storing, retrieving, and displaying information in non-textual forms, such as images, sound and video that learning environments can be customized. Universal Design for Learning suggests that these tools can be developed within a flexible curricula and materials for all students strengths, weaknesses, styles, interests and background knowledge. Therefore, the literature suggests a need for a different type of online course.

Through understanding the literature, it is apparent that adults learn in novel ways, and can be engaged in an online environment that is equitable. Through restructuring the design of the Masters of Arts in Education (MAE) online class called Technology as a Tool for Inclusion in Multi-cultural Classrooms to one that incorporates Universal Design for Learning (UDL) principles, will be an online framework that incorporates the research of situated learning, adults' epistemological development, and critical pedagogy. In essence, the restructuring of the Masters of Arts in Education (MAE) online class called Technology as a Tool for Inclusion in Multi-cultural Classrooms will have a new design framework

where adults will be situated in an online environment that invites them to be legitimate peripheral participants in a community of practice. As well, the design framework will incorporate the way adults epistemologically learn, as well as, have access to knowledge that looks at current pedagogical frameworks of power, access, and change, so that a new discourse will continue to inspire a new transformational design framework that can serve adults in an online environment.

CHAPTER THREE: METHOD AND DESIGN

The Process of Applying UDL to the Course Web Site

The Web based course design was chosen as the medium because it allowed for the implementation of a Universal Design for Learning (UDL) framework and the World Wide Web Consortium (WC3) basic access guidelines in an online learning environment for adults. Huang (2002) writes that the World Wide Web provides hypertext links and hypermedia ability to facilitate educational instruction. As well, the Web provides an environment where adult learners can search actively and discover rich resources to problems solve and construct their own knowledge. Moreover, Huang (2002) writes that adult learners need to take control of their learning, to set up their learning goals, look for appropriate resources, decide on their learning styles and evaluate their progress, and learn how to critically reflect to become life long learners. By using the Web as a tool, and through implementing the UDL framework and WC3 basic access guidelines, the course Web site provides adult learners with appropriate instructional supports and challenges to promote their ability to learn.

Rose and Meyer (1988) write that the Center for Applied Special Technology (CAST) has examined individual differences within a framework suggested by recent neurological research, and found that Positron Emission Tomography (PET) studies have confirmed that brain activity occurs in roughly the same areas for most individuals performing a given task, but that each individual has a unique signature of brain activity for that task. In other words, within the UDL framework it can be determined whether a goal is focused on information (recognition network), on process (strategic network), or on

significance for learners (affective networks). By separating the methods and materials from the goals, appropriate instructional supports can be implemented, based on using the three brain networks.

Furthermore, Pisha and Coyne (2001) write that the World Wide Web Consortium (WC3) developed interoperable technologies (specifications, guidelines, software, and tools) to lead the Web to its full potential. W3C is a forum for information, commerce, communication, and collective understanding. By basing the design framework on WC3 basic access guidelines. I had a foundation upon which to build new options, features, and supports that more closely met the needs of adult learners. Moreover, some supports for adult learners that were incorporated into the course Web site were to make available a launch page for each chapter, with options for presentation of text, images, and other content elements, such as providing options to view text, images, charts, sidebars, including both text and graphics in each icon and keeping links consistent, outlining each chapter, embedding video clips, and keeping a consistent appearance.

The completed design framework includes the implementation of the UDL principles and WC3 basic access guidelines in a course Web site that strives to facilitate an equitable learning environment for adults. As well, the course Web site aims to incorporate the interactivity and learner-centered strategies already written as content in the original course syllabus. Moreover, in order to facilitate an equitable online environment the design framework contains examples of: a) how three brain networks function using flexible materials and methods for assignments and readings, b) showing how the flexible materials and methods demonstrate ways to support and scaffold adult learners, and c) designing the course Web site to adhere to the WC3 basic access guidelines.

The Instructional Design Process

To begin with, I applied CASTs research of applying UDL to a Web site framework, as well as the WC3 basic access guidelines to support adult learners. I did this by first implementing the UDL framework into the course Web site. Next, I found the main focus of the standard, which is to meet the state's Level 2 technology requirement. It assumes students have some skill or are proficient in low-level multi-media presentations in PowerPoint or with an HTML editing program. For each reading and assignment in the course Web site, I universally designed. In other words, the design framework includes separating the methods and materials from the standards so that appropriate instructional supports will be implemented based on using the three brain networks, as well as WC3 basic access guidelines. For example, the design framework includes: a) identifying the main focus of the learning standard, b) determining variable instructional components that would support adult learners while matching the central focus of the learning standard with each of the three brain networks, and e) design the framework of the online course Web site to abide by WC3 basic access guidelines.

Let me illustrate my application of the UDL framework, as well as WC3 basic access guidelines to support adult learners in the design of an equitable course Web site.

a) I began by identifying the main focus of the State of California Level 2 standard that was already written in the Masters of Arts in Education (MAE) syllabus, which showed how to use some technology to accomplish activities and assignments. In other words, the main focus of the learning standard was already determined and written to allow for multiple methods and materials to be used for adult learners. Moreover, I implemented the variable instructional components that would support adult learners while matching the

central focus of the learning standard with each of the three brain networks. As well, I abided by WC3 basic access guidelines in the course Web site design framework, such as having the same navigation, structure, and look and feel on each page.

Therefore, with the above in mind, the stages for designing the course Web site are as follows (see Figures 1,2, and 3).

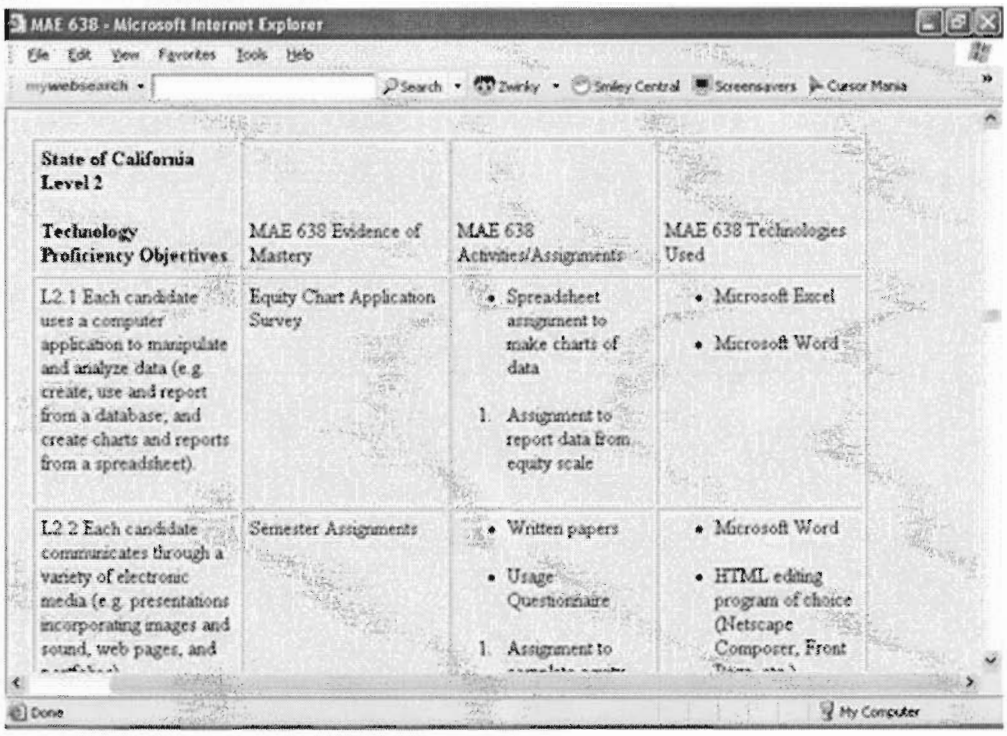

Figure 1. An image of the State of California Level 2 Technology Proficiency Objectives - and how the original course was based on the design framework of using some technology

a) Identifying the main focus of the learning standard. By identifying the main focus of the State of California Level 2 standard in Figure 1., I was able to begin to understand how to separate the methods and materials from the main focus of the learning standard, and continue with the next stage of the design framework.

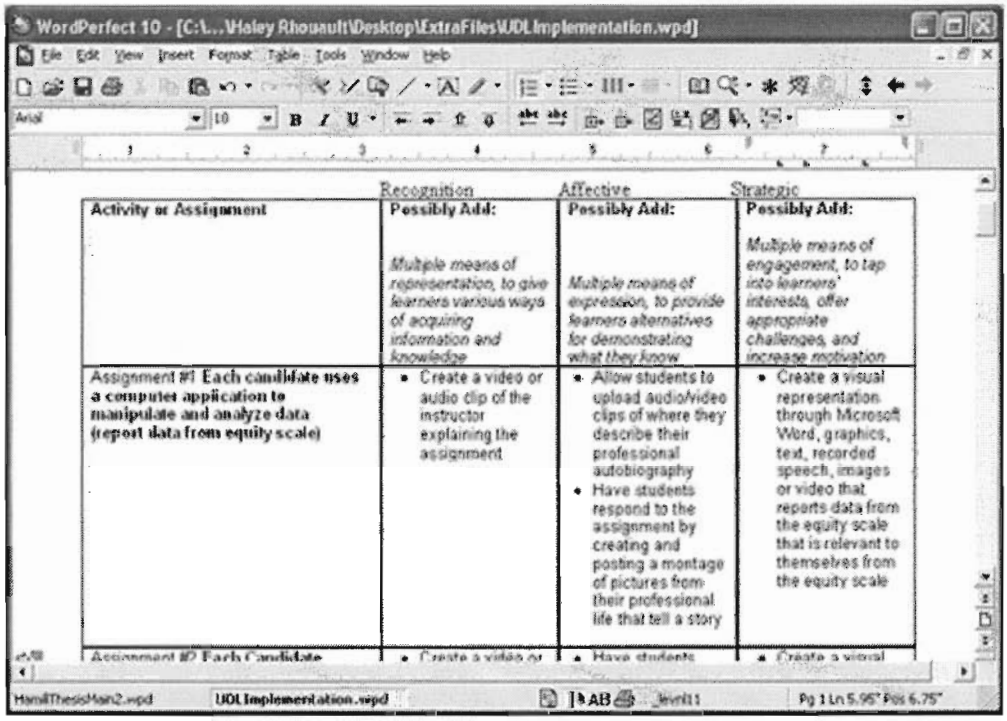

Figure 2. A table describing variable instructional components that would support adult learners using the UDL framework

b) Determining variable instructional components that would support adult learner characteristics while matching the central focus of the learning standard with each of the three brain networks. Figure 2., illustrates how the readings and assignments are matched by a central focus of the learning standard on the left hand side of the page. Then the three brain networks, recognition, strategic and affective are written in order across the top of the page. In the vortex of each reading and assignment and for the three brain networks, there are variable instructional components that support adult learners. In other words, they way I chose which variable instructional components to use is through what Rose and Meyer (2000) write that to learn "how" to do something emphasizes skills and strategies and are the strategic networks, to focus on enjoyment and engagement are the affective networks,

and to ask "who", "what", "when", and "where" and that prioritize the learning of information are the recognition networks. In other words, the *recognition network* has one or more ways to approach the subject matter, such as text, images with no text, images with text, voice, animation, video, or a sequence of sounds. Whereas, the *strategic network* shows how using multimedia and the Internet with flexible learning supports and opportunities to practice skills can support learners. In addition, multimedia and the Internet can be used to monitor learning effectively. Lastly, the *affective network* uses flexible media that can support learner's interests, as well as engage and motivate them. After finishing Figure 2., it was apparent how the implementation of the UDL framework can support and scaffold adult learners in the process of accessing information and for effective engagement.

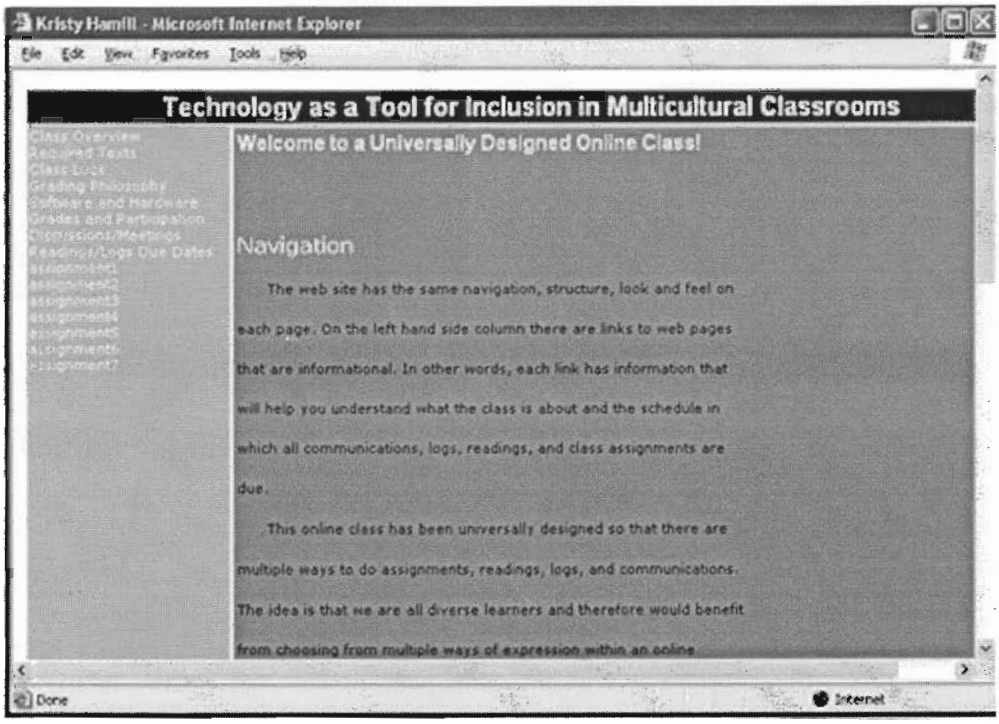

Figure 3. This is an image of the first page of the course Web site.

Figure 3. Design the framework of the course Web site to abide by WC3 basic access guidelines. Figure 3., illustrates that the design framework abides by the World Wide Web Consortium (WC3) basic access guidelines. In other words, each page contains a left hand side column where links are accessible to web pages that are informational. Also, each link, when clicked, will open up to a page that has information that will help adult learners understand the course requirements, and the schedule in which all communications, logs, readings, and class assignments are due.

Examination of the Differences in the Course Web Site

The main difference between the Masters of Arts in Education (MAE) online class called Technology as a Tool for Inclusion in Multi-cultural Classrooms and the new design framework is that the course Web site includes UDL principles and WC3 basic access guidelines. Another difference is that the original course content and instruction is based on using text as the main medium of exchange. Furthermore, the design framework of the new course is an actual course Web site, instead of an informational digital syllabus and digital calendar. As well, the original course does use Blackboard, which is a learning management system that CSUMB uses to build and manage virtual classrooms.

As aforementioned earlier, the course design framework is based on CAST research of incorporating UDL principles and WC3 basic access guidelines. Therefore, I designed the course Web site to incorporate flexible technological tools that supported the decoding of text by the use of the three brain networks.

Rose and Meyer (2000) write that although text has many advantages, it has limitations too. Mainly, text lacks the inherent qualities of speech. As well, text is bound by conventions, such as the fact that text is printed differently, and must be approached in a certain manner. For example, newspaper articles, poems, novels, and reference books might begin on the same page and end on another page and so forth. In addition, learners do not experience the advantages and limitations of text in the same way. The reason relates to how text engages the three brain networks.

Rose and Meyer (2000) write that the recognition network uses a multi-dimensional process for learners to read. In other words, decoding text requires many levels of different patterns, such as for readers to recognize letterforms, letter-sound correspondences, words,

sentences, and larger units of meaning. Because learner differences can develop in any of these areas, barriers to reading can develop at any level. In other words, strategic networks are involved in comprehension of text, which is just not about understanding the meaning, but also involves constructing meaning through interpretation and analysis. Difficulty can occur through setting goals, understanding purpose, interpreting structural cues and meaning within text, connecting prior knowledge with new content, monitoring progress, and remembering concepts are among some barriers in the strategic network. Furthermore, there can be barriers in affective networks, in the reader understanding the emotions in the text, negative associations with text, or if the text is not relevant to them. These individual differences can shape a learners understanding and engagement of the text.

Lastly, I cut and pasted from two documents, the original course syllabus, and the calendar of the due dates and integrated them into the new course Web site. Moreover, Huang (2002) writes that the World Wide Web provides hypertext links and hypermedia ability to facilitate educational instruction. As well, the Web provides an environment where adult learners can search actively and discover rich resources to problems solve and construct their own knowledge. Therefore, the design framework for the new course Web site includes UDL principles, WC3 basic access guidelines, and flexible technological tools that support the decoding of text, all incorporated into a course Web site.

How the Original Course Supports Adult Learners

As aforementioned before, Huang (2002) writes that adult learners need to take control of their learning, to set up their learning goals, look for appropriate resources, decide on their learning styles and evaluate their progress, and learn how to critically reflect

to become life long learners. I looked over the content of the original course, and found that adult learners were supported through having learner-centered and interactive activities. In other words, there course was set up to have group discussion, online chats, reflect and response sessions weekly in order to learn content through class logs or Listservs, or threaded discussions. The original course used, which is a learning management system used to build and manage virtual classrooms. In this way, adult learners were involved in interaction with other people in their online class, which supports learner development and understanding. As well, interaction with other people supports learners to consider and reflect on the content and process of learning.

Furthermore, Huang (2002) writes that adult learners can be supported through the instruction because the course content is grounded in real-world problems where adults can exchange their own experiences in class logs or Listservs, or threaded discussions using Blackboard or their own digital media. Moreover, the instructor became a facilitator by creating a safe environment, as well as allowing learners to express themselves in appropriate ways, share ideas, and ask questions. Also, adult learners can actively motivate themselves to design their own learning plans to keep up with the class, and to use the Internet. In other words, adults can use browsers or search engines to transfer files and information from thousands of possible real-life sources to themselves. Furthermore adults can actively learn from external inputs and construct meaningful knowledge from their own past individual experience. Hence, I recognized that there are many ways in which adult learners are supported in the original course. All in all, the content and instruction does support adult learners, yet to create an equitable online learning environment, I have found that barriers for adult learners need to be eliminated through implementing flexible digital

tools that support adult learners in connection between their inherent qualities of their three brain networks.

Digital Tools Used in the Design Process

The digital tools that were used in the design process included purchasing a diverse assortment of software to design the framework of the online course Web site, with flexible technological tools. I already had some software and hardware, but I still needed to purchase and borrow others. My aim was to use the design framework of UDL, and WC3 basic access guidelines, to implement varying technologies so adult learners could have multiple, flexible methods and materials to reach the same goals. In other words, by separating the methods and materials from the standards, appropriate instructional supports could be implemented based on using the three brain networks. The design framework on the online course Web site, began with a Web authoring program, called Macromedia Dreamweaver MX. Moreover, the software I used to show that flexible materials and methods could be used to reach the same goals, based on the three brain networks are Adobe Photoshop 7.0, QuickTime Player, Nero ShowTime 2, Microsoft PowerPoint, Inspiration, Nero Essentials Suite 1, QuickTime, Inspiration, and Microsoft Office 2000.

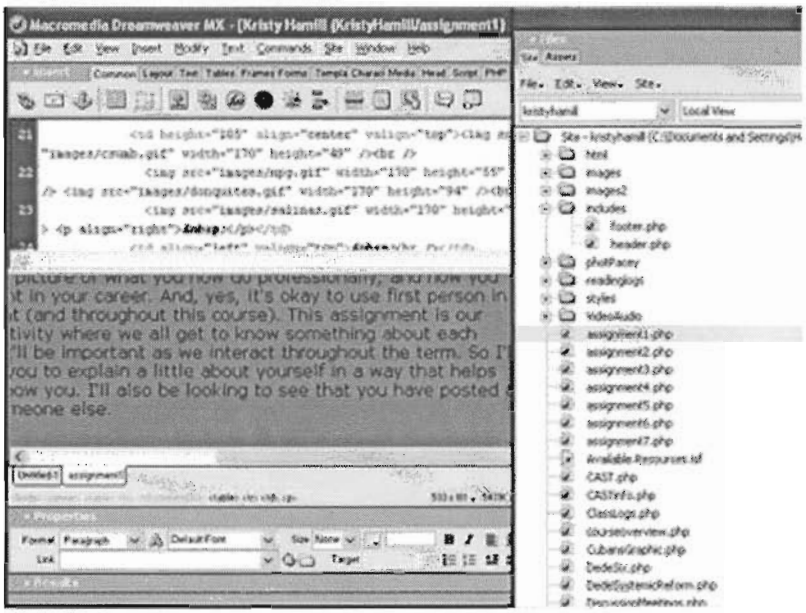

Figure A. Inner landscape of Macromedia Dreamweaver MX

As Figure A. illustrates, Macromedia Dreamweaver MX 6.0. is a Web authoring tool. For example, I was able to create a consistent user interface because it had an accessible and logically arranged user interface. In other words, I was able to make design decisions quickly with visual previews of text styles, and gradients. Also, I could be efficient because I could quickly open recently used files, create new files, or access tutorials from this page. In addition, there were other helpful user interface elements, such as site definitions, panel management, tabs over multiple open documents, coding and visual preview tabs, and a common Property inspector.

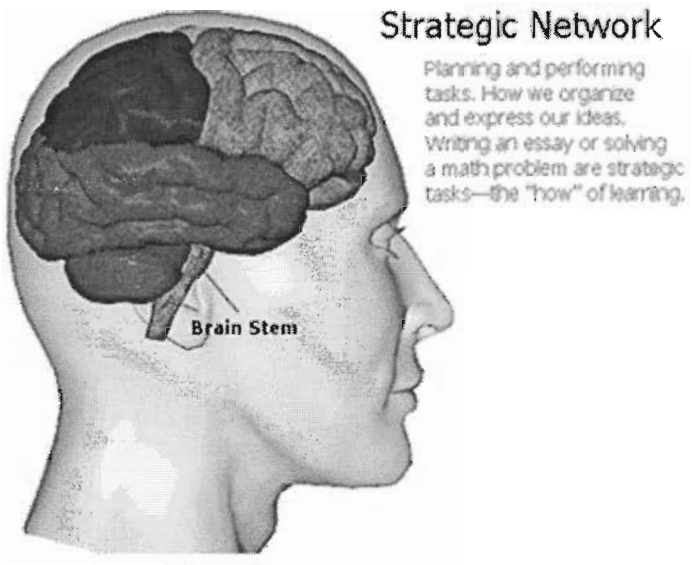

Figure B. An image manipulated in Adobe Photoshop 7.0 of a graphic that was used in a Photo Album on the online course Web site.

The next software, Adobe Photoshop 7.0, is a professional image-editing standard that provides image-editing tools. Adobe Photoshop 7.0 aided the design of the course Web site by allowing me to edit images. Through image and bitmap manipulation, I was able to upload an image, change the size, and resave it. For example, one image from the Brain Networks photo album in Figure B., I was manipulated through the use of the crop tool, and the zoom tool. As well, I used the horizontal type tool, and the color palette, to choose the type and the color, and to write some information on the image. Also, I was able to flatten the image and save it "for the web".

In addition, QuickTime Player and Nero ShowTime 2 are flexible tools that I used to make the audio and the video for the course Web site. QuickTime Player is a free multimedia player. It can used to view many kinds of files, including video, audio, still

images, graphics, and virtual reality (VR) movies. Along, with a video camera and a computer, I used QuickTime Pro to record a movie. QuickTime Pro can capture video from most FireWire-equipped sources, including the Apple iSight, DV cameras, and some webcams. With a Macintosh or Windows computer, you can also record audio using a built-in or external microphone.

Nero ShowTime 2 is a comprehensive software program. To use Nero I selected the desired category (e.g. Video), then I chose a task (e.g. Make Video CD) and the relevant software started automatically. As well, Nero allowed me to have quick and easy access to all digital media files, TV time-shifting, DVD, video, photo and audio playback support. As well, Nero is skinable and adaptable to all kinds of display devices such as TV, Plasma, LCD, and is a powerful database for storing and organizing media files into playlists, and Complete multiple tasks concurrently.

I combined QuickTime Player and Nero ShowTime 2 to capture video and audio. In other words, I borrowed a DV camera, talked with a friend over how to shoot video and found out a few very amateurish secrets, such as where to place the lighting, and to include a backdrop. Then, took my JVC mini DV, and turned it to record. Automatically, a box popped up in NeroVision Express that gave me options to use. After, shooting the video, I made a folder for all the captured video. Then, I went to the file and right clicked on it, which opened the captured video in Quicktime. Once in Quicktime, I would take my curser and go to "file" on the navigation bar, and scroll down to "export" and click it. This way the captured video could be saved as either a sound or video file because there are various file extensions that I can export the captured video, such as, .aiff for a sound file, and .mov for a movie file. In this way, I was able to use a plugin from Macromedia Dreamweaver

MX 6.0., and insert the sound or video files right into a course Web page.

In addition, I used PowerPoint 2003 to create slide shows with text and graphics. I was able to access Clip Art and insert my own. I used some of the multimedia elements, such as images, sounds, photos, and animations to show impact in my presentations. Mainly, I used PowerPoint 2003 to tell a story or to show how I understood the information of the task. Yet, PowerPoint 2003 has many other capabilities, such as security options, animation effects, support for additional file types to play video, and ability to add notes and illustrations while giving a presentation. And, I was able to use a dictionary, thesaurus, and online research sites, automatic fixing of writing errors, and Smart Tags. A Smart Tag will appear that provides additional information and a list of actions to take when a specific word or phrase comes up.

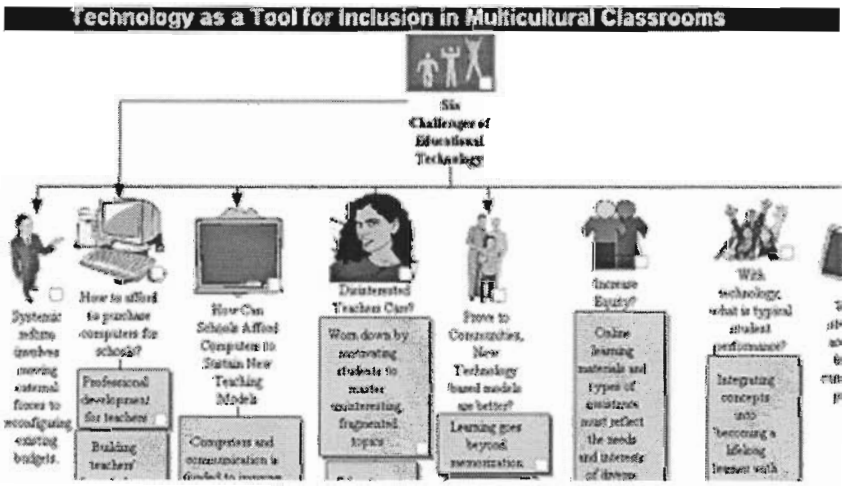

Figure C. Part of a diagram created in Inspiration

Furthermore, I used the software Inspiration as a tool to plan, research and complete tasks in the course Web site. Within the integrated diagram and outline views, I used

graphic organizers to expand topics into writing. For example, in Figure C., I used a template, by choosing between "language arts", "planning", "science", "social studies", or "thinking skills" that best represented my understanding of concepts, and which demonstrated my knowledge of the task. Moreover, I created my own diagram by placing bubbles, arrows, text, and inserting images. I found Inspiration a very useful tool for visual learners because they can analyze, compare and evaluate information. Also, learners can quickly search for new ideas. For example, the RapidFire tool is helpful because it is collection of symbols that represent specific categories of images. This is a helpful tool because learners can show relationships between ideas, and link images and add text to further clarify meaning. In addition, learners can begin the writing process, by visually integrating notes to expand topics and then switch to outline view to further develop their ideas. As well, there is an integrated word guide that helps learners choose words with more precision, and a contextual spell checker that automatically identifies misspelled words. To finalize projects, students can transfer to their favorite word processor or transform their work into a web site with the Site Skeleton export tool. All in all, Inspiration helps students organize information, develop thinking skills, and demonstrate knowledge.

Lastly, I used Microsoft Office 2000 to design some of the documents for the course Web site. I put the cursor on the navigation bar and clicked "view", then scrolled down, and chose to view the document in print layout mode. In this mode, I could see how the document would look after it was printed. Furthermore, I used many tools, such as headers and footers, page numbers, page breaks, and images on almost every page. As well, I

clicked on "format" on the navigation bar and scrolled down to choose the type of font, color of the font, and spacing. Then, I clicked on "tool" on the navigation bar and scrolled down and chose "spell check" to check the entire document for misspelled words and typos. Although, I only had access to an older version of Microsoft Office, a new version now exists. In other words Microsoft Office 2007 has many more supports in using documents, spreadsheets and presentations. In other words, there are many more ways in which tools can be used to create a flexible learning environment for adults, such as screen readers, magnifiers, speech recognition, alternative displays and other assistive technologies.

CHAPTER FOUR: RESULTS OF THE DESIGN

The design framework for the Masters of Arts in Education (MAE) online class called Technology as a Tool for Inclusion in Multi-cultural Classrooms incorporates UDL principles and WC3 basic access guidelines, to create an equitable online course Web site. Through copying and pasting the content and instruction from the original course documents into the online course Web site, and incorporating UDL principles, the course Web site supports adult learners capacities that exist in connection between their inherent qualities of their three brain networks and digital media. Moreover, by giving examples of flexible technological tools throughout the course Web site, adults now have multiple, flexible options to choose from that will best support their own learning, as well as demonstrate their understanding and knowledge. Moreover, in order to facilitate an equitable online environment the design framework contains examples of: a) how three brain networks function using flexible materials and methods for assignments and readings, b) showing how the flexible materials and methods demonstrate ways to support and scaffold adult learners, and c) designing the course Web site to adhere to the WC3 basic access guidelines. Some technological tools used to facilitate an equitable online learning environment in the course Web site are: Macromedia Dreamweaver MX, Adobe Photoshop 7.0, QuickTime Player, Nero ShowTime 2, Microsoft PowerPoint, Inspiration, Nero Essentials Suite 1, QuickTime, Inspiration, and Microsoft Office 2000.

The Masters of Arts in Education (MAE) online class called Technology as a Tool for Inclusion in Multi-cultural Classrooms incorporates now incorporates Universal Design for Learning (UDL) principles and The World Wide Web Consortium (WC3) basic access guidelines can be found at http://www.kristyhamill.com

CHAPTER FIVE

Discussion

A new framework for curriculum reform for adults is to include Universal Design for Learning (UDL) principles and the World Wide Web Consortium (WC3) basic access guidelines. Adult learners bring their unique learner characteristics to online learning environments. The design of the online course Web site is based on UDL principles so that learners, who have varying background knowledge, readiness, language, preferences in learning, and interests, can access information and engage effectively. In order to do this, my design includes media and tools that support the three brain networks: recognition, strategic and affective. Rose and Meyer (2002) write that the importance of helping learners thrive in any learning environment is to consider the three brain networks when selecting media and tools. I incorporated UDL principles and the World Wide Web Consortium (WC3) basic access guidelines to create an equitable online learning course Web site. The learning theories of "situated learning" and "critical pedagogy" have given me an understanding of the importance of designing an equitable online learning environment.

Thus, the design situates adult learners in an equitable online course Web site. In other words, an online course Web site, a site where other members of the community of practice model how to problem solve and develop solutions through knowledge transference. To begin to situate adult learners in an online course Web site, I had to first understand their learner needs. Keri cites Cranton (1992), who writes that adult's needs are "autonomous and self-directed, goal directed, want relevance in learning material, practical

and problem solvers, and have life experience" (p. 31). Adults bring unique learning characteristics to the online environment compared with children and adolescents. That is why the principles of universal design, drawn from architecture and product development are effective educational tools.

Moreover, the development of UDL learning tools and teaching strategies required an understanding of the ways learners may differ. CAST had examined individual differences with a framework and found through neurological research three brain systems: recognition, strategic, and affective. Rose and Meyer (2000) write UDL principles can be supported through the recognition network which has multiple, flexible methods of presentation; to support the strategic network there are multiple, flexible methods of expression and apprenticeship; and to support the affective network there are multiple, flexible options for engagement. Through implementing Universal Design for Learning (UDL) principles established by CAST, adult learners are supported through digital media and brain research.

As well, the design of the online course Web site incorporated the digital syllabus and digital calendar to make a more versatile medium for active involvement. After all, Kraidy (2002) writes that hypertext provides users with access to a virtual reality in which to seek information in exchange for active involvement with the medium and even with other people using it. As well, the design framework also included the WC3 whom developed interoperable technologies, such as specifications, guidelines, software, and tools that I incorporated into the design of the online course Web site. Pisha and Coyne (2001) write that WC3 developed interoperable technologies, which can lead the Web to its full potential. By basing the design on their foundation, I was able to build new options,

features, and supports that more closely met the needs of adult learners. For example, I was able to make available a launch page for each chapter, with options for presentation of text, images, and other content elements, such as providing options to view text, images, charts, sidebars, including both text and graphics in each icon and keeping links consistent, outlining each chapter, embedding video clips, and keeping a consistent appearance

To include UDL principles in the online course Web site, the goals needed to provide an appropriate challenge for all the learners. The design framework included separating the methods and materials from the standards so that appropriate instructional supports could be implemented using the three brain networks for each reading and assignment. Through identifying the main focus of the learning standard, determining variable instructional components that would support adult learners, and matching the central focus of the learning standard with each of the three brain networks, I created variable ways to get to the same goal. These examples support adult learners capacities to learn that exist in connection between their inherent qualities of their three brain networks and digital media. In this way Hitchcock (2001) believes that Vygotsky's "zone of proximal development (ZPD)" is an ideal balance point where the goals are just beyond reach but are achievable with effort.

I incorporated the ZPD because it supported the design of the online environment where the goal is just beyond reach, by offering learners media and tools that did to compromise the learning goal. As well, the ZPD could provide challenge and meet the needs of adult learners. To situate adult learners in their ZPD that supports their needs and goals required that the design of the online course Web site to include learner centered and interactive activities, such as group discussions, online chats, reflection and response

sessions that take place weekly in order to learn content through class logs or Listservs, and threaded discussions. As well, UDL principles support adult learning needs and goals because there are examples on the online course Web site that show media and tools that supports the three brain networks: affective, strategic and recognition. For each system in the learning brain, various media flexibly accommodates specific kinds of learners. The design framework included various digital medias. For example, Macromedia Dreamweaver MX 6.0. which is a Web authoring tool. Next, Adobe Photoshop 7.0 is a professional image-editing standard that provided image-editing tools. Then, QuickTime Player is a multimedia player that I used for many kinds of files: including video, audio, still images, graphics, and virtual reality (VR) movies. While, Nero ShowTime 2 is a comprehensive software program, that allowed me to have quick and easy access to all digital media files, TV time shifting, DVD, video, photo and audio playback support. Next, PowerPoint 2003 created slide shows with text and graphics, or I accessed Clip Art and/or inserted my own. Then, I used Inspiration as a tool to plan, research and complete tasks in the course Web site through integrating diagrams. Lastly, Microsoft Office 2000 was used to write the documents for the online course Web site. In this way, adult learners would be able to choose between flexible digital tools that were most effective for them in the process of accessing information and for effective engagement. By including these various technologies in examples of using the three brain networks, and in constructing the online course Web site, adult learners will have more than just text as the medium of exchange.

Kraidy (2002) describes linear media, which is designed to be used in a predetermined, structured order, has little user flexibility, such as books and lectures, whereas non-linear media such as hypertext provide multidimensional access to

information for individualized and customized learning. In essence, the online course Web site has more than just text as the main medium of exchange. Thereupon, a universally designed online course Web site improved learning opportunities for everyone. Rose and Meyer (2000) write that although text has many advantages, it has limitations too. Mainly, text lacks the inherent qualities of speech. As well, text is bound by conventions, such as the fact that text is printed differently, and must be approached in a certain manner. In other words, learners do not experience the advantages and limitations of text in the same way. The reason relates to how text engages the three brain networks. In one example, Rose and Meyer (2000) write that the recognition network uses a multi-dimensional process for learners to read. In other words, decoding text requires many levels of different patterns, such as for readers to recognize letterforms, letter-sound correspondences, words, sentences, and larger units of meaning. Because learner differences can develop in any of these areas, barriers to reading can develop at any level. Individual differences can shape a learners understanding and engagement of the text. Using text as the main medium of exchange in the original course did not support learner.

Consequently, by implementing UDL principles, adult learners are situated in an equitable community of practice where multiple, flexible digital materials are available to support their recognition, strategic and affective brain networks. Likewise, Freire (2004) believes one way to recognize if the discourse available is one that supports adult learners, is if it "announces that there is a humanizing pedagogy that tries to cut the chains of oppressive educational practices of advocating the dialectic dialogue by having oppressed students share their experiences and upsets, but does not equip them with the necessary tools to unveil the root causes of oppression" (2004, p. ax). The online course Web site is

designed to support what Freire recommends, to have adequate tools and activities to promote a learners belief in their ability to learn. Another way to have adequate tools and activities is to situate adult learners in an actual online course Web site.

Marra (2002) describes an ideal online environment, where learners feel encouraged to develop their own epistemic beliefs, which promotes their abilities to learn. Through research, the design of learning instruction can steer a learner into certain beliefs about their abilities to learn that may promote black or white thinking, or can steer a learner to develop new beliefs through the exploration of multiple perspectives, and then to more complex thinking within an ideal online design framework. In order to situate adult learners in a community of practice that promotes their belief in their ability to learn, I included the original course's content and instruction, and UDL principles based on WC3 basic access guidelines. In this way, learners are situated in an online course Web site that supports their belief in their ability to learn, and looks at current pedagogical frameworks of power, access, and change, so that a new discourse will inspire a new transformational design framework that will continue to serve adult learners in an online environment.

Recommendation

I recommend that educators implement an equitable online learning environment for all learners based on UDL principles and WC3 basic access guidelines, along with learner centered and interactive activities. After all, there is a lot of support and research to sustain such an equitable learning environment. For example, Rose and Meyer (2000) write that the National Center on Accessing the General Curriculum (NCAC) created the UDL framework to increase access to the general education curriculum for all learners. As well, CAST, with the help of NCAC has received funding from the U.S. Department of Education and others to have an Internet-based service with access to tools and resources for UDL. This Universal Learning Center (ULC) will have a Web site, a searchable database, a content library, and a consulting and product services department. This will help educators and parents obtain accessible digital curriculum materials, and give publishers the capacity to respond to new accessibility requirements so they can quality for state adoptions, as well as provide students with new opportunities to gather information. Lastly, CAST is researching and developing a parallel UDL concept: the Universal Learning Editions (ULE's). ULE's will adhere to the Web Accessibility Guidelines, developed by the World Wide Web Consortium, and will be Universally Designed for Learning criteria established by CAST and supported by the National Center on Accessing the General Curriculum.

Conclusion

My scholarship in the MA program afforded me the opportunity to inform, confirm and re-shape my thinking about teaching practices. Moreover, by exposing myself to new learning concepts, such as "situated learning" and "critical pedagogy", I have learned the importance of situating adult learners in an equitable online learning environment, where they have access to adequate tools and activities to maximize their potential.

My hope, is that CASTs' research of UDL principles will show educators that it is possible to take responsibility for designing equitable learning environments based on these guidelines, as well as WC3 basic access guidelines. In a UDL curriculum there are flexible materials and methods, and for each system in the learning brain there are various media that can accommodate diverse learners. In this flexible curriculum adult learners are supported more effectively because there are multiple ways to get to the same goal, instead of just a single textbook. By recognizing that learners differ, CAST's framework, distinguishes how each brain system is flexibly be accommodated by digital media. Therefore, UDL principals and WC3 basic access guidelines are implemented into the design of the Masters of Arts in Education (MAE) online class called Technology as a Tool for Inclusion in Multi-cultural Classrooms. In this way, adult learners will have an equitable online learning environment to be engaged and motivated for the purpose of information access and effective engagement.

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