Brain-Based Learning Theory: An Online Course Design Model

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Abstract

Abreena W. Tompkins. BRAIN-BASED LEARNING THEORY: AN ONLINE COURSE DESIGN MODEL (Under the direction of Dr. Steven Deckard) School of Education, February, 2006.

The development of a theoretical brain-based online course design model with potential transferability across course management systems in higher education is the problem for this study. Qualitative inquiry was the emergent design and consisted of an extensive current, relevant literature review of educational literature in brain-based learning theory, online course design, and course management systems for the purpose of developing a theoretical brain-based online course design model for higher education. The model developed includes synthesized indicators from the analytical charting. The proposed model is presented in acronym form, which in and of itself aligns with brain-based learning theory. The acronym *IGNITE* has emerged as the theoretical brain-based model and will be discussed.

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Chapter 1

Challenges and problems in distance education continue to be addressed in research, theory, and application. This study was an extensive literature review which analyzed and synthesized information, related to brain-based learning theory, distance education course design, and course management systems for the purpose of developing a theoretical brain-based online course design model. This review presented the need for a theoretical brain-based online course instruction design model with potential transferability across course management systems. Chapter One presents the background of the study, specifies the problem statement, describes the significance of the study, presents an overview of the methodology, and concludes with definitions.

Background of the study

Much current literature for online course instructional design focuses on broader principles for guiding course development and/or design, and does not specifically address an applicable theoretical design model for higher education programs. Nor does the current reviewed literature discuss the transferability potential of a course design model across course management systems. This was a major factor in the conceptualization and execution of this study. Tallent-Runnels, Thomas, Lan, Cooper, Ahern, and Shaw suggest, "Appropriate and excellent course design and development may prove to be paramount to the success of students in online courses" (2006, p.117).

While many educators focus on the technology tools, Brown notes that the most important aspect of online education is what the students are expected to do, how they are supported, and how students engage with the challenge (2006, p. 10). Tallent-Runnels', et al. research suggests that while online convenience is important for students, the quality of the instructional design is the critical element in providing successful learning, even for the most focused and motivated student (p. 112). However, the development of a theoretical design model creates potential for instructional design to maximize the learning-teaching cycle in an online environment. Furthermore, a theoretically sound online course design model potentially results in a course that can be effectively taught and delivered in any institution's course management system.

Bollinger & Martindale's work notes that one continual resurfacing online course issue is how to best deliver the information and how to best facilitate learning for the student (2004). While motivational and systematic design models such as Dick and Carey's systems model approach (1996), Keller's (1983) ARCS (attention, relevance, confidence, and satisfaction) and Knowles' principles (1970) for adult learning may have, at one time, been adequate for online course design, technological advances and greater demands for more engaging online courses, presents the timely need for a theoretical model for online course design (McGriff, n.d., from the Google database).

Many evaluation studies indicate critical factors in successful online course implementation as pedagogical refinement or innovation at the context rich level (Brown, 2006, p. 11). Clemons contends that "student learning is impacted by how the human brain accepts and processes information delivered in the course," a topic that is discussed more extensively in the literature review (2005b, Abstract, ¶ 2). The natural tendency of

an instructor designing an online course is to focus on transferring traditional seat content to online content as content is consistent with what is taught in the classroom (Barker, 2002, p. 184). Many instructors attempt to transform their current traditional classroom-based courses to the online format, which results in another version of the same course, and may or may not be based on sound theoretical educational pedagogy (Dabbagh, 2001, Rational). For online courses, Barker recommends keeping the use of technical capabilities simple, as students have a strong desire to learn in a comfortable environment. Therefore, instructors should avoid add-ons, plug-ins, and creating a need for students to download large files (2002, p. 184). The recommendations of Barker, and the literature that notes a consistent lack of sound theoretical basis for design, indicate the need for a theoretical course design model with potential transferability across course management systems.

Sanchez, et al., notes that theoretical questions related to design models, methodologies, and evaluation have hardly been addressed or studied in depth. Sanchez, et al., goes on to propose an online architectural model, with the goal of universal transferability across CMS and pedagogical programs (2000, p. 346). Sanchez's research establishes the importance of a universal course design model, which aligns with the purpose of this study. However, Sanchez's model is based on the premise that abstract knowledge and virtual learning systems (three dimensional applications) are best for the online courses and states that "it makes no sense to teach all educational content using this technology [online instruction]" (p.348). He endorses online courses for abstract knowledge-based disciplines only. Sanchez goes on to explain that his model is based on Lakoff and Johnson's theory of cognition and is designed to provide guidelines for a

metaphorical virtual world design (p. 359). While Sanchez's research focuses on a course design model from a solely metaphorical perspective, this study will take his work a step further through the development of a theoretical course design model focused on brain-based learning applicable to any course content.

In the January-March, 2002, issue of *International Journal on E-Learning*, Hirumi notes, along with others, that educators often fail to ground their instructional designs in research and theory, often due to insufficient time, training, and resources (p. 22, Bonk & Kind, 1998; Bonk & Cunningham, 1998; Bednar, Cunningham, Duffy, and Perry, 1995). Up to this point, instructors have defaulted to past experiences when designing online courses and attempted to transfer best practices from the face-to-face learning environment to the online environment. Hirumi states that "the application of theoretically grounded instructional strategies can help educators plan and manage meaningful [online] e-learning interactions" (p. 22). The theoretical approach used for course design decisions has the potential to optimize student learning, if and when it aligns theory and practice (p. 22). Hirumi's work does not advocate any one epistemology but aligns with this study, indicating learning theory to be a crucial element for developing effective online courses.

Problem Statement

For this study, the problem researched is to develop a theoretical brain-based online course design model with potential transferability across course management systems in higher education.

Significance of the study

This study will also address the question posed in a paper presented by Howard-Jones and Pickering at the 2005 Teaching & Learning Research Program Annual Conference: "How do concepts from neuroscience resonate with current educational thinking? (Thematic strands and issues arising from discussions). As noted previously, excellent course design and development is imperative for online student success according to Tallent-Runnels, et al. (p. 117). Similarly, Clemons notes that "brain-based…learning theory focuses on concepts that create an opportunity to maximize attainment and retention of information" (2005b, Conclusion, ¶1). Both perspectives align with the purpose of this research. A course design model developed using brain-based learning theory with potential application across various online delivery systems holds positive significance by providing a potential, highly effective way to align practice with theory, and holds positive significance for students by potentially optimizing learning in the online environment.

In addition, Healy suggests, with what is known about brain development in children, information technologies may be encouraging brain development in areas much different from previous generations (1999, p. 133). Healy also suggests that this view creates a two-fold implication for higher education. First, the differences between the younger students' brains and the instructors' brains may create a disjunction in communication and perception of expected abilities and capabilities. What an instructor expects a student to know and be capable of accomplishing may be quite different from the actual capabilities of the student. Second, ever-evolving media will continue to impact neural circuitry and development, which potentially means even more differences

in capabilities of younger students and those of older, more traditionally educated instructors (1999, p. 133). Healy also notes that "newer technologies emphasize rapid processing of visual symbols…and deemphasize traditional verbal learning…and the linear, analytical thought process" (p. 142). "If Healy is correct, then higher education may need to use media and web-based materials to capitalize upon the next generation's brain connections and abilities… [while also] using some traditional methods to ensure that students are able to reason in traditional linear and logical fashion" (Meyer, 2003b, Creating a new brain: Through media? ¶ 3). This extensive literature review study holds the potential to significantly impact Healy's considerations, as noted above, and Meyer's (2003b, Using technologies in light of brain research) considerations pertaining to the following:

- [The] need to design web-based courses that offer learning by repetition through a variety of contexts, but with awareness that too much repetition is boring.

- The need to design a variety of learning experiences that help students change a prior worldview or inaccurate learning, and provide opportunities to receive new and different views in an effort to encourage the brain to revise its model and change its current synaptic connections.

- The need to design web-based modules that will provide opportunity to "refresh" or relearn previous material via appropriate brain connections, realizing that efficient learning

may not have initially occurred.

Hughes and Attwell conclude that there is a need for transferable models based on a theoretical basis for virtual learning environments [distance education] (2002/03). Information from the Hughes and Attwell study suggests that transferability should enable higher education professors to use a theoretical course design model in an efficient, confident manner, with the expectation that students will learn. For this study, the brain-based learning theory premise is that the human brain is information seeking, processing, and organizing in order to learn. The brain-based learning theory, as noted previously, focuses on neuroscientific concepts in order to create an opportunity to maximize learning (Clemons, 2005b). There is a need for further neuroscientific investigation into issues with educational significance, a need for mutually informative research with valid methodologies, and a need for a theoretical perspective that allows insights from educational practice and scientific investigation to inform each other (Howard-Jones, & Pickering, 2005). Howard-Jones asks two questions relevant to this study:

1. Can concepts from neuroscience resonate with current educational thinking in a meaningful manner that retains the integrity of the different perspectives involved?

2. Can methodologies be developed that are suitable for the investigation for concepts and applications of neuroscience in education? (2006, Objectives and purposes, ¶1).

The perspective of Howard-Jones is "pursuing research that is mutually informative for both educational and scientific communities via multi-method approaches may combine the scientific scrutiny of educationally-relevant principles with the experiential and qualitative exploration of their educational usefulness by practitioners" (2006, Objectives and purposes, ¶2). Howard-Jones aligns with Sims who suggests transcending epistemological precepts in order to develop new instructional design models of teaching to address today's learners' new and constantly evolving skill needs (Sims, 2006). Sims notes that instructional delivery is not a timely goal for online educators, however; interactive and collaborative learner networks is an ensuing target for empowering learners (2006).

The research method chosen for this study was an extensive analytical synthesis based on qualitative inquiry of current literature related to the problem statement. While not necessarily a widely used dissertation study method, this research yields useful methodological findings that are potentially transferable across various college courses and course management systems for educational professionals working in distance education.

Overview of methodology

The basis of this study was the development of an online course design model based on brain-based learning theory with potential transferability across varying course management systems for higher education. Qualitative inquiry was the emergent design and consisted of an extensive current, relevant literature review of educational literature related to brain-based learning theory, online course design, and course management systems in order to develop a theoretical brain-based online course design model for

higher education. Articles were selected according to an evolving criterion, based on at least one common study element. Information was reviewed, categorized, analyzed, synthesized, and developed into a course design model based on brain-based learning theory for online college courses. The literature review evolved into a literature analysis charted by variables analyzed in the study. Totally, 50 course design articles, 50 brain-based learning theory articles, and 20 course management articles were determined as acceptable for analysis and charted by variables.

As noted in the introduction, various models of design principles and design models do exist and continue to be developed. The overall concept of this study was to expand an analytical literature review to the synthesis level for model development. The basis of this study was to align pedagogical and technological considerations, then develop a theoretical brain-based design concept as a recommended course design model with potential transferability to higher education courses via commercial and open source course management systems. In order to identify substantive characteristics that could become model characteristics, a detailed framework was developed as research was ongoing. A detailed description of the methodology will be addressed in Chapter 3 of this dissertation.

Definitions

The terms brain based learning, brain compatible learning, and brain based learning theory are found throughout current literature. For this study, the term *brain-based learning theory* will be used. Based on information synthesized from this study, the term will be defined as instructional strategies designed to be compatible with the brain's propensities for seeking, processing, and organizing information in order to maximize

learning. The term *brain-based learning theory* will be defined in more detail and discussed extensively in the Chapter 2 Literature Review. For the purpose of this study, brain-based learning was addressed neurological simply as possible. The research focus was on the educational perspective of learning. Other terms used in this study are defined as follows:

Online education: Learning structured to occur over the Internet, intranet, extranet, groupware, or other networks where the majority of instruction and learning occurs.

Course design: Many times the term course development is used to define the systematic development of instruction, while the term course design is used to determine what course content and form that content will be posted or loaded into a particular course management system. The term course design is defined as a combination of the two preceding definitions as a systematic development of instructional course content for delivery via online course management systems. A more advanced and comprehensive definition based on the research and results of this study defines course design as the systematic pedagogical development of instruction using learning theory, with considerations for the technological applications via course management systems.

Support personnel: The professionals who act as administrators, analysts, and/or maintenance facilitators/engineers for any course management system.

Course management system (CMS): The software that allows instructors to manage classes and coursework in an accessible online environment. CMS is defined as both commercial, meaning the service is purchased, and open-source delivery mediums, meaning the software is free for use and modification, which enable students to access course content in the distance education format (Branzburg, August, 2005, p.40).

The remainder of the dissertation will expand the literature review in Chapter 2 into the comprehensive analytical section of the study. The research methodology will be explained in Chapter 3 and will involve the topics of course design, course management systems, and brain-based learning theory. Chapter 4 will state the results of the synthesized analytical review and the dissertation will conclude in Chapter 5 with a summary and discussion for this research's implications.

Chapter 2

Literature review

This chapter will discuss literature by categorical topics of brain-based learning theory, online course design, and course management systems that provide the basis for this study. A brief historical overview is discussed to establish the context of the study and the literature is discussed theoretically and empirically.

Brain-based learning theory

The decade of the 1990s was acknowledged by U. S. President George Bush and the U. S. Congress as "The Decade of the Brain." Lucas notes that the initial prediction was that neuroscience research would render significant resources for society. By the close of the twentieth century, a plethora of information on the brain and how the brain learns began to appear. While neuroscience is a separate field of study from education, there is contemplative thinking that suggests findings on how the brain learns has the potential to positively impact the delivery and facilitation of online classes at all education levels (2004). Dr. Bruce D. Perry, M.D., Ph.D., internationally recognized authority on brain development, notes that over the last 40 years more has been learned about the human brain than in the preceding 400 years (2005). Educators and neuroscientists are now attempting to utilize information from basic and clinical neuroscience as practical application in classrooms. One such example is the suggestion

of putting factual information into context in order to link concepts and contexts (Perry, 2005, Neural system fatigue, ¶ 2). Collaborative research and application of neuroscience and education is a global trend. Japan has initiated Major Brain Science and Education Research Programs which include longitudinal imaging studies on 10,000 children. In 1988, The American Educational Research Association developed a Special Interest Group in the areas of Neuroscience and Education. The Centre for Neuroscience and Education at Cambridge University opened in July 2005. Harvard Graduate School of Education hosted a program, "Mind, Brain, and Education" with the goal of initiating the field of mind, brain, and education, while the newly formed International Mind, Brain and Education Society (IMBES) is working toward collaborations and possibly a new international journal dedicated to this interdisciplinary area (Howard-Jones & Pickering, 2005).

Neuroscience can provide information about the brain's chemistry, but for educational practice, understanding the simultaneous acts of organizational layers within the brain helps educators to have a concept of how memory, vision, learning, emotion, and consciousness are processed. Perry states that teachers do not have to become neuroscientists, but acknowledges that teaching practices can become more effective with some knowledge of how the brain perceives senses, processes, stores, and retrieves information (2005, ¶ 2). Hardiman also purports that "education initiatives that link current practice with promising new research in neurological and cognitive sciences…offer real possibilities for improving teaching and learning" (2001, ¶ 2). An example of such practice is the basic precept of brain-based research that indicates the understanding of a learning experience is best achieved by connecting to the learner's

background knowledge (Hardiman, 2001, ¶ 2). In this section of the dissertation, and as noted in Chapter 1, the theoretical aspects of brain-based learning is not an attempt to oversimplify the complexities and intricacies of neuroscience or cognitive psychology. A comprehensive synthesis of educational literature on brain-based learning, brain compatible learning and brain-based learning theory concurrently states that the brain-based learning theory term is the instructional framework and/or strategies designed to be compatible with the brain's propensities for seeking, processing, and organizing information in order to maximize learning. The website, *Funderstanding*, states the brain-based learning theory very basically as being "…learning based on the structure and function of the brain. As long as the brain is not prohibited from fulfilling its normal process, learning will occur" (from http://www.funderstanding.com, ¶ 1).

Theoretical implications

Studies in neuroscience and cognitive neuroscience have provided a new framework for learning and teaching (Gulpinar, 2005, p. 302). As established by Caine and Caine, Gulpinar notes the Caine Learning Institute's 12 principles of brain/mind learning as the following:

1. All learning engages the entire physiology.
2. The brain/mind is social.
3. The search for meaning is innate.
4. The search for meaning occurs through patterning.
5. Emotions are critical to patterning.
6. The brain/mind processes parts and wholes simultaneously.
7. Learning involves both focused attention and

peripheral perception.

8. Learning is both conscious and unconscious.
9. There are at least two approaches to memory
   (rote learning system, spatial/contextual/dynamic
   memory system.
10. Learning is developmental.
11. Complex learning is enhanced by challenge and inhibited
    by threat associated with helplessness and fatigue.
12. Each brain is uniquely organized. (2005, p. 302)

Based on these 12 principles, three fundamental elements of effective teaching and learning are: relaxed alertness, orchestrated immersion in complex learning experiences, and active processing of learning experiences (Gulpinar, 2005, p. 302).

In reference to Caine and Caine's principles, Chipongian notes that these three conditions are not based solely on neuroscience, but are ideas generated and synthesized as a result of cross-disciplinary research from cognitive psychology, sociology, philosophy, education, technology, sports psychology, creativity research and physics. Chipongian considers brain-based learning theory to be a combination of brain science and common sense, thereby making neuroscience a partner for improving learning (1997, Where Did the "12 Brain/Mind learning principles" come from? ¶ 1). Caine's principles, which have withstood the test of time, were first published in 1990 and were determined based on the following qualifications:

1. The phenomena described by the principle should be universal.
2. Research documenting any one specific principle should span

more than one field or discipline.

3. A principle should anticipate future research.

4. The principle should provide implications for practice.

Translating from the principles and theory [brain-based learning] require a new concept of thinking about communicating for educators. Teaching strategies based on what the principles of brain-based learning theory tell [teachers] about learning and can empower teachers to become the best professionals possible (Caine, 2004).

Based on brain-based theory, Dwyer notes that "when instruction becomes too explicit and lacks appropriate challenge, the learner will 'tune out'" (2002, p. 267). In addition, the brain has a difficult time paying attention for long periods of time. The brain has periods of high level focus followed by low level focus, in a cyclical fashion (Dwyer, p. 267). Learners will "tune out" unless short breaks are built into instruction time. The break allows for new learning to be rehearsed or revisited in the learner's brain, allowing neural connections to be strengthened prior to receiving more new information (Dwyer, 2002. p. 267). Also, the neural systems fatigue quickly, actually within minutes; neurons respond to a patterned and repetitive, rather than to sustained, continuous stimulation. While neurons fatigue quickly, they also recover within minutes. Learning requires attention, and Perry states that "only 4 to 8 minutes of pure factual lecture can be tolerated before the brain seeks other stimuli, either internal or external" (2005, ¶ 3). Even for adults, breaks should occur about every 20 minutes. In a 40 minute session, the first 20 minutes should be new information followed by 10 minutes of processing time to allow for neural strengthening, then 10 minutes of reinforcement and summary time" (Dwyer, 2002. p.267). When the teacher is not providing some amount

of novelty, the brain becomes distracted (Perry, 2005, ¶3 & 5). This neurological focusing information has the potential to parallel Sims' suggestion that online courses must aim beyond conventional design and delivery, and seek to develop learning environments with resources and strategies that engage and empower diverse distance learners (2006).

Accordingly, a person's attention is very selective and focuses primarily on novelty, while ignoring the usual. An educational designer who can use the brain's constant search for novelty to draw students into material with new concepts will create positive interaction…until the once novel design becomes ordinary. Attention getting devices need to be regularly redesigned to continually meet the brain's need for attention and novelty (Meyer, 2003b, Pursuing novelty through attention, ¶1).

Novelty attractions attention, but "research supports the claim that the search for meaning is innate and occurs through patterning" (Caine, n.d., Principle # 1 pattern and meaning making). Because the brain's search for meaning is innate, authentic and purposeful learning is optimized when learning for a specific goal. Connecting new information, such as course content, to background knowledge can create the opportunity for meaningful learning (Clemons, 2005a, Learning theory supports creativity.). Students can benefit from creativity exercises, demonstrate greater self-efficacy, and improved ability to demonstrate learning creatively (Slavkin, 2004).

Jensen indicates that a student's attitudes, perceptions, and beliefs act as frames that encourage or inhibit learning (1998). Leamnson concurs with Jensen by explaining that the neural pathways connect the limbic system, the brain's center, to the frontal lobes, which play a major role in learning. In addition, hormones alter the chemical

makeup of the brain of a person under stress. When a person is threatened or even feels threatened, chemicals are released that can impair memory and learning (2000).

The findings that neuroplasticity occurs rather rapidly, the complex interconnectedness of the brain allowing for simultaneous processing, and the uniqueness of each brain suggests that educators reconsider the way students are currently educated (Roberts, 2002, p. 281). Educators and students must move beyond "learning by doing" for philosophical underpinnings and practical approaches to have more impact in mainstream education (Roberts, 2002, p.284). Roberts also says efforts must be made to increase both qualitative and quantitative research that crosses into mainstream education in order to establish a broader, pedagogical foundation from which to work (2002, p.284).

Wolf and Brandt established the concept of neural plasticity, which means that the brain changes and reshapes itself as learning opportunities are presented (1998). Increasingly, neurological research indicates that brains can grow and change, even in adults (Shute, 2004). Shute points out that some scientists debate whether adult brains do grow, but most scientists agree that the hippocampus, the brain's memory center…does grow new neurons (2004, ¶ 6). Wolf and Brandt's concept combined with Greenleaf's conclusion that the physiology of the brain is such that it is constantly seeking meaning, patterned connectedness, relevance, and useful applications have the potential to impact distance education course design. Perry states "a basic precept of brain-based research states that learning is best achieved when linked with the learner's previous knowledge, experience, or understanding of a given subject or concept" (2005). Instructors who accommodate student's connections to prior knowledge enable students to achieve higher levels of understanding (Ivie, n.d. Literature review, ¶ 2). Meyer continues to note that

"this review of brain research gives those who use…the web for distance education plenty to contemplate as they plan courses and programs of study" (2003b, Using technologies in light of brain research, ¶ 1). Deutsch states that "technology can cater to neuroscience brain-based findings…for online learning courses" (2003, ¶ 1).

The emerging view of the brain is one of "a complex system for creating coherence and consistency, even as it allows for the detection of novelty and the revision of knowledge to form new views of the world" (Meyer, 2003b, Introduction, ¶ 3). "Learning is a function of how the brain forms connections between synapses, which is largely a chemical process, where routes through synapses are laid down and then repeated to form stronger and stronger connections," notes Meyer (2003b, Learning-and changing learning-in the brain, ¶1). Learning occurs through a process where every new experience causes the neuronal firing across synapses, either strengthening or weakening the synaptic connections….result[ing] in connections that respond automatically or that finish the sequence once the initial parts of a series of connections are begun (which can explain why some learning is so difficult to change) according to Meyer (2003b). Hall (2005) explains that neurons are responsible for all mental activity. Each neuron has a cell nucleus, a "tail" known as an axon which is the transmitter of electrical charges between neurons. Smaller branching structures are called "dendrites" and act as receptors of messages from other neurons. When a dendrite receives a message from an axon, it is known as a "synapse." It is the synapse that undergoes significant changes as dendrites and axons grow; the entire process is called "synaptogenesis." A reduction of synaptic connections occurs as a means of pruning the connections between neurons. This reflects the neuroscientific perspective of brain plasticity and it is now clear that the

brain changes and reforms throughout life as a result of each learning experience (Hall, 2005, p. 28). This life-long process known as brain "re-construction" is ongoing change meeting ever changing needs and demands (Gulpinar, 2005, p. 300). Neurological studies indicate that synaptogenesis is greater in the earlier stages of the human life and several studies have indicated how the adult brain structure can and does change (Howard-Jones, & Pickering, 2005).

Neuroscientific research has indicated enriched environments as being encouragement for the growth of dendrites, which is related to learning (Sprenger, 2004). While brain-based theory advocates the need for enriched learning environments to engage students in learning, there is nothing that indicates the environment must be physical (Clemons, 2005a, Creativity begins in the brain, ¶ 6). One of the qualities of a good learning environment is emotional safety. Having time to learn, the pursuit of a learning goal, novelty and repetition, problem solving, visuals, and creativity are all part of the focus for online instructors (Clemons, 2005b). The brain pays the most attention to what is personally meaningful or that has a link or association to previous learning. If this information is received by a brain that perceives threat, either physically or psychologically, the cerebral logical thinking process becomes inhibited or shuts down as the hypothalamus and pituitary gland release adrenaline in the fight or flight response. While this response is a physiological response, it is not conducive to learning. The thalamus acts as a relay station to direct information to the amygdala and the hippocampus. The amygdala is at the center of the limbic system (emotional brain) and, if the brain perceives a threat, then it closes the connections to the prefrontal cortex of the brain and logical thinking becomes impaired (Dwyer, 2002).

An objective of a Kennesaw State University action research study was to test the effectiveness of a brain compatible classroom environment on mathematics achievement. Brain compatible was defined more by physical accommodations that instructional strategies (low lights, soft music, water bottles, snacks, bare walls, and inclusion activities that include movement). The method of participant selection was not based on a random sample; it was based on the tracking of the same students throughout two study units. This research design used quantitative methods for data collection and measurement. The results were interpreted using an ANOVA test. The results of the data did not show a statistically significant improvement of math scores in the brain compatible environment versus the regular classroom environment. The mean difference between the pre- and post-test in both units compared whether the average was higher in the brain compatible environment or in the regular environment. The probability yielded from the analysis of variance was .0737, which means the differences were not statistically significant. The average mean for the brain compatible environment was 23.7692 while the average mean for the regular classroom environment was 19.6154 (Ivie, n.d.).

Online course design history

The online format is becoming a more predominant option at the college and university level. As of 2000-2001, 89% of 4-year public institutions offered distance education courses with almost 200 schools offering online graduate degrees (Pethokoukis, 2002). The National Center for Education Statistics, in 1999, noted that all distance education programs have grown in the United States by 72% between 1995 and 1998 (2003). According to the United States Census Bureau report from 2003 for the

years 1999-2000, a total of 16,539,000 undergraduates were enrolled in distance education courses, excluding all correspondence courses (2003). For graduate enrollments at both private and public institutions, the National Center for Education Statistics reports 510,000 students utilizing online courses as of 2000-2001. The statistics provided by the nation's Census Bureau and the National Center for Education Statistics indicate developments in society that will continue to strongly impact higher education. Busacco, director of Academic Affairs for the American Speech-Language-Hearing Association, predicts that by 2025 the university as it is now known will no longer exist and will be replaced by virtual universities comprised of educational providers who collectively distribute services (p. 4). One of the factors that influenced the conceptualization and execution of this study is the acknowledgement of increasing numbers of online programs and the increasing numbers of people enrolling in these programs that anticipate and expect meaningful learning.

Historically, Wilms notes, the mass production mind-set of American industry transferred to the mass production and scientific management mind-set of American education. Therefore, education became shaped in the image of industry as standardized and mechanical (2003, The long shadow of mass production). While that mass production model may have been appropriate, "most of the traditional classroom pedagogical strategies have proved to be less effective in online courses because of the different learning dynamics at play brought about by boundaries of separation inherent in distance education courses" (Wilhelm, 2003, Introduction, ¶1). Additionally, Konrad notes the challenge that online education presents to the roles and responsibilities of teachers and to the professionals who provide online learning opportunities (2003,

Pedagogical issues, ¶6). Acknowledging that "recent initiatives toward accountability and standards have placed experiential education [brain compatible approach] in the crosshairs of reform-minded…school consultants," aligns with McDonald's work that notes online education creates a novel instructional environment and is evolving its own pedagogy (Roberts, 2002, p.282).

The Office of Institutional Research Northern Virginia Community College concludes that even with the involvement of accreditation and government agencies in the quest for quality distance education, the more recent increased understanding about students, learning, and assessment has contributed to assuring quality education at colleges and universities (2002, p.26). Some of distance education's design developments include the conclusions of Richard Clark, School of Education at the University of California, Los Angeles, who notes in his article, *Media Will Never Influence Learning*, that "it is important for instructional designers to know that…a variety of treatments will produce a desired learning goal" (1999, p.1). Clark recommends that a distance education instructional designer "choose the…most cognitively efficient way to represent and deliver instruction" (1999, p.2). Few researchers have concluded and offered specific guidelines for designing technically interactive Web-based learning courses (Chou, 2003). In addition, Jung's literature review concludes that design of research, design of interaction and learner's satisfaction and achievement make up the majority of studies with few studies examining the pedagogy or learning theory used to guide how and what students learn (2000).

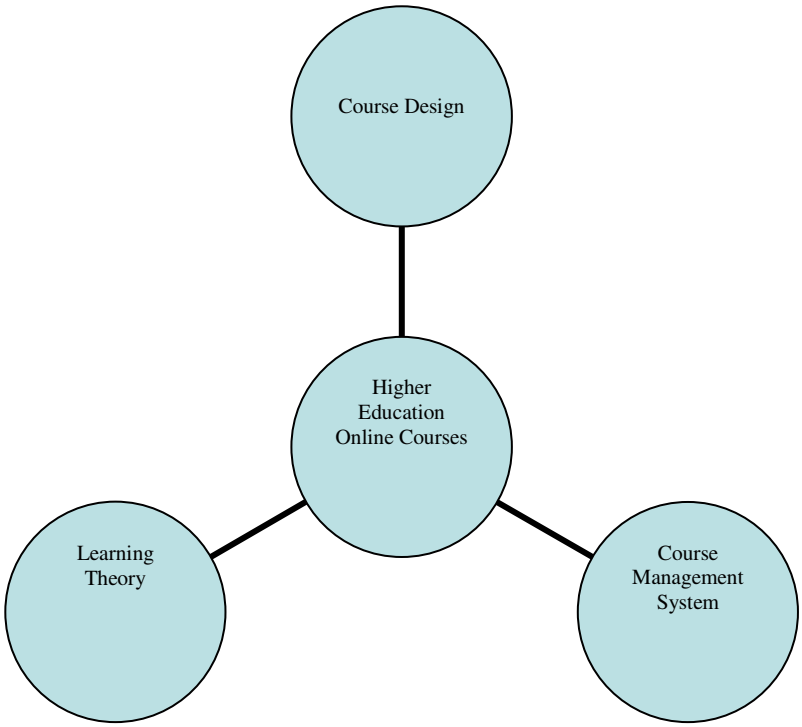

Figure 1. Current online course design components: Visual model of current higher education online course design.

Note in Figure 1 that the current online course components, course design, online courses, learning theory (may or may not be considered), and course management exist singularly, yet connected to course design; however, there is no interconnectedness. Therefore, consistency between design theory and delivery is not demonstrated. Recent trends in distance education developmental studies, according to Richy and Nelson, often take the form of (1) performing instructional design, development, evaluation activities, and studying the process of distance education at the same time, (2) investigating the impact of someone else's instructional development, and (3) studying instructional design, development and evaluation process as a whole, or as a particular (1996). None

of these distance education studies address the concept or impact of a learning design model with transferability across course management systems, and as such indicates the need for this study and the need for continued research, theory, and application.

Establishing the need for a theoretically based course design model

In association with the American Center for the Study of Distance Education, Jung completed an extensive literature review of 62 studies on Web-based education, all of which were published in four refereed journals. Jung concludes that while 31% of those studies reported the design and development approaches, most of them investigated the strengths and weakness of the design of on-line learning environments (Jung, 2000). A 1997 study conducted by Heath, which investigated strengths and weaknesses in online design environments, was reviewed by Jung. The purpose of the Heath study suggested a model be followed in further development research, but it did not suggest a model be used for course design. From the Heath study, a conclusion that the major weakness in design was in discussion boards that required moving back and forth between assigned readings to making comments on discussion boards (1997). Aligning with Heath's conclusion, Sadik (2003) indicates that Blackboard (and other delivery systems) is limited in the functions of developed online tutorials based on sound learning principles or pedagogy. Even with current challenges, there is confidence that integrated research on the brain and learning processes will contribute to the field of education (Bruer, 1999).

In addition, if the instructional design model is consistent across media, then the learning outcome differences between various learning environments will not be significantly different. An instructor's role may vary, the course content layout may vary, and the media may vary, but if the course is based on a sound learning theory, the

instructional results for students will be comparable. Therefore, course content applicable to varying delivery media should be based on theoretical design (Morrison, 2001).

Furthermore, Sims calls for a timely assessment of relevant theories and frameworks for informing online course design and implementation. Sims uses analysis of design strategies, proactive modeling and interactive metrics to discuss an alternative to common instructional design practices. His work addresses both self-paced collaborative online considerations. Learning styles, course completion, cognitive activity, roles [instructor/learner], audio/visual effects, and feedback elements of interaction, according to Sims, should be integrated with delivery, content, strategy, and interface (2006). This study will take Sims' work one step further and address the development of a foundational learning theory for course design and delivery.

Distance education course design

Despite a common perception that creating a Web-based course using Blackboard (or any other information delivery system) is done with relative ease, faculty from higher education institutions have experienced otherwise. In fact, designing a single online course can take inordinate amounts of time. Time to edit, set and reset availability dates, and time to update are all important. In addition, all online courses are sometimes impacted by unexpected technological glitches such as a CMS malfunction or server outages (Deckard, & Tompkins, 2007). Many faculty attempt to transform their current traditional classroom based courses to the Web-based format, which means the end result is just another version of the same course (Dabbagh, 2001, Rationale). However, course design is a complex and critical issue in distance education. Selim notes that in 1995 Le Grew formulated a "paradigm shift" that demonstrated transformations in higher

education institutions…as industrial to society to information society, technology peripheral to multimedia central, and instructional focus to learner focus (p. 25). With that paradigm shift in mind, Selim also notes that course design and course structure are but two of several quality benchmarks needed to provide a pedagogical foundation for effective e-learning (electronic) environments (p. 26). Powell purports in *The ABCs of Online Course Design* that student interests, motivation, satisfaction, and success are the indicators of an adequately designed course. Powell continues by naming authority of resources, bias, citations, dates, error messages, frames, graphics, help, icons, interaction with students, recordkeeping, links, multimedia, navigation, organization, printing, and required plug-ins as the principles of design checklist for course design (2001). There is no mention in the Powell article of learning theory or educational pedagogy.

Distance education has a well-developed approach to creation and sequencing of content-based, single-learner, self-paced courses; however, there is a need to create activities which involve groups of learners interacting within sets of collaborative environments (Dalziel, 2003). Willis and Lockee note that when instructional need is being assessed, the course designer must determine the scope of the distance learning environment, considering and determining how much background or basic information is needed to facilitate new learning. Another consideration for the course designer is the delivery system and its ability to support the various types of learning activities needed to reach the course learning outcomes (2004). In addition, providing a variety of online learning activities designed in alignment with CMS capabilities, Henke and Latendresse contend, that any online course not developed for multiple deliveries is not suitable for delivery (2005).

From a contrasting perspective, Harvey, purports that technology is the starting point of course design and that technology should not be treated as a choice menu during course design. Because most models used to design online courses are often a transfer from face-to-face classes, he continues by encouraging a continuing departure from the traditional classroom design for online design framework and purports a technology first philosophy for instructional design. Harvey's reasons for such are not noted as theoretical, but as giving the learner more control in the name of distributed learning (2002).

Distance education instructional models and learning theories

There is a distinct difference between instructional design models and design theory. Models are defined as visual representations of the instructional design process and are recognized by the common names Dick and Carey Model, ADDIE Model, Kemp Model, ICARE Model, and ASSURE Model. The purpose of instructional design models is to address the design components of analysis, strategy development, and evaluation. The Dick and Carey model is the exemplar systematic approach to curriculum, while Kemp's model is useful for large-scale programs involving groups of people and multiple resources (McGriff, n.d., from the Google database.)

For example, the ADDIE Model does place emphasis on the learner and consists of five phases. The first, analysis, considers the target audience; the second, considers instructional objectives and strategies; the third involves constructing a product for delivery of the information. The fourth phase is implementation while the designer analyzes, redesigns, and enhances the product. The fifth and final phase is

multidimensional evaluation. While this phase is often overlooked, Peterson purports it to be a necessary practice (2003).

In contrast, McGriff notes that a theory may be considered as a set of statements that are organized in such a way as to explain, predict, or control events, or a theory may be considered as a logical explanation of behavior (and phenomena) that is one of the following two characteristics: (1) the information is consistent with preceding research and explanations, or (2) the information soundly negates or modifies the preceding research and explanations. McGriff defines a learning theory as instructional design that focuses on the cognitive process that leads to learning. McGriff also notes that, according to Reigeluth, an instructional design theory offers explicit directives on how to help students learn and develop (n.d. from the Google database). Even though Herrington and Standen noted that learning theories which proposed learning to be no more than the transfer of knowledge from teacher to student, many examples of multimedia learning environments use the same instructional design as was used in the programmed instruction texts of the early 1950s (2000).

Tallent-Runnels, et al., completed a comprehensive literature reviewed of 76 studies on teaching online courses. The conclusion made by Tallent-Runnels, et al., is that they found no comprehensive theory or model that informed studies of online instruction…but found many studies that recommended use of new technologies and sound pedagogies as models (2006, p. 115, 116). These researchers note that students' learning in the online environment are affected by the quality of online instruction and, therefore, these findings call for online instructors to design courses based on sound educational theories (Tallent-Runnels, et. Al, 2006, p. 116). As an instructor,

collaboration with colleagues and a review of current literature on Web-based course design is initially completed before attempting to define course objectives. Once the course cohort group has determined the course objectives, then three pedagogical frameworks are addressed to guide design, delivery, and implementation of the distance education course. The three pedagogical frameworks include (1) Khan's eight dimensions which utilizes the resources of the Internet and the World Wide Web, (2) Bannan's and Milheim's three dimensions which can be used to analyze and describe education Web-based materials, and (3) Bannan-Ritland's, Harvey's, and Milheim's framework provides a six-level hierarchy based on increasing levels of interactivity of instructional elements (Dabbagh, 2001, Course content and instructional activities).

Each learning theory utilized in distance education has its own implications for course design. According to Boettcher and Conrad (1999), three primary learning theories are behaviorism, cognitivism, and constructivism. While an instructor may adhere to one theory more than another, it is possible and, according to Boettcher and Conrad, important to consider key principles of all three theories in distance education course development. These experts note and recommend the following on behaviorism: (1) A key principle of instructional design is to review and examine existing materials to see if they can be used to achieve stated goals and objectives. Identify the goals and objectives to be learned. (2) Create an environment for learning that assists the learner in acquiring these goals…include stimulus or tasks that will engage the learner. (3) Review, examine, and consider adopting or adapting existing materials before developing new ones (p. 19). From the cognitivism perspective, Boettcher and Conrad formulate two additional recommended instructional design principles as follows:

(1)Design course to include problem solving, and provide sufficient help and resources to assist the learner. Structure problem solving in steps so learners can be successful in building their solutions.

(2) Have some way of ensuring readiness for learning the core concepts, principles, and attitudes of a course (1999, p. 20).

Addressing the current, and often prevalent, constructivist learning theory, Boettcher and Conrad contend that there are three design constructivist principles to be considered for distance education courses: (1) Design for continuity of learning at the individual level by providing options; (2) Design for interaction between faculty-student, student-student, and student- learning resources; (3) Design for student goal setting and decision making (1999 p. 22).

Chickering and Gamson, as noted in Konrad's 2003 review of educational research on virtual learning, determine the "Seven Principles for Good Practice in Undergraduate Education," to be the following:

(1) Encourages contacts between students and faculty.

(2) Develops reciprocity and cooperation among students.

(3) Uses active learning techniques.

(4) Gives prompt feedback.

(5) Emphasizes time on task.

(6) Communicates high expectations.

(7) Respects diverse talents and ways of learning.

Konrad continues by noting that distance education presents a challenge to the roles and responsibilities of academics and its support professionals. Much current literature on distance education course design focuses on the broader picture of guiding principles for design and does not specifically address an applicable model of course design for higher education programs, nor is there prevalent reference to course instruction models that are transferable across varying CMS (2003, Issues in evaluation of VLE use, ¶ 5).

As constructivists, Carr-Chellman and Duschatel are noted as suggesting the following components for an ideal on-line class:

> A blend of appropriate delivery media including a study-guide and printed textbook;
>
> The use of assignments to provide contexts for learning;
>
> Provision for collections of student work and examples online;
>
> The use of all possible forms of communication to connect learners and their tutors;
>
> Activities that support interactive skill building, not simply information searching and acquisition; and
>
> Support for learner engagement capable of adaptation to suit the individual learners (as cited by Oliver, 2000, ¶10).

Conventionally designed courses limit instructional effectiveness for three reasons, including inappropriate description of course objectives, planning course centered on content, and choice of inappropriate assessment strategies (Oliver, 2004, Introduction). Deubel notes that no one theoretical foundation exists for instructional design that is suitable for all applications (2003a, ¶ 2). Deubel writes, “Typically, guidelines for design

of interactive multimedia systems have been based on intuitive beliefs of designers rather than being founded on relevant research and theory" (2003a, ¶1). Continuing to discuss design models based on behaviorism and cognitivism theories, Deubel eventually speaks to the topic of a Universal Design Learning Model (UDL). The UDL approach, as described by Deubel, promotes a variety of strategies, hints, models, etc., within the digital context, none of which is based solely on a learning theory that would support the blending of both behaviorist and cognitivist approaches (2003a).

Elements of distance education course design

The Distance Education Report of October 15, 2003 reports, a study conducted by Keith Hopper of Southern Polytechnic University in Georgia. Hopper conducted a multiple-case study of online courses in an attempt to determine the following questions:

> What are the common elements and attributes of current exemplary internet courses? Are there common construction, design, application, and interaction elements in excellent internet courses?
>
> What is the role of learning theory, if any, in current exemplary internet course development? (2000, Introduction).

The details of the study methodology were not given, but Hopper notes that exemplary course results were as follows: provided abundant and rapid feedback, involved master teachers, and provided the opportunity to learn by doing. Instructors viewed the lack of face-to-face dialogue as a substantial instructional challenge and worked to overcome it. Hopper also notes that course developers were judicious in the selection of technologies (Hopper, & Harmon, 2000).

Bennett, Bunker, and Rowley presented their research and results from Managing the Development of Technology-Based Courses: Success Factors From Eight Department of Defense (DOD) Training Courses at the 2005 Annual Conference on Distance Teaching and Learning. They note in the literature review that Robinson summarized common problems related to innovation with on-line distance education learning and compiled the following success factors: resource availability, organizational cooperation and support at all levels, adequate trained human resources, and technology capabilities with adequate funding and technical support (2003).

Because the textbook is often the primary source of content in a distance education course, textbook selection is more critical than for a traditional seat course (Deckard & Tompkins, 2006). At the Sacred Heart University, when all RN to BSN nursing major courses transitioned to online courses, Barker notes that texts with case studies, workbook assignments, CD-ROMs, text website, and Web links were more likely better choices (Barker, 2002).

Additionally, online course discussion is very important. It is sometimes impossible for the instructor to comment on each student's remarks and, therefore, the faculty member's role becomes one of management by encouraging dialogue. The asynchronous threaded discussion is often times richer and more in depth than classroom discussions and, thus, the threaded discussion questions should encourage student-to-student interaction and involves critical thinking skills (Barker, 2002).

Furthermore, assessment is the element in online course design that challenges instructors to consider assessment techniques that will meet the needs of today's learners (Muirhead, 2006). Crooks, addressing the issue of all types of assessments, notes that

evaluation appears to be one of the most potent forces influencing education and it deserves very careful planning and considerable time investment from educators (2001, Introduction, ¶ 2). Muirhead, moderator and summarizer of discussion on Effective Online Assessment Strategies for Today's Colleges and Universities, notes the importance of teachers communicating the academic standards and the evaluation criteria to students, thereby eliminating confusion over expectations and bringing consistency to grading. In regard to assessment, this discussion concurred on the importance of a holistic view that takes academic knowledge, skills, and experiences from the students' course to the students' career is needed. However, the discussion participants note that assessment processes can be influenced by instructional design issues, and courses that are instructionally sound can still fail if the course has a poor design. In addition, rubrics used to reduce subjective grading and alternative assessments such as various types of journal writing can be used to promote academic achievement while individualizing the students' educational process (Muirhead, 2002).

Other assessments that meet the needs of learners with varied cognitive experiences and backgrounds are journals, interviews, portfolios, Power Point presentations, book reviews, and interviews (Travis, 1996). There are numerous processes of assessment that are practical, yet constructive alignment requirements need to be met between course objectives and learning outcomes (Oliver, 2004). Some of Oliver's considerations are timely and informative feedback, appropriate scores for verification of student achievement, the discouragement and prevention of plagiarism and ensure the identity of the person doing the coursework. Also note that course objectives stated in terms of

capabilities and performances tend to yield forms of assessment that veer from conventional forms of assessment (Oliver, 2004).

Huba & Freed have collaborated and determined eight assessment features considered as crucial to meaningful instruction:

> Learners are actively involved and receive feedback.
>
> Learners apply knowledge to enduring and emerging issues and problems.
>
> Learners integrate discipline-based knowledge and general skills.
>
> Learners understand the characteristics of excellent work.
>
> Learners become increasingly sophisticated learners and knowers.
>
> Professors coach and facilitate, intertwining and assessing.
>
> Professors reveal they are learners, too.
>
> Learning is interpersonal, and all learners—students and professors—are respected and valued (2000, p.33).

Technology

According to Sadik, a review of instructional design literature showed that various features and instructional and support elements should be available in on-line learning environments, but also notes that all [instructional and support] elements do not have to be available in all courses (2004). As noted in Chapter 1, Barker (2002) recommends keeping the technology [in distance education courses] simple since students innately desire to learn in a comfortable environment and many instructors are at the intermediate level of technological knowledge and skills. The task, the media, and the material choice are directly linked to the type of CMS chosen for delivery. Therefore, the instructor must keep in mind both the linear and circular flow of the both the course design and the CMS

design (Willis and Lockee, 2004). However, Christel (1994) suggests that motion-video-interface facilitates better recall for student than still slides and that the 2001 study of Mayer, Heiser, and Lonn demonstrated that for complex concepts, that concurrent narration and animation split visual attention and lowered transfer performance.

Integration of technology in the online course should tap into the cognitive processes that are known to work. Media provides opportunity to utilize visual cues, one of the best known cognitive processes (Achacoso, 2003). Accordingly, Burnham, Richardson, and Woodard suggest that technology is now almost completely synonymous with distance education, and thereby is a contextual part of accountability for performance and productivity of colleges and universities. They examine the need for educational leaders need to clearly articulate the role that technology plays in the efficiency/effectiveness model for the purpose of productivity, the cost-benefit model, and the utility model, for the purpose of determining institution usage (2005, p. 46). The article does not address any form of accountability for learning or for educational theory or pedagogy integrated or transferable across varying types of technology, which for the purposes of this study would be any CMS.

Distance education course design data

A study conducted by the distance education based Athabasca University in Canada and the Richard Ivey School of Business at the University of Western Ontario, in London, Ontario states, “When it comes to learning, the online classroom provides a better forum for communication than does its traditional counterpart” (Paskey, 2001, ¶ 1). The researchers surveyed 111 students in the online M.B.A program at Athabasca and 101 M.B.A. students in a classroom setting at Ivey. The asynchronous program

demonstrated more powerful communication and an environment where it was possible to do things that are more powerful than in the traditional seat class.

The study was not a comparison between the programs at the two schools, but the asynchronous program demonstrated that online communication provided an environment to be very effective subject understanding (Paskey, 2001).

Of the ten critical design and administrative issues that Indiana University's (IU) Kelley Direct online program addresses, two issues relate to this study. One of the design issues for Indiana University is the question of putting more dollars into the design effort or more dollars into training individual faculty in online pedagogy. Indiana determined that it is not an either-or question, but one versus another under varying conditions at various stages of development. Another relevant issue is that of technological delivery and the course management system selection. Indiana University chose a hybrid strategy which involved a commercial vendor which had an open structure, ANGEL, teamed with an IU technology team to develop plug-in programs required by the faculty (Magjuka, Shi, & Bonk, 2005).

Meyer notes that Newman and colleagues used content analysis of online messages to determine critical thinking indicators in computer conferences. In online conversations, students were more likely to make important statements to link ideas than in traditional face-to-face courses (2003a). In a State University of New York study conducted in spring 1999, researchers examined factors affecting the success of asynchronous online learning through relations between student perceptions and course design factors. Students were asked to complete an online survey with eight questions pertaining to demographics and twelve questions pertaining to satisfaction, learning, and

activity in the course. The survey was rated on a Likert-type scale. Averages for student satisfaction, perceived learning, interaction with instructor, and interaction with peers were compared. There were 3,800 students in 264 courses who participated. The researchers were particularly interested in actual course design and the relationship between course design features and student perceptions. Therefore, they looked at course variables in the 73 courses for which there was a 40% or greater rate of return on the student satisfaction survey. Since rankings among the various course design variables were not normally distributed, two-tailed Spearman's correlations were used (Swan, 2000, p. 515).

Correlational analyses showed that the more interaction students believed they had with their instructors, the more satisfied they were with their courses ($r=.761$, $p<.01$). One-way analyses of variance showed significant differences in student satisfaction ($p < .01$) and perceived learning ($p< .01$) among students interacting with their instructors at differing perceived levels. Students who reported low levels of interaction with the instructors also reported the lowest levels of learning. Contrastingly, students who reported high levels of interaction with instructors, reported higher levels of satisfaction and higher levels of learning from the courses. The results were similar for interactions students believed they had with other students ($r= .440$, $p <.01$ for satisfaction and $r=.437$, $p <.01$ for what they believed they learned). The study also indicated that the lower the number of modules in a course, the more students believed they learned from it. The findings of this research indicate three course design factors that contribute significantly to the success of online courses. These are a transparent interface, an instructor who interacts frequently and constructively, and dynamic

discussion. This State University New York study supports previous findings linking course structure to student satisfaction, learning, and retention to Romiszowski & Cheng -1992, Eastmond-1995, and Irani-1998 (Swan, 2000, p. 515, 516).

A qualitative study was conducted in 1998/1999 by two United Kingdom universities to determine if staff felt that lifelong learning needs were being met. There were 26 instructors who were responsible for utilizing 14 modules in Lotus Learning Space. In-depth phenomenographic interviews were conducted pre- and post course instruction. The resulting data was analyzed using phenomenographic inquiry, which resulted in six major themes. Instructors were concerned with the diverse backgrounds of the instructors and their starting points of instruction; the instructors' over all perception of the vocabulary used; their approach to teaching and learning as it transferred across contexts; time and frustration, support, and the future of distance education courses. This particular study was conducted in a top down form where few people understood what was involved in the creation and delivery of an online course. Instructors felt that this experience forced them to come face-to-face with their own approach to teaching. Instructors noted that they didn't feel that they had adequate support neither in the form of resources nor in developing appropriate pedagogies (Richardson, 2001)

Course management systems

Availability of technology for all consumers has increased students exposure and expectations for online distance education courses (Henke and Latendresse, 2005, ¶1). Still yet, consideration of online needs acknowledges that when course management systems (CMS) are assessed, the technology component portrays the "user as a singular, homogenous entity" instead of representations of users as creator and definer of the

learning community environment (Sims, 2006, New millennial learners, ¶1). For instructors, one of the frustrating aspects of learning how to use a course management system is the discovery of the limitations inherent in the platform of the CMS (Rivera & Rice, 2002, Instructional experience, ¶5). However, the recognition for instructors is, as Ullman and Rabinowitz states, "Every CMS enables instructors and students, individually and as a group, to communicate online" (2004, Virtual Community, ¶.1). A CMS can allow students to use technology to enhance learning as they constructively interact with content material (Maikish, 2006, p. 26). Ullman and Rabinowitz note that there is potential for the teacher to consider the CMS and the classroom as a seamless entity whereby learning becomes a richer experience (2004, CMS as organizing the course, ¶.2). "Learning effectiveness is a function of effective pedagogical practices," according to Joy and Garcia, based on the tenet, educators should ask "what combination of instructional strategies and delivery media will best produce the desired learning outcome for the intended audience?"(2000, Abstract). One question posed by Harrington, Gordon, and Schibik is, "To what degree has the emergence and development of CMS led to improved teaching and learning?" The University of Southern Indiana professors' study concluded no improved teaching and learning with a CMS and purport that CMS usage may be a "fleecing" of the American education system (2004). Note that these professors looked for "improved" learning and not just learning in and of itself.

Many times educational course management systems [CMS] are designed without changes of technological advancement or evolving educational theory in mind, which indicates the need for the establishment of a development and management framework for teaching and learning systems. A lack of standardized concepts and procedures for

design and management contributes to inflexibility and maintenance complications (Pahl, 2003, p.99, Deckard & Tompkins, 2006). At this point, Pahl indicates that no management of current educational technology has withstood the test of time. However, Pahl continues by noting that new hardware and software technologies are enabling new pedagogical approaches to be implemented into course design. Ensuing discussions should be of educational pedagogy and the enabling technology for delivery. The need for transferability across systems has lead to elements common to all CMS. Presently those elements are interactive elements, multimedia features, and flexible content. Pahl notes the four factors of technological that are change structured along with educational change are content (information related to the subject being taught), format (content updating and revising), infrastructure (technological updating and restructuring), and educational pedagogy (2003). As of 2004, Angelo noted that over 80% of public and private colleges and universities that do use a CMS, "have settled on a single product standard, which means they use one primary system, according to Kenneth Green, director of The Campus Computing Project (p. 52). The need for a single system comes from faculty collaboration needs, managing licensing and installation costs, infrastructure costs, staffing costs, software costs, and updating costs.

There are as many as seventeen commercial systems named by Angelo, with Blackboard being the leading system, followed by eCollege. According to Angelo, Sakai, a "6.8 million dollar endeavor," is currently the open source CMS that is "meant to be shared among education providers" and is vying for placement with commercial systems (2004, p. 53). A search for all course management systems, open and commercial source, will not occur in this study. A literature overview for representative

CMS softwares will be reviewed as the purpose of this study is to determine commonalties in software design for learning theory transferability.

Moodle (Modular Object-Oriented Dynamic Learning Environment), originating in Australia, is another open source CS that is "designed to help educators create quality online content and a collaborative, interactive environment to support their classroom courses" (Young, 2004, ¶ 36; Maikish, 2006, ¶ 3). Moodle is an open source CMS for online learning with the goal of providing tolls that support inquiry and discovery-based approaches to learning (from http://Infotrac-college.thomsonlearning.com). The formats categories available from Moodle are *weekly, topics, or social* and the interface allows teachers flexibility when managing assignments and tests (Branzburg, 2005).

Blackboard (now combined with major competitor WebCT), along with Moodle and Sakai, are three of the leading examples of systems used in education to house the distance learning environment. The goal of the Blackboard information delivery system is to create a network and community learners via new technology (n.d., from the Google database). The Building Blocks structure of Blackboard is intended to allows institutions to "integrate both custom developed and best-of-the breed commercial services" in order to meet consumers' needs (Pittinsky, 2003, Introduction).

The topic of "Learning Design" has evolved into the design of the course management system called "LAMS," the Learning Activity Management System. The main elements of this CMS are on the context dimensions of distance learning with individual work evolving into collaborative approaches. LAMS is used at the college and university levels in Australia, Canada, and the United Kingdom. Collaborative tools for LAMS include: question/answer (student answers shared with groups either named or

anonymous), synchronous chat, noticeboard (text content/instructions), resource presentation and sharing (web pages, files), notebook/journal, assessment submission, and True/False, including options to display feedback, average class score and "high" scores (Dalziel, 2003).

As the world's leading open source Learning Design system, LAMS has, since 2003, collaborated with Blackboard (commercial), Moodle, and Sakai (both open source CMS) to integrate systems as needed or desired by users. Most recently, university students in China gained access to LAMS as CMS for interactive online educational. A key principle of instructional design is to review and examine existing materials to students in China gained access to LAMS as CMS for interactive online educational experiences (Dalziel, 2003).

The University of Michigan, Indiana University, Stanford University, the Massachusetts Institute of Technology collaborated to combine their four separate CMS systems to form Sakai another open source CMS (Angelo, 2004, p. 51-52). Sakai, like Moodle, allows for modification of software and Sakai offers the capability of homemade software designed to be workable with the Sakai system. Commercial CMS do not allow as much freedom for add-on tools and are more guarded with some of their computer codes (Young, 2004). As of 2004, Blackboard had requested to make their software compatible with Sakai on a continuing basis (2003, ¶ 24).

In conclusion, articles and studies indicate that colleges and universities are seeking ways to provide and promote effective learning opportunities for distance education students. An examination of online courses reveals that many online course offerings are not of very good quality (Oliver, 2000, Introduction, p.1). Often colleges

and universities utilize new online learning technologies to achieve this [online courses] goal; however, the technology itself is not so important as how the teacher uses the technology, combined with how the course is designed. Otherwise, web-based courses have the potential to be just as ineffective as any other form of poor instruction (Richardson, 2001). Analyzing various learning theories and associated instructional design strategies can be confusing and can create a feeling of cognitive dissonance (Mergel, 1998). As noted previously in Chapter 1, appropriate and excellent course design may prove to be paramount to the success of all students in online courses (Tallent-Runnels, et al. p. 117). The two practices of media for instructional purposes and instructional design are the core of online education (Reiser, 2001, p. 57). A model for online courses, based on research and not just on intuition or a standard model for traditional courses, should be designed according to Tallent-Runnels, et al. (p.118).

Chapter 3

Methodology

This chapter explains the methods of emergent descriptive qualitative inquiry used to conduct this study. The overall concept of this study was to expand the analytical literature review to the synthesis level due to the need for a theoretical online course design model that will be pedagogically sound and be potentially transferable across course management systems. Current literature demonstrates a gap in theoretical-based online course design and information in regards to theoretical course design development. Therefore, the study method was designed to collect, review, analyze and descriptively synthesize expert information on brain-based learning theory, online course design, and course management systems (CMS) in an attempt to develop a theoretically based course design model for online college courses. Both qualitative and quantitative information were researched, analyzed, synthesized, and reported. Articles were reviewed and selected according the prospect of addressing one or any combination of the study topics as listed above. An initial literature preview presented the need for an iterate analysis methodology. Iterative analysis can be extremely time consuming and difficult to report in a meaningful form; therefore, to create efficient credibility efficiently, the emergent methodology, as discussed below, was developed to qualify criteria for analytical synthesis and, finally, model development.

The literature was researched by category as brain-based learning theory, course design, or course management system (CMS). Another, more thorough, review of the categorized literature, using the qualifying criteria as discussed later in this chapter, emerged into charted information for analyzing. Once the analytical charting was complete, the information was compiled according to each category of literature and then synthesized to establish a theoretical brain-based online course design model with potential transferability across course management systems in higher education.

Conceptual framework

Numerous models of design and principles of design do exist; however, this study's concept is theoretical pedagogy alignment with technological considerations. With the model development, the expectation is foundational concept change, resulting in structural changes in course design, and ultimately providing an opportunity to optimize student learning. As the study began, the prevalent assumption was that determining potential transferability across CMS would be a most complex component of developing a theoretical online course design model. However, contrasting information evolved from the literature review. Technological advances are occurring so rapidly that by the time the literature was reviewed, clearly, the dominant technological position was that CMS softwares are more and more compatible. The emergent qualitative inquiry methodology altered the study direction at that point. Course management systems became a diminished element, with much less prevalence in regard to developing the theoretically aligned online course design model. Basically, the twenty article review, analysis, charting and synthesis became a verification of what CMS experts purported to be

occurring. CMS softwares are more interchangeable, more adaptable, and more capable of integration across systems than ever.

This study lays out a conceptual framework of elements that are components of brain-based learning theory, online course design, and CMS for model development. These individual elements are discussed in more detail later in this chapter when the analytical chart is described.

Theoretical framework

The theoretical perspective of this study frames the inquiry for the contextual integration of brain-based learning theory, course design, and course management systems. In effort to establish credibility, an evolving analytical trend/characteristics tool was used to assess inquiry of critical discourse. The research model is based on the model of critical inquiry developed by Garrison, Anderson, and Archer (2000). A noted result of theoretical model development, according to Anderson, Rourke, Garrison, and Archer, is creating the consistent opportunity for students to sense the "grand design" of their online courses with the expectation that their learning goals will be met (2001, Design and organization, ¶ 4). The model, as described, is significant because it aligns theory with practice and course design. There is also positive significance because of potential transferability across course management systems when instructors can design courses with a reasonable assurance that the CMS will be capable of delivery. Both of these factors hold significant potential to optimize students' learning in the online environment. Again, Meyer notes that a design without boring repetition, a variety of learning experiences, and many connections to the learner's background information holds positive potential to change synaptic connections in the brain and again, as theory

is aligned with practice, learning is optimized for online students (2003b, Using technologies in light of brain research).

Analytical framework

Distance education is influenced by the same factors that impact face-to-face education, according to Schwab (n.d., from http://ott.educ.msu.edu/literature/frame.pdf. Those factors include teachers, students, course content, and the teaching-learning milieux. For the purpose of this study, the teaching-learning milieux will be defined in terms of brain-based learning theory, course design, and CMS. A table of charted variables was designed to provide a constant-comparison framework that was modified as the literature review was conducted. An evolving detailed framework was developed to identify substantive characteristics indicating methodological, theoretical, and pedagogical trends that could become model characteristics.

The analytical chart was revised a total of fifteen times during the extensive review and analysis of literature. As extensive literature reviewing began, the analytical chart began to develop and emerge as more solidified and refined as the depth of inquiry, knowledge, and understanding increased. An internal synthesis began to develop which later impacted the external development and chart revisions. Recognizing that, in order to collate researched literature effectively, the original chart had to be modified time and again, refining for a deeper, more accurate and objective analysis of each article. For example, the initial chart had learning theory as an element in both course design and course management columns, but rather quickly, logic and the literature indicated that learning theory should have been placed in the category column with its own applicable subcategories. Another example of logical refinement the was the placement of the

subcategory (literature) *researcher/author conclusions* in all categories of learning theory, course descriptions, instructional design, instructional feature, instructional design assessment, and course management systems. Other emergent chart modifications occurred during the in-depth analytical readings as it was determined that within subcategories such as instructional design assessment, one form of assessment, for example, *group work,* may have been inadvertently overlooked and needed to be included for accurate information charting. Changes in the chart were for clarity, accuracy, and precision. Changes involved moving row categories from one column to another more appropriate column, adding categories within the rows, and under the columns for additional depth in analysis.

The research context

The literature search and selection

The emergent qualitative inquiry research review needed a definite plan for reviewing and charting for credibility. The emergent research process was evolutional as literature was identified, reviewed, and then categorized into one of the three main study topics. The analytical reading of the literature focused on one research topic at a time, beginning first with brain-based learning theory, then online course design, and finally, course management systems.

Literature included in the research analysis and synthesis was identified by a four-step process. First a thorough search was conducted for related literature via EBSCOHOST, Academic Premier, ERIC, PSYINFO, Liberty University's dissertations on files, Internet search engines: Infotrac, Google, Dogpile, and AltaVista, FindArticles, LookSmart, as well as Surry Community College Library Research Resources. The

following terms were used to conduct the electronic and hardcopy search for brain-based learning theory: brain-based learning theory, brain based learning, brain compatible learning, neurocognitive learning, neuroscience, neuropsychology, cognitive learning, and learning theory.

In addition, the following key words were used to conduct the electronic and hardcopy search for online course design: online design models, online course design, online education course design, distance education and course design, distance education and course development, distance education course design and development, course design of distance education courses, models of distanced education course design, and distance education models of course design. For the purpose of the database search and for database analysis, the term "design" and "development" were considered synonymous and whenever the article author indicated no intended difference in definition, either term was considered to be defined as creation/organization of course material for the purpose of a distance delivery system.

Finally, the terms searched for the electronic and hardcopy literature for course management systems were as follows: course management systems, online delivery systems, commercial course management systems, and open source course management systems. Varying combinations of the preceding terms were used to search for the study topic areas of course design, information delivery systems, and brain based learning theory. The electronic and hard copy searches identified 340 potentially relevant articles. Each abstract from the 340 articles was read and each article was scanned to determine any applicability to the research topics of brain-based learning theory, online course design, and course management systems. From the initially review articles, 20 articles

were determined to discuss other topics more directly and were completely withdrawn from the review of literature. There were 15 articles removed from the database because the publication dates were prior to 1996 or a more recent publication date could be located on the same topic and could provide more current information. Then 5 articles were eliminated because the topics discussed biological aspect of the brain and made no applicable connection to the learning aspect of education. The remaining 280 articles were determined to have the most potential applicability to one or more of the three study topics and were read for the literature review in Chapter 2.

An emerging literature criterion was evoked from the numerous reviews and readings. For the remaining 280 articles, the emergent criterion was established to determine selection for further article analysis. From the remaining data base, the next reading determined if literature was usable based on the following:

(1) Article must address:

(a) Distance education relevant to course designs either comprehensively or as isolated elements, including case studies and course descriptions.

(b) Distance education course design model(s).

(c) Information delivery system information for any open source or commercial course management systems.

(d) Brain-based learning.

(2) Numerous research reviews have been forthright in pointing out low quality problems of many early (1980's) distance education studies. Articles from the last 10 years (1996-2006) were reviewed, but to stay with the most current literature, more recent articles were selected over older publications.

(3) The articles must have complete reference information (author, date, and source). (4) Articles with empirical data were to be included when the data was directly applicable to course design or a direct element involved in design such as interactions, assessments, or delivery medium. Empirical course design data from multiple articles that utilized descriptive statistical data such as measures of central tendency (i.e. mean, percentage, or correlation between variables) was to be included as qualitative information.

As articles were read and determined as fitting or not fitting the established criteria, the literature not selected for analytical study was reviewed and compiled in an Annotated Bibliography located after the References section of this dissertation. At that point, out of the 280 articles, there were 130 articles selected for the analytical synthesis part of this study and the remaining articles became the Annotated Bibliography. Reviewing the 125 articles selected for the analytical study once again, 10 articles were moved to the annotated bibliography because they did not contain contribution potential for further analysis. The last 10 articles were moved to the annotated bibliography because 5 of them pertained to study procedures and the other 5 were actually articles that had inadvertently been printed twice. At that time, the final database for analytical study was 50 articles on brain-based learning theory, 50 articles on course design, and 20 articles on course management systems. Reference information from articles that were charted but were not used as in text citations are found in Appendix B.

Outcome measures

As noted, to develop a credible framework of analysis within which a theoretical brain-based online course design model with potential transferability across higher

education course management systems could be developed, and for implications to be discussed with conclusions drawn, the need to repeatedly revise the analytical chart evolved. The chart had been designed to methodologically obtain substantive information as an iterate process to chart analytical information to be synthesized for model development. For the three separate topics of brain-based learning theory, online course design, and course management systems, one comprehensive chart was designed and used. The four main headings of *category, element, scale,* and *source* were determined, and as suggested by Garrison, Anderson, & Archer, to be applicable to all of the study topics (2000). For ease of organized analytical review, and for precision and accurateness, common variables or indicators evolved as articles were read. The indicators were classified within each of the categories for clarity and analytical synthesis. The chart provided two separate ways to record article information. One way was to select from a choice of variables offered in the column categories and the other way was for the reader to make relevant topical annotations based on the article author's conclusions and comments. Table 1 depicts the charting used for model development. The topical combined chart coding is found in Appendix A and the individual chart coding results are available on CD from the researcher.

Literature Analysis Chart

Table 1

Category	Element	Study results	Source
Topic	**Publication Year**	**Yes/No**	**Title**
	Instructor/Author		**Publication** **Website**
Abstract/Introduction	**Study Design** **Researched** **Information**	**Qualitative** **Quantitative**	
	Measurement	**Descriptive Statistics** **Experience Perspective**	
Learning Theory	**Principle or pedagogy**	**Application**	**Researcher/author Conclusions**
Indicators of **Effectiveness**		**Faculty Satisfaction** **Student Satisfaction** **Standardized Tests** **Descriptive Statistics** **Qualitative Data** **Descriptive Language**	**Researcher/author Conclusions**
Course Descriptions	**Instructional Course Goals and objectives**		**Researcher/author Conclusions**
Instructional Design	**Materials Section**	**Content** **Layout (or presentation) of materials**	**Researcher/author Conclusions**
Instructional Feature	**Educational Level**	**Undergraduate** **Graduate** **Post Graduate**	

Interaction Type		**Student Content** **Student-Student** **Student-Instructor**	**Researcher/author Conclusions**
Instructional Design **Assessment**	**Evidence of** **Instructor Use**	**Standardized** **Subjective** **With/without rubrics** **Discussions** **Group Work**	**Researcher/author Conclusions**
Course Management **Systems**	**Commercial CMS** **Open Source CMS**	**Note Delivery** **System Component**	**Researcher/author Conclusions**

Study variables analyzed

The *category* column included the broader aspects of each topic for this study. Article topic, abstract/introduction, measurement, learning theory, indicators of effectiveness, course descriptions, instructional design, instructional feature, interaction type, instructional design assessment, and course management systems were all listed in a row under the category column. The *element* column allowed documentation of category column topic subcategories, and next, the *scale* column provided documentation of any course or study information measurements and/or qualifications determined to be subsets within the topic subcategories. Finally, the *source* column documented literature sources and researcher/author conclusions. Each column will be discussed, but from this point, the chart will be described from the perspective of rows.

The first two rows allow for documentation of topic, publication year, if the article provides scale information, article title, website, publication, and the name of the author/instructor. Very specific reference information such as page numbers, retrievals

dates, URLs was omitted as complete reference information was located in the References pages of the dissertation. Neither page numbers nor URL was determined as information needed for analysis and synthesis. The category of learning theory was not isolated to brain-based learning theory and any learning theory was indicated and analyzed accordingly. In the learning theory category, the rows include the element of principle or pedagogy and then application noted, if applicable within any particular article.

The next six rows, indicators of effectiveness, course descriptions, instructional design, instructional feature, interaction type, and instructional design assessment charted information pertaining to the study topic of course design. The category of analysis for course design, indicators of effectiveness, were charted under the study information category and included faculty satisfaction, student satisfaction, standardized tests, descriptive statistics, and qualitative data. In the source column, as applicable, notations were taken from researcher/author conclusions. Course descriptions were annotated as course goals and objectives, with research/author conclusions as applicable. Instructional design charted the element of materials selection with notations optional for study information as content and layout of materials. The course design category of instructional feature indicated the educational level as undergraduate, graduate, and post-graduate and was charted if clear article indication existed; otherwise, the educational level was not charted. The interaction type was listed as choice items (selected as any or all) as student-content, student-student, and student-instructor. Again, as applicable, annotations were made from the researcher/author conclusions. Finally, instructional design assessment included element documentation as evidence of instructor use, again

with choice items (selected as any or all) as standardized, subjective, with/without rubrics, discussions, and group work with the source column allowing for researcher/author conclusions.

The last row in the analytical chart was course management systems, with subcategories of commercial/open source, notation of delivery or system components, and researcher/author conclusions. Conclusions charted were that of the literature author and not the researcher of this study.

Source of instrument. The source of instruments used to indicate effectiveness can impact final study outcomes. In attempt to establish study credibility, when applicable, the study design and sources were charted. The most often used measures were qualitative studies using questionnaires and surveys. The most often used measure for quantitative studies was ANOVA.

Effectiveness factors

Factors affecting the outcome of this study include the publication date and instructor as author. As new research and advancing technologies became evident, more recent literature was deemed more accurate based on Zhao, Lei, Lai, & Tan note Machtmes & Asher's research which indicates the time a study is conducted has a strong relationship to the reported effectiveness (2005, p. 1845). For this reason, the publication date was charted for all reviewed literature.

Zhao, Lei, Lai, & Tan also note Begg's 1994 work suggesting that all studies are based on advocacy (2005, p. 1845). The hypothesis of this study is that the result would more likely favor the topic if the author is also instructor in the related topic area. To

verify this hypothesis, when identifiable, the author/instructor was recorded in the analytical charting of each article.

Analytical charting

After the initial search and review for topical articles occurred, articles were reviewed and read a minimum of two times for charting purposes. Each of the 120 study articles was reviewed, analyzed and charted. First, a hard copy of the analytical chart was used for the individual coding of each chart. Then, a final review of the article and the opportunity for modifications to chart information was made as the information from the hard copy was transferred to the electronic chart. After analytical charting was complete for each of the study categories, topical information was compiled in a combined analytical chart.

At that point, all of the information reviewed was synthesized into three charts: one for brain-based learning theory, course design, and course management system For organization and identification purposes, the articles for brain-based learning theory were charted with a green font, course design literature information was charted with a blue font, and the literature pertaining to course management systems was charted with purple font. From the individual analytical charting, trends and indications were collaboratively noted by using three analytical charts as master information charts for study topics of brain-based learning theory, online course design, and course management systems. As noted previously, these individual article chartings are currently on CD and are available for review from the researcher, and the charted articles not used in text are listed in the Appendix B to provide credibility based on the articles charted. From the three combined topical master charts, common and predominating variables or indicators

emerged as charting trends were synthesized and aligned for a theoretical brain-based online course design model with potential transferability across course management systems in higher education. The three combined charts are found in Appendix A.

The results of the analysis emerged into the information synthesis and allowed the development of the theoretical brain-based model for online courses with potential transferability across course management systems in higher education and the results will be discussed in Chapter 4.

Chapter 4

Results

As stated in Chapter 1, this study reported, analyzed and synthesized a large body of literature on the topics of brain-based learning theory, online course design, and course management systems in order to develop a theoretical model for use in higher education. The results of this inquiry are the theoretical brain-based online course design model with potential transferability across course management systems. This chapter will explain the model, discussing brain-based learning theory collaboratively with recommendations for online course design as that pattern of discussion fits the practical use of the model. The theory and the design will integrate and have the ability to be used in various course management systems as previously discussed. The final part of this chapter will discuss the theoretical brain-based model with recommendations for online course design and with potential transferability across course management systems.

Theoretical brain-based online course design model

Based on the results from the analytical literature review, the model for brain-based learning theory is one that addresses patterns, and design patterns are an idea introduced by Goodyear for the purpose of successful course management system implementation (2005). Previous work in agreement with this consideration, as noted by Goodyear, are Avgeriou, Papasalouros, Retalis, & Skordalakis, 2003; Eckstein,

Marquardt, Manns, & Wallingford, 2001; Frizell & Hubscher, 2002a, 2002b; Goodyear, Avgeriou et al., 2004; Lyardet, Rossi, & Schwabe, 1998 (2005).

Gulpinar suggests that the assumption behind Brain-Based Learning Theory is that neurological research will provide information to guide learning. Gulpinar continues by noting Goodyear's consideration that the following creates relaxed alertness, orchestrated immersion in complex experiences, and time for active processing (2005, p. 302). The synthesis of the analytical review on the topic of brain-based learning theory indicated and determined the following variables, not listed in a particular order of importance, to be dominant indicators based on emerging trend for model development:

- Low Risk, nonthreatening environment
- Challenging real life authentic assignment
- Rhythms, patterns, cycles
- Chunking, grouping
- Learning orchestration
- Maintain level of novelty
- Time intervals
- Purposeful assessments
- Visual, auditory, kinesthetic learning
- Active processing; mental models
- Universal examples and analogies
- Parallel processing.

This study's model includes synthesized indicators from the analytical charting, but again, in no particular order of importance, as there is no indication of order importance

for model application. The model proposed is presented in acronym form, which in and of itself aligns with brain-based learning theory. The acronym *IGNITE* has emerged as the theoretical brain-based model and will be discussed.

IGNITE

Intervals: Provide intervals of intense focus with frequent breaks

Grouping: Chunk everything possible in groups of 3-5

Novelty: Use novelty, variety, humor, and frequent change

Interconnectedness: Connect, engage, experience/demonstrate, revisit

T²: Integrate *technology* integration; allow *time* for processing with depth and quality

Environment: Demonstrate the value of affective atmosphere in teaching/learning.

Intervals of focus are needed to direct and process one's own learning. As noted in Chapter 2, both Dwyer (2002) and Perry (2005) address the brain's need for cyclical, intense focus followed by a brief break to prevent neuron fatigue and learner boredom. Dwyer suggests 2 minute breaks for every 10 minutes of focus, while Perry suggests that only 4 to 8 minutes of intense focus can occur before the brain seeks other stimulation. Learners tune out or give attention to other stimuli without numerous breaks according to both Dwyer and Perry. Leamnson notes that this time of focus as referenced by Dwyer and Perry is called "concentrating" and it is one of the two elements required for learning (2001, Implications for learning).

To increase attentiveness in online courses, the brain-based learning theory lends itself to attending to the length of time it will take students to read and process through the content presentation. Brief, explicit, and direct information take less time for students

read. Present segments of information that would take a student about 15 minutes to read through and then create a natural break by requiring that the document, item, folder, or module be closed and a new one opened in order to continue. Suggest to students to set a time and take 2 minute breaks every 15 minutes (Clemons, 2005b, Increasing attentiveness). All of these considerations are examples applicable to any CMS.

Grouping information is a part of the model in order to utilize rhythms, patterns, and cycles to which the brain so readily responds. Evidence suggests that it is the cerebellum in the brain that responds to ritual and routine. This part of the brain regulates balance, posture, movement, learned responses, territoriality, and hierarchies. Building rhythms, patterns and cycles can be ritualistic and routine and is feasible in, to note a few areas, content/discipline routine, communication routines, and behavioral expectations. Patterns and routines can be empowering to students as a sense of control and empowerment within the learning environment (Tyrer, 2002). Beware that too much patterning becomes unproductive repetition. Repetition is desirable in the form of rhythms, patterns, and cycles because it revisits and strengthens neural connections between synapses, strengthening dendrite growth. The difficult aspect of repetition is to know when it stops being productive and then it starts being ignored.

One way to utilize *grouping* in online courses is to "chunk" anything possible. Using chunks of information is easier for the brain to remember and should consist of no more than seven items, plus or minus two, with the idea chunking being groups of 3 or 5. In an online course, text information in word documents can be chunked with bullets, numbers, or even white space. An instructor might also chunk discussion points in presentations, lecture notes, or even in the layout of the course modules themselves

(Clemons, 2005b, Implications for development/facilitation of online classes). By using numbers or bullets to group items on a syllabus or any other course document, students can more easily remember items listed within course materials. Again, according to literature reviewed, these considerations are applicable across any CMS.

Novelty is needed to prevent too much routine, or when every element of course design is based on routine, boredom readily occurs. The brain is stimulated and interested in things new and different, or things presented in a new and different manner. *Novelty* may be interesting or strange stories, jokes, unusual facts, interesting visuals, discussions, debates, unusual interpretations and critiquing, used to create a richer learning environment. In course design, students' attention may be drawn in by visual cues or concepts, but once the design becomes ordinary, then attention is lost. Instructors must constantly assess the design of online courses, from a student's perspective, to determine if novel design elements are becoming repetitious and boring. "Attention is selective, finding and focusing primarily on novelty, and ignoring the usual," was according to Meyer (2003b, Pursuing novelty through attention). This study found no literature in regard to the amount of time that a design item moves from being novel and attention getting to being repetitious and boring.

Interconnectedness represents the largest most complex part of the theoretical model. In broadest terms, it means *connect, engage, experience/demonstrate, and revisit*. At this point, the instructor is no longer a deliver or lecturer of content information or even a facilitator of learning. The instructor has the opportunity to take on the role of conductor for the orchestration of learning (Gulpinar, 2005, p. 302). Another analogy might be that of architectural engineer for a multi-million dollar project. Both analogies

allude to the professional who can and will orchestrate the connections needed to align with students' background knowledge and skills, engage students in active, meaningful, authentic real life lessons, create the opportunities for experiencing independence as a learner and then demonstrate organization of learning through authentic purposeful assessments in multiple arenas, including performance, and finally, provide the opportunity to revisit by continuing making connections to what has been learned as new opportunities for learning occur.

Personal *connections* are the platform for engagement. Personal connections, by examples and analogies, are important in order to connect to a myriad of backgrounds and experiences of distance learners. This study recommends the use of *universal* examples and analogies, ones related to the weather, senses, emotions, and human nature. No matter where the distance student is physically located or what life experiences he/she has lived, these topics have the ability to align delivery with reception of content for effective student learning. Otherwise, examples and analogies are presented based on the assumption that online students have a background for understanding.

Online course *connections* may be made at almost any point of delivery and provide an instructor with a "*hook,* a place to hang important new concepts" (Valiant, 1996, Instruction in a brain-based learning environment, ¶2). Once a connection is made, *engagement* becomes the next part to be orchestrated by the instructor. According to the synthesis of the literature analysis, engagement involves parts, if not all of the entire body. The learner may be *engaged,* or have interest hooked, by physical activity, emotional experiences, conversation, or challenge, competition, or any other number of possibilities. The brain is a parallel processor; therefore, it is poorly designed for linear

activity (Roberts, 2002, p.282). The ability of the brain to process several stimuli simultaneously indicates that students' learning will be improved in an online setting by integrating a variety of activities. Utilizing video clips, streaming lecture, diagrams, symbols, white space, typographical aids, etc. will, accommodate the brain's ability to *engage* in multi-processing learning (Clemons, 2005b). Note that video clips, streaming, and other typographical aids are capabilities currently available on any CMS according to the literature reviewed for this research.

The indication of the chart analysis is that *experiencing and demonstrating* is beneficial for learning. At this point, as noted by Richardson (2001), it is not the fact that one is using technology as educational delivery, it is what the instructor does with the available technological resources that has the potential to impact learning. From the synthesis of information on brain-based learning theory, true authentic assessment is realistic, purposeful, and meaningful to the learner. Online *experiencing and demonstrating* may include the use of directed learning, self-assignments, interactive work, self-study guides, student power points, student speeches, choice of assessments, all based on the learning objectives and outcomes for the course. Sylwester notes that the brain is similar to a complicated jungle and cites Edelman as indicating that the brain might thrive best in a jungle-like environment with numerous sensory, cultural, and problems closely related to real life (Sylwester, 1994, p. 50). The sum synthesis of chart analysis on multi-sensory learning can be communicated analogously by Shute's reference to Snowdon who says in reference to using the brain by participating, "It's kind of like investing in a mutual fund instead of individual stocks" (Shute, 2004, Conclusion).

Finally, *revisiting* or review is part of brain-based learning theory. Rhythms,

patterns, and cycles create opportunities for revisiting. Neurologically, Clark (2005) describes revisiting as neurons signaling deep into the hippocampus, which is responsible for learning and memory. When neurotransmitters are released from the hippocampus across synapses connecting neurons, memory becomes stronger. The more this action occurs, potentially, memory can be improved (p. 678). Synthesis of the study chart indicates that periodical short quizzes are one way to create the opportunity for *revisiting* in online courses. Online discussions, chat rooms, and threaded discussions are all names repeated in the analytical charts, indicating the power of revisiting materials and topics by languaging. According to the researched literature, these software capabilities are readily available in all CMS.

The "T²" is a term of mathematical orientation and it represents the integration of appropriate *technology*, and *time* to actively process the course content. *Technology* integration is the convergence of this learning theory with CMS, and time is what each learner must have to actively process course content in the online format Using technological capabilities just for the sake of usage has no research basis. In addition, online environments should provide ample *time* for processing from the personal connection and engagement to the experience and demonstrate stages with depth and quality. This may mean covering less material, but delving much deeper into the most important content concepts.

Environment represents the importance of a low risk, non-threatening, supportive environment that addresses the affective needs of the learner. Brain-based learning theory calls relaxed alertness the term for a learning conducive, nonthreatening environment. A nonthreatening, or low-risk environment readies students for meaningful

learning experiences. When students feel threatened, then the brain "shuts down" or "downshifts" and attention is lost, emotions become volatile, and a sense of helplessness and/or fatigue overtakes the disposition (Caine, R. 2004). Students who feel that they are never going to have a positive or correct response stop being active participants in the learning environment. These students may be considered ones who produce only minimal work, but in reality are unable to think clearly because of threat or have such a fear of being wrong that they choose not to engage and interact within the learning environment.

IGNITE and course management systems

Implementing the *IGNITE* model has the potential to enable online course instructors to utilize a credibly researched learning theory for content design and "using technology as a tool for acquiring, organizing, and processing information to develop new knowledge" is based on that same theory (Valiant, 1996, Instruction in a brain-based learning environment, ¶5). As noted in Chapter 2, course management systems have become extremely flexible and are now highly refined with the current goal of the leading CMS provider being to create a network that allows institutions to "integrate both custom developed and best-of-the breed commercial services" in order to meet consumers' needs (Pittinsky, 2003, Introduction). Since 2005, open source CMS have announced integration capabilities. Moodle announced integration capabilities with LAMS in 2005 (*World's leading open source e-learning systems Moodle and LAMS announce integration,* Retrieved January 10, 2007) and another leading open source CMS, Sakai, announced integration capabilities with Moodle in November of 2006 (*Sakai Project,* Retrieved January 10, 2007). For constant and continuing integration capability reasons,

the portion of this study pertaining to course design model with potential transferability across CMS in higher education has markedly diminished. As the concern for online CMS capabilities have lessened, the question of appropriate media for teaching and learning will continue to be a strong consideration in the course design decision making process. This is true in regards to software medium capabilities and software tools. More so than ever, the technology of course management systems has now become the convergence channel for integrating course design and delivery (Porto, & Aje, 2004, p.2).

The analytical charting of 20 articles on the topic of CMS did, however, reveal noteworthy information in regard to CMS softwares and the attempt to develop a theoretical brain-based learning course design model. All 20 articles reviewed for the analysis had been written since the year 2000. Current information was dominant, with 9 articles written in 2006. Eleven different CMS, both commercial and open-source, were discussed with, Blackboard being discussed in 4 articles, which was more than any other system. The learning theories discussed in the articles included experientialist, objectivism, empirical, rationalist, pragmatic, and constructivism. Constructivism was discussed more frequently that the others, with 3 articles discussing the constructivism theory. Brain-based learning theory was not explicitly discussed in any of the 20 articles. Most evident in the 20 article analysis was the 7 articles discussing the need for a theoretical course design model based on sound pedagogical principles.

Online course design recommendations

Now that the majority of online courses are delivered by a course management system, instructional designers contend that there is an increasing need for a methodological approach, creating an educational setting that represents the collaboration

of tasks, activities, environment, and people. Sustainable effective course design is more than a higher institutional online demand; it has now become an ongoing need in order to make the best use possible of a course management system and in order to create a network of learning communities.

Vrasidas suggests that each educator, either consciously or unconsciously, subscribes to an epistemological paradigm that shapes beliefs about teaching. Because of this, online instructional designers should always be aware of those pedagogical assumptions as those beliefs will guide and direction teaching methods (2000, Conclusion). In addition, developing a high level pedagogy based on theoretical foundations for online learning occurs when an instructor makes a commitment to utilizing a model of design. The comprehensive organization of online course design involves three kinds of work; designing sound learning tasks, designing and managing the total learning environment, design opportunities for social interaction and supportive relationships (Goodyear, 2005).

According to Busacco, even by 2025 the traditionally known and accepted university will not longer exist (2001, p.4). Deubel states that Pisha & Coyne indicate that recent developments at the Center for Applied Special Technology suggests that based on Universal Design for Learning (UDL), at a minimum, online students need multiple resources for learning and that text alone is insufficient to meet the broad range of learners' needs. Hypertext, color, visuals, animation for novelty and attention, help screens, audio, attention breaks, chunks of information, and video links should be utilized to optimize the online learning environment (2003a). Brain-based learning theory parallels these recommendations.

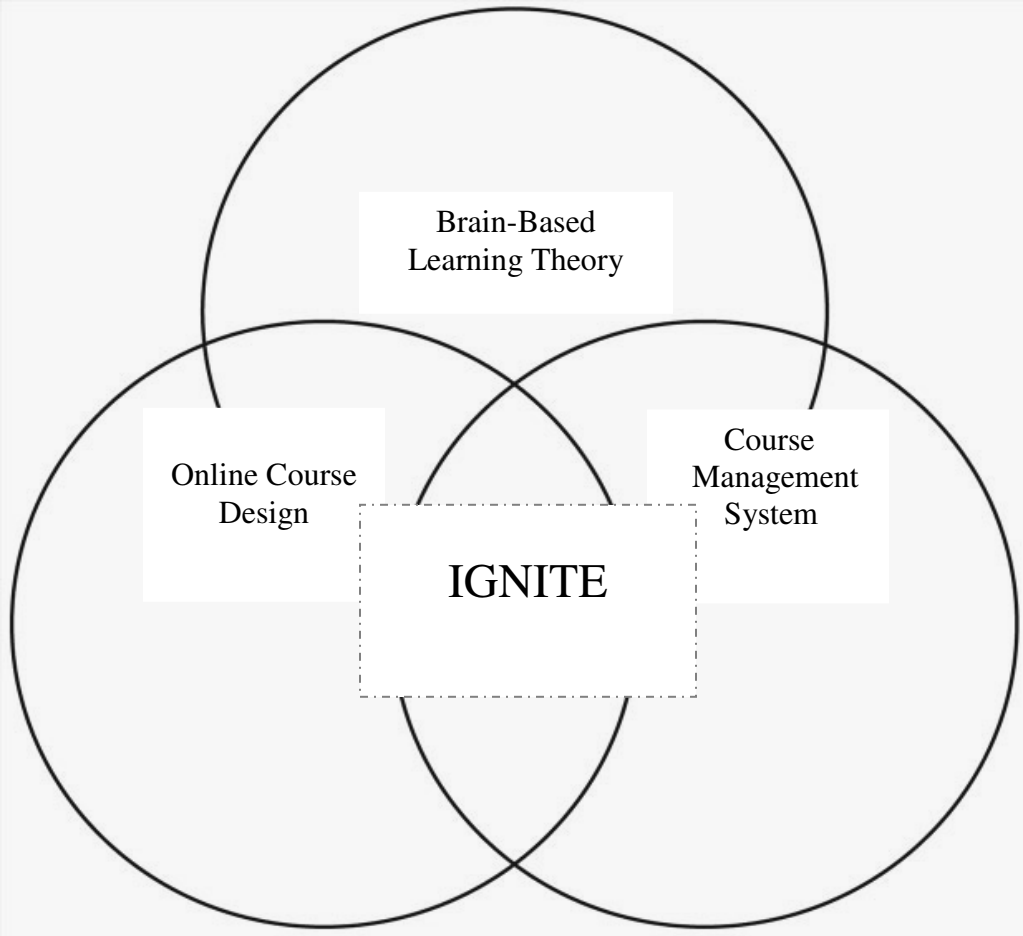

Figure 2: Theoretical online course design model: *IGNITE*

Note that Figure 2 represents an integrated interconnectedness of learning theory, online course design, and delivery system. Therefore, consistency in online course design based on learning theory, and potential transferability across various delivery systems is indicated by this model.

Chapter 5

Summary and discussion

The final chapter of this dissertation restates the research problem and reviews the major method used in the study. The major sections of the chapter summarize the results and discuss their implications. For this study, the problem researched is to develop a theoretical brain-based online course design model with potential transferability across course management systems in higher education.

As explained in Chapter 3, the study used the method of emergent descriptive qualitative inquiry of a literature review. The basic concept of the study was to expand the literature review from a comprehensive analytical review to the synthesis level for the purpose of developing a theoretical brain-based online course design model with potential transferability across course management systems in higher education.

Trends and indicators

The trend and indications revealed by this study as determined in Chapter 3 and discussed in Chapter 4 suggests the need for a theoretically based course design model. The analytical charting also suggests that the brain-based learning theory is a credible learning theory with potential to positively impact students' learning in online courses integration across commercial and open source delivery systems has been and continues to occur. While technological advancements have enabled course management systems

to redesign for delivery capabilities, instructional course designers, according to the information contained in this study, have not redesigned online courses to align with current learning theory and to align with delivery system capabilities.

The IGNITE model proposed by this study is an attempt to provide a foundation of theoretical pedagogy grounded in brain-based learning theory, integrated with those same theoretical principles for the purpose of higher education online course design for delivery that can potentially optimize student learning. The broadness of the IGNITE framework is the aspect that will potentially enable instructional course designers to continuously update, modify, and change both course content and technology capabilities as rapidly as information and technological advancements occur.

Significance of the research

While intuitive beliefs have been utilized as online instructional design guidelines, this study suggests that it is time to change to the utilization of a theoretical perspective that will optimize teaching and learning in an online course management system format. In addition, a theoretical course design framework integrated with a quality interface or course management system holds potential to optimize online learning experiences. However, true changes will involve acquiring different assumptions regarding learning, instruction, and technology (Harvey, 2002, p. 60). As advances in technology occur, there must be continued research with practical course design in regard to implementation in the areas of neuroscience, brain-based learning, and cognitive psychology (Deubel, 2003b, Introduction, ¶1).

Researcher's Insights. While this one study established the need for and develops a model that could impact education in a powerful and transforming manner,

there remain barriers that inhibit positive responses to a theoretical brain-based course design model. One of those barriers from higher education institutions is lack of vision and failure to use technology strategically. Re-organization of thinking and practice must take place (Bates, 2000, Barriers to change). According to Harvey, removing barriers to intuitive online design means no longer just revising conventional assumptions about instructional design. One consideration proposed by Harvey is to consider creative thinking in order to change current thinking about online course design (2002, p. 62). Howard-Jones and Pickering suggest that the inclusion of the increasing knowledge pertaining to brain research can be used to create a more complete picture of educational processes (2005). Accordingly, creating a more complete picture of educational processes includes recognizing the importance of biological and social influences of learning. Challenging existing ideas may lead to teaching and learning in unexpected and unusual ways; therein is the opportunity to prompt further inquiries of formal research for educator/researchers.

Based on the information from this study, this researcher suggests that this brain-based learning theory model may be just as effective in the traditional seat environment as in the online environment. In addition, not only may this model hold potential for optimizing student learning in higher education, but may also hold positive potential for optimizing student learning at any other level of education. This researcher also determined, by information synthesis, the need for *universal analogies and examples*. That specific idea was not found in any of the reviewed literature.

Relationship of the Current Study to Prior Research. Based on information from this study, professors of higher education courses will potentially be able to follow a

model of design for distance education courses in any information delivery system in a more efficient, theoretically sound, professional, and confident manner, expecting that students' learning experience will be gainfully beneficial. At noted earlier in this dissertation, Willis & Wright's investigation revealed no one theoretical foundation for instructional design that was suitable for all applications (Meyer, 2003a, Conclusion). Harvey suggests that distance education has yet to find a framework that integrates and uses technological online capabilities. Harvey continues by noting that many traditional classroom symbols have been transferred to the online format without consideration that online formats actually have a wider variety of offerings for course design. The suggestion by Harvey is that online learning power remains untapped because there is no course design framework that integrates pedagogical theory with technological capabilities (2002). Numerous times throughout this study, authors have explicitly stated that online course design lacks a theoretical framework for higher education. This dissertation study has the potential to impact and/or change those findings.

Explanation of Unanticipated Findings. The initial purpose of the study was to develop an online course design model with potential transferability across various course management systems. Even as the study was being developed, technological advancements were occurring so rapidly that by the time the study was conducted, CMS sources, both commercial and open-source, acknowledged integration capabilities. The literature review indicated this repeatedly and the indication was consistent. Therefore, the course management system component of the study for model development purposes became notably diminished. For that reason, course management systems literature was reviewed, analyzed, and synthesized, but only with 20 articles as compared to 50 articles

for each, brain-based learning theory and online course design.

Implications for practice

According to Garrison and Cleveland-Innes, "the purpose of an educational experience…is to structure the educational experience to achieve defined learning outcomes" (2005, p. 133). Joy and Garcia purport that learning effectiveness is a result of effective pedagogical practices in online instruction and that course designers should not expect that any particular type of technology delivery will be any more effective than another (2000, Abstract, Introduction, from www.aln.org/publications/jaln). The results from this study align with Joy and Garcia's position.

A faculty member should be knowledgeable in his or her content area, be proficient as an instructor, and be competent with education technology, but faculty members entering institutions of higher education are not always proficient simultaneously in all three areas (Wilhelm, 2003, Instructional designer, ¶1). As more and more educational institutions are placing an increased number of courses and programs online and often times in order to replace traditional seat classes, higher education must rethink the transfer of traditional content to the online format (Janicki & Liegle, 2001, p. 60). This model merges sound theory into practice and technology for improved student learning.

From this study, indicators acknowledge that various types of interaction are imperative for online course design. IGNITE principles of brain-based learning theory can integrate directly into course design if the instructional designer can leave the traditional classroom model. At noted early, the IGNITE acronym represents *Intervals* (of time), *Grouping* (by chunking in groups of 3-5), *Novelty* (to gain and maintain

attention), Interconnections (connect, engage, experience/demonstrate, and revisit), T^2 (appropriate *technology* integration, and *time* to actively process) and *Environment* (low risk atmosphere that also attends to affective teaching). Remembering to use chunking, novelty, humor, and other principles of brain-based learning theory, in a low risk online environment can be the "glove in hand" fit to any course management system at this point in time according to this literature analysis.

From the neurological perspective, it is becoming increasingly clear that synaptic connections in the brain change throughout life. The brain's ability to be constantly malleable has increased educational interest, but there is much to be learned and used to positively impact teaching and learning (Hall, 2005, p. 29). Another consideration is Abbott and Ryan's perspective that neurology is just beginning to uncover an understanding in regard to young minds and the energy and idealism therein. Abbott and Ryan purport it to be nearly impossible to foster intellect if young minds are not exposed to an intelligible world (1999, p.67).

The next step in this literature analysis will be to implement, assess, and evaluate the work. The need for constant improvement is urgent as higher education online demands increase and as students have more pressing learning needs. Modern society needs and expects that college graduates will be able to think, solve complex problems, act in a disciplined manner, be reliable, be able to read, write, and speak effectively, have a respect for others, and engage in lifelong learning (Gardiner, 1998, p. 122).

Gardiner notes that "today we have the knowledge and tools to actualize a vision of human development on a scale never before possible" (1998, p. 131). To ensure that this actualization occurs, it is time to systematically employ newly researched and

powerful methods as educators (Gardiner, 1998, p. 131). There is much research available, but efforts must be made to increase both qualitative and quantitative research that cross into mainstream education. While there is value in experiential education's subversive, outside-the-mainstream persona, educators must also seek ways to come in from the "outside," invite dialogue, and encourage interaction across disciplines (Roberts, 2002, p. 284). Reardon cites Nobel Prize winner, Dr. Michael Gazzaniga as noting that "Nature's biological imperative is simple: no intelligence or ability will unfold until or unless given the appropriate model environment" (Reardon, 1999). If students are to gain an operable understanding of brain-based learning theory, then instructors must model the use of it through online course design.

Delimitations

This research was an extensive comprehensive review of literature, but the limitations of the term comprehensive is itself defined by the number of articles analyzed and synthesized for this or any study. Over 300 articles were reviewed prior to selecting the 120 articles to be analyzed for the study. Because this was qualitative inquiry research for descriptive results, the design was emergent in form. Factors affecting the effectiveness were emergent as well.

Objective effectiveness was impacted by authors' bias where information was integrated with delivery instructor or designer perspectives. Many early distance education studies have been found to be flawed; therefore, articles and studies in the early part of the new century hold the possibility of being more reliable than those from the late 1990s. Joy and Garcia determined the existence of research flaws due to the ambiguity between causes and effects in experimental research (2000, p. 4). Other factors affecting

study effectiveness were the status and teaching level of the instructor/author, the level of technology being discussed, and the instructors' possible training or lack of training in distance education course design.

Future research

The prevaling course design question is no longer, will the focus be on how will the instructor teach course content, but how will online students learn? (Barker, 2002, p. 184). While Dwyer notes that the current information available on how the brain learns provides the opportunity to "re-examine our training methods…creating optimum learning environments," it remains desirable to have well-designed true random experimental and longitudinal studies in regard to learning theory and course design (2002, p. 265). Zhao, Lei, Lai, & Tan note the reality that such high-quality studies are difficult to come by in social science research. These researchers note that this situation is the current reality and that other researchers might consider novel approaches to interpreting contemporary research (2005, p. 1866). Novel approaches to contemporary research and the test of time will provide for continued examination of how online students learn.

This study was an attempt at a pragmatic approach to research synthesis in order to address the need for a theoretically-based dynamically designed model with application of brain-based learning theory for online course design with potential transferability across course management systems. While this study's results were not conclusive, it does offer suggestions for consideration by online educators and researchers. Implementation of the model will create opportunity for other researchers to examine the model's effectiveness. Other researchers are encouraged and invited to add

to this body of research by considering future studies as a more complete analysis of current literature for the purpose of synthesis and application.

Discussion

Wolfe notes that many educators intuitively have used many brain compatible strategies and those strategies have worked well, but these strategies should be brought to the conscious level in order for educators to increase knowledge base and articulate their practices as professionals. Lack of scientific knowledge means decisions made that are unrelated to what is best for students. Wolfe contends that applications of recent studies have potential to shape educational practice (2001).

The potential for the results of this study to impact learning in higher education online environments will be directly related to the receptiveness of educators who seek research based information to make student learning the goal of teaching. The *IGNITE* model is not step-by-step prescriptive, moving sequentially and/or linearly from online course instruction to technological capabilities. *IGNITE* is a theoretical brain-based model of integration and alignment of instruction practices and course management system capabilities. The *IGNITE* design model is dynamic, as it is structurally defining for online instructional course content, yet broad enough to enable content change and technological updating and advancement.

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Appendix A

Combined Brain-Based Learning Theory Literature Analysis

Table 1

Category	Element	Study results	Source
Topic **Brain-based learning theory-50**	**Publication Year** **1996-2** **1997-3** **1999-4** **2000-3** **2001-11** **2002-4** **2003-4** **2004-2** **2005-7** **2006-10 (includes 4 retrieval dates)**	**Yes-5** **No-35**	**Title** **Website**
	Instructor/Author		**Publication**
Abstract/Introduction	**Study Design** **Researched Information-1** (literature review)	**Qualitative-2** **Quantitative -3**	**Researcher/Author Conclusions** • Indications are that total brainpower isn't dependent upon synapses formed prior to age 3. • Exercise in the physical, mental, and social are all excellent for the brain to remain in good working condition. • Mechanisms of the brain and behavior connections are not likely to be understood unless theorists and experimentalist communicate developments in the field.

			• The paper discusses using neuroscience to help children with autism, seminars on brain-based learning, and give a report of seminar discussions.
	Measurement	**Descriptive Statistics** **JMPIN software** **ANOVA** **Experience Perspective**	**Researcher/Author Conclusions**
Learning Theory Brain-Based Learning Theory • Requires a focus shift to the learning process.	**Principle or pedagogy** • What qualifies as a principle? • Phenomena describe should be universal. • Research documentation should span more than one field. • Should anticipate future research. • Should provide implications for future research. • Learning is a function of how the brain forms connections between synapses. • Relaxed alertness • Challenge • Good nutrition Water • Varied assessments • Cement memories through discussion/ group work	**Application** • Learning occurs through strengthening or weakening of synaptic connections. • The teacher is the orchestrator of learning experiences.	**Researcher/Author Conclusions** • Synapto-genesis holds implications for education—it's never too late to learn. Brain-based learning will not instantly transform learning. • Suggests the "use it or lose it" aspect of brain development to be correct. He also suggests that focused attention and concentration is necessary to learning. The connection of the limbic system to emotional involvement influences how strongly attention is focused. Author purports that what one thinks about changes,

	• Non-threatening environment • Connect to past knowledge • Focus/break; intervals of time • Learning takes place in enthusiastic, low stress environment • Using technology in classroom because that's what students are using outside the classroom. • Positive emotions can improve memory. • Brain is complex. • Brain is social • Search for meaning is innate. • Search for meaning occurs through patterning. • Emotions critical to patterning. • Brain perceives and creates parts and wholes. • Learning involves focused and peripheral attention. • Learning involves conscious and		but the way one thinks does not change. • BBLT principles are multi-discipline in depth. • The brain only pays attention what things that are personally meaningful; affirms that brain-based learning theory is a combination of good training strategies and common sense methods; no intimidations or threats to create productive learning environment. Recommends breaks from intense focused attention every 20 minutes. • Instructors do not exist as entirely separate and distinct individuals, observing and controlling the learning environments of students. Instructors are participant-observers in the learning-teaching process involved in continual dynamic

	unconscious processes. • There are at least two ways to organize memory. • Learning is developmental • Complex learning is enhanced by challenge; inhibited by threat Each brain is unique12 principles (Caine & Caine) • Learning engages entire physiology • The brain is social • Search for meaning is innate • Search for meaning occurs through patterning • Emotions are critical to patterning • Brain processes parts/wholes simultaneously • Learning is both focused and peripheral attention • Learning is both conscious		exchanges between self and the environment and other selves. • Students are not empty vessels waiting to be filled, but active, motional and physiological selves being continuously reconstructed in the body, brain and mind. Instructors are active, emotional and physiological being engaged in a similar process of continually reconstructing our selves. • A nonthreatening environment allows the brain to seek novelty. • Attention is necessary to learn, but within 3-5 minutes neural systems get fatigued and need and seek a rapid recovery. • The author recommends a bob-and-weave, rotating and changing, type presentation to hold students' attention and engage them in learning.

	and un-conscious • At least 2 way to remember (rote/dynamic) • Learning is develop-mental • Learning enhanced by challenge; inhibited by fatigue • Each brain unique • Student needs relaxed alertness. • Students should actively process for real meaning. • Notes Caine & Caine's 12 principles of brain-based learning • Brain is capable of changing and growing for a lifetime of learning. • Learn to learn • Nonthreatening environment • Meaningful learning • Brain learns best through application • Patterning • Connection, correlation, and integrate • Humans extract and create in		• The mind merges at the crossroads of action, perception, and learning and proving that continues to give researchers a challenge. Author suggests neurobiological base for group-level organization. • Further study is needed to determine if dopamine has a subconscious role in learning and attention
Conditions of learning— Brain research------			

Constructivist----------	meaningful patterns and use to understand and link ideas. • Immersion, • Demonstration, • Engagement, • Expectation, • Responsibility, • Employment • Approximation • Response • Adult's brains can grow & change. • Use it or lose it. • Brain needs both physical and mental exercise. • The socially engaged stay sharper longer. • Connecting to backgrounds • Plasticity • Affective learning • Engagement • Patterns • Thoughts connected to electrical and chemical communications between neurons • Environmental literacy • Teacher demonstration • Varied opportunities • Teacher's		

	presence and support • Students ownership of activities • Temporarily accept approximations • Give specific feedback • "Whole-learning" multi-perspective of the theoretical framework.		
Indicators of Effectiveness		**Faculty Satisfaction** **Student Satisfaction** **Standardized Tests** **Descriptive Statistics** **Qualitative Data**	**Researcher/Author Conclusions** The authors discuss global happenings in linking neuroscience and education and discuss the benefits of collaboration between neuroscience and education.
Course Descriptions	**Instructional Course Goals and objectives**		**Researcher/Author Conclusions** • Brain-based learning is a combination of common sense and brain science.
Instructional Design	**Materials Section** • Mixed methods • Variety of learning experiences • Memory/ Retrieval • Learning styles • Increasing attentiveness • Role of emotion in	**Content Layout (or presentation) of materials** • Support emotional responses and need for relationships	**Researcher/Author Conclusions** • Teach students how to feel enthusiastic about their assignments and projects. This can enhance learning. • The author

	learning		suggests being mindful of the following when selecting course materials: • Memory/retrieval • Learning styles • Increasing attentiveness • Role of emotion in learning • Should be low risk • Learning opportunities should be orchestrations • Use mental models/patterns
Instructional Feature • Positive attitudes • Acquiring and integration knowledge • Extending and refining knowledge • Using knowledge meaningfully • Habits of the mind - Metacognition	**Educational Level**	**Undergraduate-3** **Graduate-1** **Post Graduate-1**	**Researcher/Author Conclusions** • Individualized lessons are possible, if not easier with computers and online learning.
Interaction Type		**Student Content-2** **Student-Student-1** **Student-Instructor-1**	**Researcher/Author Conclusions** • Learner needs variety of interactions • Learning is more likely to be achieved when the linked with a learner's previous knowledge, experience, or

			understanding of any particular given topic.
Instructional Design Assessment	**Evidence of Instructor Use**	**Standardized** **Subjective-1** **With/without rubrics** **Discussions** **Group Work-1**	**Researcher/Author Conclusions** • Seek to provide positive constant, positive, and encouraging feedback to students.
Course Management Systems	**Commercial CMS** **Open Source CMS**	**Note Delivery System Component**	**Researcher/Author Conclusions**

Appendix A

Combined Course Design Literature Analysis

Table 2

Category	Element	Study results	Source
Topic **Course Design-50**	**Publication Year** **'96-1** **'98-1** **'99-2** **'00-7** **'01-6** **'02-6** **'03-7** **'04-6** **'05-8** **'06-5**	**Yes-19** **No- 27**	**Title** **Website**
	Instructor-7 **Author-4**		
Abstract/Introduction	**Study Design** **Researched Information-7**	**Qualitative--4** **Quantitative-15**	**Publication**
	Measurement	**Descriptive Statistics** **Experience Perspective--3**	• percentages
Learning Theory • Behaviorism-**2** • Cognitivism-**4** • Constructivism-**3** • Socio-constructivist-**3** • Self learning-**1**	**Principle or pedagogy** • Blended learning • Principles of cognitive psychology • Learning and growth model • 4-MAT • Gardner • Nelson • Jonassen • Merrienboer • Schank • Student centered learning • Jurisprudential	**Application** • Bloom's Taxonomy • Gagne's Taxonomy • Mastery Learning • Keller Model • Systems Approach • Chunking • Mnemonic devices • Metaphors • Analyze • Open-ended experiences-**3**	**Researcher/author Conclusions** • Suggests eclectic use of theories as deemed best suited to what works best for the learners at a particular time. • Strengths and weakness in all theories • Constructivism has led to design for authentic learning. • People learn most

	inquiry • Simulation model • Direct instruction-**2** • Experiential-**2** learning • Inquiry learning—**2** • Inductive thinking • Problem-based learning • Pedagogical • Technological • Institutional • Ethical • Interface design • Resource support • Course management • Evaluation the context of the learning environment should influence the way students approach their learning (139). • Learning technology • Distributed learning • Learning is meaningful, active, and interpretative	• Establish objectives**-1** • Whole picture to details • Real-world problem solving-**2** • Learning is facilitated when learners solve a progression of problems that are explicitly compared to one another. (from multiple sources) • Information access • Collaborative groups • Metacognition • Lifelong learning	effectively while engaged in job assignments. • Teachers base designs on past experiences too often. • Educators often fail to ground designs in research and theory.-**1** • Most course designers rely on past experiences**.** • Results indicate that a shift in how students approach their studies is strongly influenced by the design and teaching approach. • Instructors should teach to students' learning styles but also help them build skills in less preferred models of learning. • If class attends to personal or academic needs of students, they spend more time in the
Indicators of Effectiveness		**Faculty Satisfaction** **Student Satisfaction-2** **Standardized Tests-1** **Descriptive Statistics-2** **Descriptive Language-**	**Researcher/author Conclusions** • Instructional treatment plan: 1.Gain attention 2. Inform learners of objectives 3. Stimulate recall of prior

		Qualitative Data-3	knowledge 4. Present stimulus 5. Provide learning guidance 6. Elicit performance 7. Provide feedback 8. Assessment Performance 9. Enhance retention and transfer • Authors feel that comparison studies results will continue to be weak because of so many uncontrollable variables, as evidenced in the studies discussed in this article. • Social presence of student and teacher directly related to magnitude of interactions and dept of discourse (p. 142, 143). • Most significant observation: insufficient support in resources and in developing pedagogies • Use course goals and objectives to transition from traditional designs to engaging learner centered

Course Descriptions	**Instructional Course Goals and objectives** • Identify, decide on, set objectives • Courses designed with ideological outcome approaches for the development-- • Capabilities and performance can use problem and task based approach		**Researcher/author Conclusions** • Number of programs continue to increase • Meaningful online learning may depend on sequencing of interactions rather than the design of individual activity or event. • Other experts agree that online environment should consider a full spectrum of design, including both content and technology elements • Choice of performance oriented objective and assessment tasks
Instructional Design • Cognitive model • Becoming more knowledge management • Maturity Model Oliver cites (Toohey, 99) • Needs analysis • Explore needs of target audience • Determine course content • Choose teaching and assessment processes	**Materials Section** • Learning contracts • Lecture • Discussion • Small group • Projects • Case study • Focus on fundamentals • Keep information clear • Develop in modules • Use combination of synchronous/a synchronous	**Content** • tutorial component • interaction component • manage-ment component • supportive component • Identify essential experience s necessary to achieve goals and objectives. • Select grounded instruction al	**Researcher/author Conclusions** • 35 hours to design • 73 hours teaching • 44 office hours • 3 hours misc. tasks • 155 total hours • Designed for learners to improve performance and be responsible for accessing and improving organizational knowledge

• Formative evaluation and redevelopment cycles	• Incorporate audio/video files when possible	strategies based on objectives. • Operation-al event embedded in instruction. • 5 levels from lower level to higher • meaningful contexts • choose learning activities ahead of content • open ended tasks • plenty of resources • plenty of supports **Layout (or presentation) of materials** • Textbook • Lecture notes by print • Define type of interaction. • Select the telecommunication tool. • Sequential	• directed learning, self-assignments, interactive work, self-study guides • Five-step process for systematic designing and sequencing interactions • Important aspect of instructional design is to design online discussion and manage it. The most important role of the faculty is to design discussion is to develop and promote student-t0-student interaction and critical thinking.-1 • More qualitative research in regard to the nature of online interaction pertaining to teaching and learning approaches (p. 145). • Choices of performance oriented objectives and assessment tasks
Instructional Feature	**Educational Level** Not stated- **1**	**Undergraduate-9** **Graduate-5**	

		Post Graduate-2	
Interaction Type		**Student Content-8** **Student-Student-9** **Student-Instructor- 7**	**Researcher/author Conclusions** • Frequent and meaningful-**3** • Create learning communities • Use creative solutions to fulfill objective requirements • Establish social relationships • Reducing time spent on each student detrimental to program quality • Focus on quality instead of quantity • Interactive community • Qualitative interaction, purpose and systematic • Authentic assessments • FAQ
Instructional Design Assessment	**Evidence of Instructor Use**	**Standardized-5,** **Subjective-4** **With/-4 without rubrics-1** **Discussions-5,** **Group Work-4**	**Researcher/author Analysis** • Align assessment with learning goals and objectives • Instructional media should reflect availability to learners • Instructional media and tools reflect added value of technology utilized

			• Course Management Systems be adequately prepared and supported • Reflect diversity of learners • Use instructional design approach to select media and tools used • Contingency strategies in place • Need for feedback • Need for scores for student achievement verification • Need to discourage and prevent plagiarism • Ensure identity of person submitting work • Test application driven by need • Use group and individual assessments • Multiple opportunities for assessment

Course Management Systems	**Commercial CMS -2** • Blackboard-2 (WebCT)-2 • CourseBuilder • Star Legacy • LOGO • CAI **Open Source CMS** • Wired Class	**Note Delivery** • Discussions • Group threads • Email conferencing • Chat room discussion • Collaborative activities • Peer commenting • Online assignment • Synchronous • Asynchronous Forum **System Component** Power point Email-1 Discussion groups	• Comprehensive systems of technical support services in place • Faculty have adequate support and development • 24/7 service for faculty and students • Regular feedback on success and failure of • Support systems • Policy adjustments and accommodatio ns as necessary to meet changing needs of instructors and learners • No instructor knowledge of html programming necessary for WebCT course design • Online environment include: coaching, synchronous opportunity, team chat room, • Chat rooms • Email • Online student pages • Navigational help pages • Assessments be learner

			centered • Technology is to organize higher education learning and to be an avenue of presentation for learning outcome abilities and capabilities • Technology is to organize higher education learning and to be an avenue of presentation for learning outcome abilities and capabilities.

Appendix A

Combined Course Management System Literature Analysis

Table 3

Category	Element	Study results	Source
Topic **Course Management System-20**	**Publication Year** **2000-2** **2001-2** **2003-2** **2004-4** **2005-3** **2006-7**	**Yes-3** **No -17**	**Title** **Website**
	Instructor/Author		**Publication**
Abstract/Introduction	**Study Design** **Researched Information**	**Qualitative-1** **Quantitative-2**	**Researcher/Author Conclusions** • Outsourcing is a viable option • Lack of theories or models for learning tools is a problem
	Measurement	**Descriptive Statistics-1** **Experience Perspective-1**	**Researcher/Author Conclusions**
Learning Theory • Experientialist theory of cognition------- • Objectivism---(Dick & Carey, Gagne & Briggs, Smith & Ragan, Romiszowski Tyler) • Constructivism -**3** (socioconstructivist (Piaget, Vygotsky, Blumer)	**Principle or pedagogy** • Metaphorical parallels • One true correct reality • Study world to know structures and relations • Know the world when mind mirrors reality • Evaluation/ • Assessment is criterion based . • Knowledge is constructed by learner • Two key	**Application** • Visual representations of cognition are mental representations	**Researcher/Author Conclusions** • Virtual learning environments are designed with a pedagogical model in mind, gut it is not explicit. • Educators lack specific guidance and foundational principles on which to base instructional choices. • Reusing courses may be difficult

• Empirical • Rationalist • Pragmatic/ cultural-historic	principles for virtual learning environments: • Technology is made up of many sub-categories based on computing technologies. • Education is made up of many sub-categories based on education model • Metacognition • Situated learning • Chunks of learning experiences that equals units of study • A learning object is any entity, digital or nondigital, that can be used or reused in electronic learning • Environments • Pedagogy concepts and enabling technology should have a close relationship to enable implementation .		but reusing learning objects is not too difficult.
Indicators of Effectiveness		**Faculty Satisfaction-2** **Student Satisfaction** **Standardized Tests** **Descriptive Statistics-1**	**Researcher/Author Conclusions** • Abstract knowledge is best suited for virtual learning environment

		Qualitative Data-1 **Descriptive Language-3**	• Changing the medium doesn't necessarily mean a change in student learning. CMS utilization: • 78.5% increased over time • 69.1% increased student engagement • 47.1% believed there was an increase in learning • 5.8 % believed CMS decreased learning • 71.1% increased time to update and manage online courses • 24.6% believe time to update and manage was the same as face to face • 4.2% believed it decreased time to update and manage • Moodle allows both types of feedback—qualitative/ quantitative • Continue to evaluate system control techniques.
Course Descriptions	**Instructional Course Goals and objectives**		**Researcher/Author Conclusions** • Suggest a model for universal virtual world design
Instructional Design	**Materials Section**	**Content**	**Researcher/Author**

		Layout (or presentation) of materials • Architectural ref. model • Pedagogical meta-model • Domain model	**Conclusions** • Constructivist approach: analysis, design, evaluation (on-going) • Philosophical assumptions guide teaching • Objectivist approach: content analysis, task analysis, learner analysis, formulation of performance objectives • Content (evolution; content improvement) • Format (staff; students; time tables; syllabus; curriculum; environment) • Infrastructure (hardware systems; language technology language systems) • Pedagogy (evolving instructional design; knowledge modeling; active learning; collaborative learning; autonomous learning)
Instructional Feature	**Educational Level**	**Undergraduate-5,** **Graduate-5** **Post Graduate2**	• Constructivism contends that reality is constructed in mind through social interaction
Interaction Type		**Student Content-2**	**Researcher/Author Conclusions**

		Student-Student-4 **Student-Instructor-3**	• Learner must have interaction with medium in order to have any other interaction • Web-based conferencing can be used as a sound pedagogical construct- a sophisticated, flexible community of learning to integrate what is being learned.
Instructional Design Assessment	**Evidence of Instructor Use**	**Standardized-1** **Subjective-1** **With/without rubrics** **Discussions-1** **Group Work-1**	**Researcher/Author Conclusions**
Course Management Systems **VCampus- 1** **Moodle-2----------** **Sakai-1 ----------** **Blackboard-4-------**	**Commercial CMS-5,1** **Open Source CMS-5, 1** • 1-3 formats :weekly topics, social • Runs on numerous systems. • Template based • Interface intuitive and navigational easy integrated text based, html formats, graphics, video, audio, Ppt, flash-based applications	**Note Delivery** • CMS should be a collection of function-abilities and enable a richer learning experience. It should be a spine and not a supplement to teaching. • The lack of current framework to move learning objects to a course design via a CMS is the challenge	**Researcher/Author Conclusions** • Three-fourths of higher ed. Institutions have adopted a standard CMS system • As of 2003, more than 80% of higher ed. Relies on CMS • Pedagogically, content is one aspect of the learning process. • Electronic learning environments involve group activities and improvement in academic skills.

WebCT-3---------- **ANGEL** **Promethusus** **CLI Virtuoso** **Jensabar** **Manhattan Virtual Classroom**	Bb allows instructor to focus on teaching and interacting—not learning how to program html. Designed to allow institution to extend integration to custom developed and best-of-breed commercial tools, services, hardware, and content to meet consumers' needs. • Loose integration is a bridging interface with a corresponding tool bar icon that enables an open learning space.	System Component • Functionability • Author publishing tools • Virtual community • Data management • VCampus can be set up in a matter of days • Content presentation tools favored by professors • Best ROI is widespread campus use • Reflective course component-11 • Social collegial components • Content course components • Apprehending structure (use Internet services) • Integrating parts (use Internet services and hypertext/hypertext media links on the Web) • Acting on the world • Use feedback Archi will utilize new developments: • Ontology • Domains • Events monitoring • Text searching • National Survey of CMS Utilization	• Students did not perceive video formats to be very popular, as determined by the number of download. The capabilities of students' computers contributed to this low number. • The college is encouraging streaming media to avoid downloading issues. • Streaming allows better ability to decompose the element and Bb analysis. Streaming is view on demand with no download time. • Word document file downloads were prevalent. PDF was competitive with PPT and is about 4 times as compressed. As 80% of all information to the brain is viewed, PDF should be utilized. • Download time impacts student choices. • Need learning objects in a semantic network derived from a pedagogical meta-model • A framework

Archi-2	Technological development and management techniques and procedures are not standardized. There is a need to integrate, to interface and combine prevalent features with courses being less an expression of educators' styles of teaching.	• (random selection of 350 academic department chairs) • Transferability is important: interactive elements, multimedia features, flexible content representation • Archi-very flexible; has a fill in the blanks configuration. • Systems support a big issue for the small number of installed users.	expressing t he relationship between the types of learning objects • Define the structural relationship of the content and the behavior of the learning objects. • The purpose of higher education is agreed upon for this purpose of this article to be understanding of subjects. • No conclusive evidence that departmental utilization of a CMS increased student learning. • CMS flexibility and ease of use now highly refined. • The question is: Are colleges and universities being subjected to a "fleecing" by adopting the CMS at rising costs? • Framework for education engineering, reflected in the design and geared for change is needed---an iterate process for construction and reconstruction combing technology capabilities with content.

Appendix B

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april2005/index.html

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Wilhelm, P., & Wilde, R. (2005). Developing a university course for online delivery based on learning objects: From ideals to compromises. [Electronic version]. *Open Learning, 20*(1), 65-81.

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There are environmental risk factors in regard to cognitive and behavioral health outcomes. The latest research is impacting educational development, cognitive psychology, and cognitive neuroscience investigations. American Medical Association (AMA) recommends further research.

Answering the tough questions about distance ed. (2006, March 1). *Distance Education Report, 10*(5), 7-8.

The ongoing cost of distance education often takes college administrators by surprise, according to Barry Willis. Willis also notes that the resources to meet the financial demands are easy compared to academic content and services.

Arif, A. (2001). Learning from the Web: Are students ready or not? [Electronic version]. *Educational Technology & Society, 4*(4), 32-38.

Academia believes that students have a firm understanding of computer technology. Student evaluations of online courses are held in serious regard at the University of Cape Town (UTC), South Africa.

Barkley, A. (2004). The determinants of college student performance: The role of assessment method. *North American Colleges and Teachers of Agriculture Journal*. Retrieved February 17, 2005, from the Find Articles database.

This article discusses research that examines the influence of the assessment method on student performance. Study conclusions suggest some evidence that assessment methods influence how well students perform in introductory courses.

Basturk, R. (2005). The effectiveness of computer-assisted instruction in teaching introductory statistics. [Electronic version]. *Educational Technology & Society, 8*(2), 170-178.

This is a study to demonstrate the educational advantages of computer-assisted instruction. Reviews and statistics of students with lecture plus computer-assisted instruction compared with students of lecture-only instruction shows that computer- assisted instruction resulted in higher scores.

Berns, S. (2005, December 1). Streaming audio, video level the online playing field. *Distance Education Report, 9*(23), 5-6.

Streaming video and audio provides a better connection and sense of community between faculty and students. Serious Magic's Visual Communicator allows creating a script for online presentations. More information is available at www.seriousmagic.com

Black, L. (2002). Speaking personally with Brian Mueller. [Electronic version]. *The American Journal of Distance Education, 16*(3), 191-196.

Mueller, Executive Vice President and CEO of University of Phoenix Online, states that initially online courses were modeled closely to face-to-face context. The university's goal is to grow the educational pedagogy and technological advances.

Bullen, M. (1998). Participation and critical thinking in online university distance education. *Journal of Distance Education, 13*(2). Retrieved September 6, 2006, from http://cade.athabascau.vol13.2/bullen.html

This article discusses a study on computer conferencing. Conclusions indicate that distance educators consider facilitating interaction and critical thinking to overcome the limitations of correspondence-type distance education.

Business model for online offerings benefits students' program. (2006, March 15). *Distance Education Report, 10*(6), 1, 2 & 8.

Academia at large is resistant to talk of students as "customers" and institutions as "enterprises," but the nature of distance education makes it work best with business-like approaches. A business model assumes that financial incentive be offered to professors, that the distance education site is a "storefront" for student needs, and that competition can lure the university's business to another distance education program.

Butner, B. K., Smith, A. B., & Murray, J. (1999, Fall). Distance technology: A national study of graduate higher education programs. *Online Journal of Distance Learning Administration, 2*(3). Retrieved July 27, 2006, from http://www.westga.edu/~distance/butner23.html

Distance education continually impacts higher education. This article discusses a study examining graduate level distance education delivery methods, funding, faculty workload, and compensation.

Caladine, R. (2003). *New theoretical frameworks of learning activities, learning technologies and a new method of selection*. Unpublished doctoral thesis,

University of Wollongong, Australia, School of Information Technology and Computer Science. Retrieved September 12, 2006, from the Google database.

The Learning Activities Model (LAM) was developed for the design of learning events. It provides a theoretical framework for learning activity analysis and to assist in course design. LAMS subdivide learning events into categories of activities.

The challenge of teaching across generations. (2006, April 1). *Distance Education Report, 10*(7), 5.

Comfortable and supportive learning environment is important for multi-generation students. Some spoon-fed learners have a difficult time in online courses. Group work can create a comfortable working atmosphere and enable students to become more independent learners.

Chee, Y. S., & Hooi, C. M. (2002). C-VISions: Socialized learning through collaborative, virtual, interactive simulations. In *Proceedings of CSCL 2000: Conference on Computer Support for Collaborative Learning*, (pp.687-696). Hillsdale, NJ: Lawrence Erlbaum. Retrieved November 11, 2006, from the Find Articles database.

Improved computers made technology network desktop virtual reality to users and students. Research principles of active learning, experiential learning, and collaborative learning are grounded with constructivist ideas. C-VISions is a virtual environment developed to support such collaborative online learning.

Christiensen, R., & Knezek, G. (2001). Instruments for assessing the impact of technology in education. [Electronic version]. *Computers in the Schools,*

18(2), 5-25.

The authors discuss validated instruments developed to assess integration proficiencies of technology. Beliefs, skills, and competencies are all necessary parts of effective technology integration.

A cold hard look at distance education. (2006, August 1). *Distance Education Report, 10*(15), 1, 2 & 6.

The financial success of distance education programs relies in great part on adjunct instructors who receive relatively low pay and no benefits. Ultimately, accept that online education is expensive and move on.

Comparing online time to offline time: The shocking truth. (2006, May 1). *Distance Education Report, 10*(9), 1, 2, & 6

Professor Joseph Cavanaugh did a self-centered research on the time it took to instruct an online class versus face-to-face. Cavanaugh found that he spent nearly twice as much time on the compatible online course as he did the face-to-face class.

Cooper, L. (n.d.). Online courses: Tips for making them work. Retrieved December 10, 2006, from http://www.usq.edu.au/electpub/e-jist/docs/old/vol3no3/article3/index.htm

Colleges and universities are looking for effective online courses. For any online course and for any course management system, the author suggests constant communication, diverse instruction materials, utilization of online testing, and online course evaluation. Constant effort can create an effective online learning environment.

Course evaluation made simple. (2006, June 15). *Distance Education Report, 10*(12), 1, 2 & 7.

Maryland Online, a consortium of fourteen two-year colleges and five senior institutions, purports a good rubric as a measure for quality assurance in distance education. The second part of Maryland's quality assurance program is peer review teams

Cowan, N. (n.d.). *The magical number 4 in short-term memory: A reconsideration of mental storage capacity.* Manuscript submitted for publication. Retrieved January 5, 2006, from journals.cambridge.org/action/displayAbstract?fromPage=online&aid=8444

"Chunking" is a method whereby people can more readily recall information. Cowan suggests that three to five chunks is a capacity limit, with an average of four chunks working well. The article discusses proposed reasons for limited numbers of information chunks to be effective.

Crosier, J., Cobb, S., & Wilson, J. R. (2002). Key lessons for the design and integration of virtual environments in secondary science. [Electronic version]. *Computers & Education, 38*, 77-94.

The article discusses a three-year research project on virtual environment (VE) used to teach radioactivity. The results suggest three contextual considerations: Facilities/equipment available, intended use in school, and individual learner characteristics.

Crumpton, L. L., & Harden, E. L. (1997). Using virtual reality as a tool to enhance classroom instruction. [Electronic version]. *Computers and Industrial Engineering, 33*(1-2), 217-220.

An excellent tool for educational classroom instruction is virtual reality (VR). For engineering students, it accommodates design development, evaluation, and validation. This article discusses a study exploring the possibilities of using VR in Ergonomics courses.

Davis, A. (2004). The credentials of brain-based learning. [Electronic version]. *Journal of Philosophy of Education, 38*(1), 21-35.

Davis purports that neuroscience can't have "authority" in regard to learning, as many people claim. At this point, Davis suggests that the contribution of brain science to learning is limited.

Diamond, M. C. (1999). What are the determinants of children's academic successes and difficulties? *New Horizons for Learning.* Retrieved November 29, 2006, from http://www.newhorizons.org/neuro/diamond_determinants.htm

What can parents do to encourage dendrite growth and development? Diamond suggests that since more than 80% of a child's time is spent out of school, parents should take on the role of mentors and should seek imaginative toys, fantasy, friends, rich language environment, and exposure to art and music for their children.

Dick, W., Carey, L., & Carey, J. O. (n. d.). *The systematic design of instruction*. Retrieved December 10, 2006, from the Google database.

Dick & Carey discuss instructional design as *teaching*. They recommend a systematic process to design instruction. These authors purport a model with the phases for design, development, implementation, and evaluation

Distance learning faculty liaisons offer advice. (2006, January 1). *Distance Education Report, 10*(1), 1-2.

Steinitz and Orange, users of ANGEL course management system, recommend online faculty restructure documents used in the regular classroom. They recommend an inverted pyramid, going from most important to supporting details. They also recommend blocks of text be smaller and logically divided, use bullets and highlighting, and they discourage underlining as students think it indicates broken links. Steinitz and Orange also recommend interaction and a page for frequently asked questions (FAQ).

Does broadband make a difference? Bandwidth and student performance. (2006, June 1). *Distance Education Report, 10*(11), 8 & 6.

To be successful with online courses, a student must have access to proper technology. The University of Texas conducted a study that determined students with broadband had better learning experiences than dial-up access students.

Duchastel, P., & Turcotte, S. (n. d.). *Online learning and teaching in an information-rich context*. Retrieved November 28, 2006, from Computer Research Institute of Montreal, Canada Web site: http://www.isoc.org/inet96/proceedings/c4/c4_1.htm

Historical evidence of technology increasing learning is disappointing. Duchastel and Turcotte suggest that the more modern information-rich environment is different from early computer technology. These authors suggest that technology is not a panacea for learning, but it can complement more traditional forms of teaching.

Dutton, J., Dutton, M., & Perry, J. (2002). How do online students differ from lecture students? *Journal of Asynchronous Learning Network,* 6(1). Retrieved April 7, 2005, from http://www.alnresearch.org/data_files/articles/full/_text/6_1dutton.htm

This study discusses how online students differ from students in traditional classes. However, the examination of course completion and class performance factor coefficients is the same for both groups.

Ensminger, D., & Surry, D. (2002, April). *Faculty perceptions of factors that facilitate the implementation of online programs*. Paper presented at the 7th Annual Mid-South Instructional Technology Conference, Murfreesboro, TN. Retrieved December 10, 2006, from http://www.mtsu.edu/~itconf/prodeed02/4.htm

Eight conditions facilitate the implementation, according to Ensminger and Surry. The conditions are: dissatisfaction with the status quo, skills and knowledge, adequate resources, rewards/incentives, adequate time, participation, commitment, and leadership. An online survey study was conducted to assess faculty's perceptions of the eight conditions. Results are useful for implementation of online programs.

Forbes, T. J., Buckland, H. T., Cunningham, S., Kunselman, M. M., Wilkinson, J., & Williamson, J. L. (2001, July). Teaching study skills with brain science. *New Horizons for Learning.* Retrieved November 29, 2006, from http://www.newhorizons.org/neuro//forbes.htm

The article reports on the process of teaching about brain science to students with learning disabilities. The goal was to demonstrate how brains are organized differently but remain intelligent for learning.

Genesee, F. (2000, December). Brain research: Implications for second language learning. *ERIC Digest.* Retrieved July 19, 2006, from http://www.cal.org/ericcll/digest/0012brain.html

Even though language learning occurs naturally, language teachers may benefit by understanding how the brain learns. Integrating new brain research with traditional sources of instruction is purported by Genesee.

Greer, M. (2004). Estimating instructional development (ID) time. *Michael Greer's Project Management Resources*. Retrieved December 10, 2006, from http://www.michaelgreer.com/ id-time.htm

Rules of thumb for instructional design time are rarely relevant unless they come from colleagues you know and trust. Simple ratios and rules of thumb are too simplistic to apply to any one particular project.

Guskey, T. R. (1999). Apply time with wisdom. *Journal of Staff Development, 20*(2). Retrieved November 29, 2006, from National Staff Development Council Web site: http://www.nsdc.org/library/publications/jsd/guskey202.cfm

Schools need to allow more time for career development in order to have continual growth and satisfaction of teachers. Educators need more time to overcome the myths they constantly face and wisely use the career development time allotted to them. Constant and continual analysis of programs and ideas must be done to make improvements.

Hakkinen, P. (2002). Challenges for design of computer-based learning environments. [Electronic version]. Abstract obtained from *British Journal of Educational Technology, 33*(4), 461.

Instructional design should occur for the purpose of learning. Instructional design attempts to develop an understanding of the desired learning outcomes. The prescriptive for the Instructional Design Model consists of knowledge, terminology, and procedures.

Hanson, T. L. (2006, March). Effective online instruction for the rhetorical criticism course. *Online Classroom*, 1, 3 & 7.

This author suggests an occasional face-to-face class, if possible; refer to students by name; plan for content progression of difficulty; give prompt feedback; encourage students; and make content relevant to the course.

Heinecke, W. F., Milman, N. B., Washington, L. A., & Blasi, L. (2001). New directions in the evaluation of the effectiveness of educational technology. [Electronic version]. *Computers in the Schools, 18*(2), 97-110.

Recent changes in evaluation theory and practices are discussed in this article. Recommendations are made for evaluating the effectiveness of technology in teaching and learning.

Henke, H. (2001). *Evaluating web-based instructional design*. (Original work published 1997). Retrieved November 3, 2006, from www.chartula.com/evalwbi.pdf

This author's research examines online course design, including mistakes made by course designs. The study suggests a purposefully-designed course is usable and presents fewer difficulties.

Herrington, J., & Oliver, R. (2000). An instructional design framework for authentic learning environments. [Electronic version]. *Educational Technology Research and Development, 48*(3), 23-48.

As instructional technology experiences a philosophical shift from behaviorist to a constructivist, one theory of learning that promotes authentic learning is situated learning. Findings from this study suggest the situated learning framework provides effective instructor design guidelines for a learning environment

Hölmsrom, H., & Jakobsson, M. (2001, January). *Using models in virtual world design.* Paper presented at the 34th Annual Hawaii International Conference on System Sciences. Retrieved August 20, 2006, from the Google database.

Since the internet gives the opportunity to create virtual reality, the need for design and development arise. Actual design models (Lego) are used to emphasize the need to attend to physical design principles and concepts. The authors also discuss the possibilities of virtual worlds for educational purposes.

Huang, H. (2002). Toward constructivism for adult learners in online learning environments. [Electronic version]. *British Journal of Educational Technology, 33*(1), 27-37.

Many online classes are using a constructivist theory to impact online learning for adults. The positive impact of such leads Huang to support a blending of constructivism and adult learning theory.

Huitt, W. (2003). The information processing approach to cognition. *Educational Psychology Interactive.* Retrieved February 5, 2005, from Valdosta (GA) State University Web site: http://chiron.valdosta.edu/whuitt/col/cogysy/infoproc.html

Cognitive psychology is dominant in psychology today. This article discusses various memory principles and theories.

Hurmerinta-Peltomak, L., & Nummela, N. (2006). Mixed methods in international business research: A value-added perspective. [Electronic version]. *Management International Review, 46*(4), 439 (21).

Hurmerinta-Peltomak and Nummela review empirical studies from four major journals to categorize the mixed methods used at varying research stages in order to provide a range of alternative designs for mixing qualitative and quantitative methods.

Improving the college experience: Using effective educational practices. (2001, November). *National Survey of Student Engagement (NSSE) Viewpoint*, 1-6.

Student engagement is a descriptor for collegiate quality. The National Survey of Student Engagement (NSSE) is a means of identifying areas that need attention to improve student engagement.

Irele, M. E. (2005, Summer). Can distance education be mainstreamed? *Online Journal of Distance Learning Administration, 3*(2), 1-17. Retrieved July 27, 2006, from http://www.westga.edu/%7Edistance/ojdla/Summer82/irele82.htm

Mainstreaming is often used to capture distance education's repositioning within traditional universities. Results of a study of written distance education policies in four land grant universities challenge widespread acceptance and integration of distance education into educational mainstream. Results reveal major issues that compromise distance education's capacity to be as mainstream as all relevant areas of university system.

Jackman, D. H., & Swan, M. K. (1996, April). *Instructional models effective in distance education.* Paper presented at the Annual Meeting of the American Educational Research Association, New York, NY. Retrieved December 22, 2006, from the Find Articles database.

Instructional models of Joyce, Weil, and Showers were studied to determine which models could be effectively used in distance education via the Interactive Video Network system in North Dakota. Results indicated role playing, simulation, jurisprudential, memorization, synectics, and inquiry to be the most effective instructional

Johnson, J. L. (2004, February 15). Distance education: The complete guide to design, delivery, and improvement. *Distance Education Report, 8*(4), 8.

This article discusses the roots of distance education to the Roman Empire. It also addresses the pedagogical concerns of online faculty and concludes with case studies in distance education.

Johnson, S. D., Aragon, S. R., Shaik, N., & Palma-Rivas, N. (2000). Comparative analysis of learner satisfaction and learning outcomes in online and face-to-face

learning environments. [Electronic version]. *Journal of Interactive Learning Research, 11*(1), 29-49.

A study comparing graduate online courses to equivalent face-to-face courses that shows student ratings of both instructor and course, and course interaction, structure, and support. Results indicate that face-to-face students have a slightly more positive perception of instructors and course quality, although no difference in learning outcomes.

Johnston, J., Killion, J., & Oomen, J. (2005, April). Student satisfaction in the virtual classroom. *The Internet Journal of Allied Health Sciences and Practice, 3*(2).

This article examines factors in online student satisfaction. Results indicate that flexibility, feedback, instructor presence, student-student interaction, and course orientation are extremely important.

Jorgenson, H. (2003, December 15). Evaluate & improve distance programs with Sloan-C's five pillars of quality. *Distance Education Report, 7*(24), 1-3.

The Sloan Consortium's (Sloan-C's) five pillars of quality, affordable education include: 1) learning effectiveness, 2) cost effectiveness, 3) access, 4) faculty satisfaction, and 5) student satisfaction. The pillars allow examination of a program from five perspectives and allow examination of how each area affects another.

Kalawsky, R. S., Bee, S. T., & Nee, S. P. (1999). Human factors evaluation techniques to aid understanding of virtual interfaces. [Electronic version]. *BT Technology Journal, 17*(1), 128-141.

This article discusses the availability and use of virtual reality technology, and the users. Kalawsky, Bee, and Nee attempt to provide an introduction to virtual environment assessment, a reference for interface designers and for researchers engaged in similar studies.

Kashmanian, K. (2000). The impact of computers on schools: Two authors, two perspectives. *The Technology Source Archives at the University of North Carolina*. Retrieved November 29, 2006, from http://technologysource.org/article/impact_of_computers_on_schools/

Tapscott and Healy are two contemporary authors speaking to the issue of technology uses. Tapscott encourages the use of technology, while Healy has reservations about the use/misuse of technology with very young children.

Katz, Y. J. (2000). Attitudes affecting college students' preferences for distance learning. [Electronic version]. *Journal for Computer Assisted Learning, 18*, 2-9.

Specific psychological attitudes of students toward using information and communication technology are exceedingly important in evaluation of the effectiveness of learning and instruction through distance learning. From these attitudes, student satisfaction with learning, control of learning process, and study motivation of distance learning are related.

King, J. W., Nugent, G. C., Russell, E., Eich, J., & Lacy, D. D. (2000, June*).* Policy frameworks for distance education: Implications for decision makers. *Online Journal of Distance Learning Administration, 3*(2.). Retrieved December 10, 2006, from http://www.westga.edu/~distance/king32.hmtl

Distance education designers and managers have the on-going challenge of planning comprehensively for the present and future. These authors suggest developing policies in weak areas first and assure transition from random courses to full programs in distance education.

Kneale, B., & Box, I. (2003, June). *A virtual learning environment for real-world networking*. Retrieved January 3, 2006, from the Find Article database.

The virtual learning environment Velnet is a learning network. For authentic learning, Velnet is comprised of existing hardware and software on a stand-alone machine. Velnet is a simulation to teaching of computer networking at the University of Western Sydney, Australia.

Kobayashi, N. (2004). Brain science and education. *New Horizons for Learning.* Retrieved November 29, 2006, from http://www.newhorizons.org/neuro/kobayashi.htm

Brain imaging makes it possible to locate the active part of the brain. Reports indicate that brain function imaging methods are progressing rapidly. Kobayashi advocates applying results of brain science research to improving education as a social technology.

Leonard, S. (n. d.). Creativity and innovation: Do leaders really want, need "out of the box" thinking? *Leonard Consulting* Web site. Retrieved July 19, 2006, from http://leonardconsulting.com/OutofBox.htm

Kirton proposes two types of thinkers in regard to problem solving. Adaptive style conforms, is cautious, and desires stability. The innovative style takes risks, challenges assumptions, and doesn't readily accept problems as problems.

Leonard, S. (n. d.). Whole brain teaching and learning. *Leonard Consulting* Web site. Retrieved July 19, 2006, from http://www.leonardconsulting.com/hole%20Brain%20Learning2.htm

Herrman's Brain Dominance theory and instruments concepts are discussed, along with his Whole Brain model. This model can be used to construct learning experiences, enhance learning, and make it more memorable.

Levin, S. R., Waddoups, G. L., Levin, J., Buell, J. (2001, January). Highly interactive and effective online learning environments for teacher profession development. *International Journal of Educational Technology, 2*(2). Retrieved January 3, 2006, from http://smi.curtin.edu.au/ijet/v2n2/slevin/

This article identifies five dimensions that can contribute to effective online learning. They are: 1) relevant and challenging assignments, 2) coordinated learning environments, 3) adequate and timely feedback from instructors, 4) rich environments for student-to-student interaction, and 5) flexibility in teaching and learning.

Levine, M. (2002, September). Learning differences: Misunderstood minds. *New Horizons for Learning.* Retrieved November 29, 2006, from http://www.newhorizons.org/neuro/levine.htm

Learning differences puzzle and plague people all over the world. The non-profit Institute *All Kinds of Minds* provides teachers and families the latest information in neurodevelopment research and learning differences management

Lewis, R. (1997). How to write flexible learning materials. *The World Bank Global Distance EducatioNet.* Retrieved October 30, 2006, from

http://www.1.worldbank.org/disted/teaching/Design/str-02.html

The author discusses tips on writing for the development of course materials. Lewis purports simplicity, directness, visuals, and examples.

Listening to the unheard voices of distance education. (2006, May 15). *Distance Education Report, 10*(10), 4 & 7.

The University of Nebraska – Lincoln is making a concerted effort to remove isolation of and between faculty, staff, and administration. The main objective was to initiate a "user's group" without evolving into griping sessions.

Lobel, M., Neubauer, M., & Swedburg, R. (2005, July). Selected topics from a matched study between face-to-face selection and a real-time online section of a university course. *International Review of Research in Open and Distance Learning*. Retrieved October 2, 2006, from Athabasca University Web site: file://D:\Lobel (2005) [Sociogram analysis].htm

In a study conducted to compare/contrast two interpersonal skills-building university courses, it was concluded that students in online courses were more likely to participate and express themselves versus face-to-face classroom students. This was believed to be due to online students having more time to gather and express thoughts.

Lorenzetti, J. P. (2003, November 1). Thirty-two distance education trends. *Distance Education Report, 7*(21), 1, 2 & 6.

Demographic data and articles reveal trends in distance education. Analyzing recent articles, Williams synthesizes some of the following trends: 1) Instruction is becoming more learner-centered and self-directed. 2) There is a growing

emphasis on academic accountability. 3) Higher education outsourcing and partnerships are increasing. Some advocate standardizing content by means of "learning objects."

Lorenzetti, J. P. (2004, January, 15). Faculty peer review: A rubric for the online classroom. *Distance Education Report, 8*(2), 8.

The online faculty can't be assessed by traditional means. A peer review rubric is proposed to guide course design and successful online instructors. Such a rubric can serve as a roadmap for success without getting caught up in technological bells and whistles.

Lorenzetti, J. P. (2004, February 1). Open source: Pros and cons for program administrators. *Distance Education Report, 8*(3), 8.

Open source can be used "as is" or customized. Open source usage is likely to begin in limited populations. If institutions are willing to consider open source, it is often cost beneficial.

Lorenzetti, J. P. (2006, January15). Choose a better learning management system, and the campus will beat a path to your door. *Distance Education Report, 10*(2), 1, 2, & 8.

Learning management systems require serious consideration for university online courses. Cost, support, management, and system features are all to be considered. Lorenzetti notes Shapiro (St. Petersburg College, FL) as recommending adequate time to make LMS selection for any learning institution.

Lorenzetti, J. P. (2006, March 15). Course evaluation project is model for content assessment. *Distance Education Report, 10*(6), 7-8.

The California-based Monterey Institute for Technology and Education created the Online Course Evaluation Project (OCEP). OCEP's focus is to assess online content and how to make it more engaging. Some course evaluations are available at www.edutools.info.

Lorenzetti, J. P. (2006, June 15). Five simple rules for creating e-learning with a small team. *Distance Education Report, 10*(12), 5 & 8.

The Savannah (GA) College of Art and Design uses five rules for creating e-learning programs. They are as follows: 1) Know what you want. 2) Use your subject matter wisely. 3) Provide a course road map and rules of the road. 4) Describe roles, not jobs. 5) Produce for reuse.

Lorenzetti, J. P. (2006, July 1). Meeting the challenge of intellectual property with an IP protocol. *Distance Education Report, 10*(13), 4-5.

The University System of Georgia has made impressive progress with eCore, a set of 25 online courses that can be used to craft the first two years of undergraduate work. Faculty has the responsibility of academic integrity in this program and is urged to assess intellectual property rights as they develop the course.

Lorenzetti, J. P. (2006, August 15). Growing by degrees: Four things you must know about the condition of online education. *Distance Education Report, 10*(16), 4 & 6.

Online education has reached a level of maturity but continues to have challenges. One primary challenge is those faculties have not fully accepted the value of online education.

Make the most of your content dollars - Access the national repository. (2006, July 15). *Distance Education Report, 10*(14), 1, 2 & 6.

The Monterey Institute for Technology and Education strives to provide a highly reputable national repository of online courses. The goal is to provide faculty a place to find resources and courses for distance education.

McAndrew, P., Weller, M., & Barrett-Baxendale, M. (2006). Learning design and service-oriented architectures: A mutual dependency? [Electronic version]. *Journal of Learning Design, 1*(3), 51-60.

The concept of reusability and interoperability is becoming more prevalent in distance education. The authors note that work should continue in affordances of software and how user interactions with a system can be impacted by subtle interface differences.

McLeod, G. (2002). *The inspired enterprise architecture frameworks*. Retrieved July 2, 2006, from www.inspired.org/InspiredFrameworksWhitePaper.pdf

The Archi knowledge management tool is discussed as a component of the Enterprise Architecture of scope, enterprise model, system model, technology model, components, and functioning systems. Other components discussed are the architecture framework (interfaces and standards), criteria, and processes to using the Enterprise Architecture.

Mills, K. (2006). Discovering design possibilities through a demagogy of multiliteracies. [Electronic version]. *Journal of Learning Design, 1*(3), 61-72.

Mills notes that today's communication is rapid, emergent, and must be meaningful. Key findings indicate an ethnography concerning pedagogical

interactions and access to multiliteracies among diverse learners. Situated practice and overt instruction can yield positive results for diverse learners.

Neale, H., & Nichols, S. (2001). Theme-based content analysis: A flexible method for virtual environment evaluation. [Electronic version]. *International Journal of Human-Computer Studies, 55*, 167-189.

The article presents a qualitative method of gathering detailed information and growing data into meaningful categories. Some of the data collection methods discussed are short interview, open-ended questionnaires, and observations. These methods can be utilized in a number of different circumstances.

Newman, D. R., Webb, B., & Cochrane, C. (n. d.). *A content analysis method to measure critical thinking face-to-face and computer supported group learning.* Retrieved September 23, 2006, from Belfast: Queen's University, Information Management Department Web site: http://www/qub.ac.uk/mgt/papers/methods/contpap.html

A detailed account of analysis methods used to measure critical thinking during group learning by comparing face-to-face with computer conference learning. A student questionnaire and content analysis mentioned above were developed from Garrison's 5 stages of critical thinking and Henri's cognitive skills.

Offir, B., Lev, Y., Lev, Y., & Barth, I. (2001). Using interaction content analysis instruments to assess distance learning. [Electronic version]. *Computers in the Schools, 18*(2), 27-41.

Distance education instructors who are aware of how their teaching behaviors impact learning behaviors assist in overcoming distance limitations. Results of this study suggest that distance teachers make most frequent use of procedural,

expository, and explanatory interactions and that training in effective teacher interaction can increase the teachers' use of varying interactions.

Oliver, M. (2000). An introduction to the evaluation of learning technology. *Educational Technology & Society, 3*(4). Retrieved October 2, 2006, from file://D:\Oliver (2000) [An introduction_to_the_Evaluation_of_Learnin.htm

This article presents a context for analyzing the complexities of evaluation by summarizing important debates from the wider evaluation community. These are related to a context of learning technologies. This results in the identification of a range of specific issues given as paradigm debate, authenticity or the role of checklists.

Open University applies Moodle on grand scale. (2005, December 15). *Distance Education Report, 9*(24), 3 & 6.

Britain's Open University spent over $8 million to build a comprehensive online program using Moodle. This course management system makes development and other functions uniformly simple. Moodle runs for Unix, Linux, FreeBSD, Windows, Mac OSX, Netware and any other systems that support PHP, including most Web host providers.

Overcoming facelessness in the online classroom. (2006, February 1). *Distance Education Report, 10*(3), 4 & 7.

Most students like online convenience but miss face-to-face interaction. Online faculty can create an online presence by using icebreakers, personal and professional information, creating a homepage, log in every day, and create an

announcement each week. Encouraging students to answer other students' questions is another way to provide feedback and interaction.

Parchoma, G. (2003). Learner-centered instructional design and development: Two examples of success. [Electronic version]. *Journal of Distance Education, 18*(2), 35-60.

Dropout numbers in online courses are higher than traditional courses. A comparative analysis of learner evaluations illustrates the benefits of learner-centered development and delivery.

Parsons, S., Beardon, L., Neale, H. R., Reynard, G., Eastgate, J. R., Wilson, J., et al. (2000). *Development of social skills amongst adults with Asperger's Syndrome using virtual environments: The 'AS interactive' project*. Paper presented at the 3rd International Conference Disability, Virtual Reality & Assoc. Tech., Alghero, Italy.

People with Asperger's Syndrome (AS) are significantly impaired in social understanding. Virtual environments are ideal methods for social training skills because they are user-centered by design and enhance social skills.

Peraya, P., & Haessig, C. (1994). Course development process: Design and production of teaching material at the Fern Universitaet and the Open Universiteit. *Journal of Distance Education*. Retrieved from the Google database.

This article presents information from a comparative study on the design of online teaching materials in two European distance education universities. The results indicate a difference in the design and delivery of teaching materials. Results

indicate that one university formulated coherent theoretically-based materials, while the other university used a more pragmatic, less formal methodology.

Plass, J. L., & Salisbury, M. W. (2002). A living-systems design model for web-based knowledge management systems. [Electronic version]. *ETR&D, 50*(1), 35-57.

Most current instructional design models were based on the concept of stability over time. A knowledge management system designed to accommodate continuous change has been a problem. A living-systems approach is based on the need to design an ever-changing model.

Pogglo, T., Rifkin, R., Mukherjee, S., & Niyogi, P. (2004, March 25). General conditions for predictivity in learning theory. [Electronic version]. *Nature, 428*, 419-422.

Theoretical foundations are key towards understanding intelligence. Learning theory based on stability suggests more direct connections with cognitive properties of the brain's physiological functions.

Proctor, R. M. J., Watson, G., & Finger, G. (2003). Measuring information and communication technology (ICT) curriculum integration. [Electronic version]. *Computers in the Schools, 20*(4), 67-87.

Information and Communication Technology (ICT) standardized literacy and numeracy test are less than reflective of ICT's full impact. This paper discusses the development and initial validation of a new ICT instrument based on Productive Pedagogies framework. It is a methodology for validity and reliability measuring ICT impact as integrated into classrooms.

Reynolds, J., & Werner, S. C. (2002). *An alternative paradigm for college reading and study skill courses*. (Original work published 1993). Retrieved February 5, 2005, from Northern Virginia Community College Web site: http://www.nv.cc.va.us/home/nvreynj/papers/ltlaltpd.htm

A learner-centered paradigm is supported by Reynolds and Werner. College students need a philosophical perspective that recognizes unique learning styles and patterns and one that examines reading and writing strengths and weaknesses, according to these authors.

A roadmap for training instructional designers. (2006, April 15). *Distance Education Report, 10*(8), 3 & 7.

The American Distance Education Consortium and other professional associates collaborated for instruction designer competencies. Some of those were advanced interaction methods, delivery strategies, and planning and conducting evaluations.

Rohse, S., & Anderson. T. (2006). Design patterns for complex learning. [Electronic version]. *Journal of Learning Design, 1*(3), 82-91.

Learning cannot be predetermined by teaching but is defined by circumstances and the context of learning objectives. Uncertain learning designs are dynamic and innovative. Architect Alexander's patterns and patterned language offers a means to support complex learning design.

Rose, F. D., Brooks, B. M., & Attree, E. A. (2000). *Virtual reality in vocational training of people with learning disabilities*. Paper presented at the 3rd Intl. Conf. Disability, Virtual Reality & Assoc. Tech., Alghero, Italy. In virtual environments used with people with learning disabilities in vocational training,

the results indicate better transfer to real world and justification for further development in virtual environments.

Rose, S. W.(2003). The relationship between Glasser's quality school concept and brain-based theory. [Electronic version]. *International Journal of Reality Therapy, 22*(2), 52-56. Areas of congruence between research on brain-based learning and the Glasser approach are emotion in learning, the need for novelty, the need for student choice, and the intellectual ability of the learner.

Rover, D. (2004). Learner-centered assessment: Asking the right questions. [Review of the book *Learner-Centered Assessment on College Campuses: Shifting the Focus from Teaching to Learning*]. *Journal of Engineering Education*. Retrieved February 17, 2005, from the Find Articles database.

Asking questions about what should be taught is not as productive as asking questions about what is to be learned and what can be done to make learning occur. *Learner-Centered Assessment on College Campuses: Shifting the Focus from Teaching to Learning* by Huba and Freed is a practical guide for assessing student learning.

Rubric clearly describes exemplary online instruction. (2002, December 1). *Distance Education Report, 6*(12), 5.

In 2002, California State University-Chico began to develop a rubric (designed to use with Web CT) for determining the quality of online instruction. The goal was to evaluate online courses, self-evaluation for the instructors, and course development.

Rutter, T. (2001). Mindful of students' brains: An interview with Eric Jensen. *Brain Connection, 166*(1). Retrieved November 30, 2006, from http://www.brainconnection.com/content/166_1/printable

The interview relates how a middle/high school teacher (Eric Jensen) participated in a workshop that changed his career. The workshop focused on ideas for educating young people based on information about how the brain works. Jensen co-founded an experimental academic enrichment program for teens called "SuperCamp." He later created the Jansen Learning Corporation., which focuses on the science of teaching and learning for language educators.

Ryder, M. (2006). Instructional design models. Retrieved November 21, 2006, from Denver: University of Colorado, Department of Education Web site: http://carbon.cudenver.edu/~myrder/ite_data/idmodels.html

An instructional design model gives structure to design and the challenges therein. Design models enable a visualization of problems and a way to work in manageable units. Models should be judged based upon how well they are able to function as the designers intended.

Schieman, E., Teare, S., McLaren, J. (1992). Towards a course development model for graduate level distance education. *Journal of Distance Education*. Retrieved October 26, 2006, from http://www.cade.athabascau.cu./vol7.2/09_schieman_et_al_119.html

Instructional designers agree that practices can be theory-based. Results from the University of Calgory indicate positive outcomes.

Schifter, C. (2000, Spring). Compensation models in distance education. *Online Journal of Distance Learning Administration, 3*(1). Retrieved November 22, 2006, from the Google database.

Faculty believes that teaching a distance education course is more challenging than traditional teaching. Distance education programs are a major topic in education news media, meetings, and conventions. It would be worthwhile to know what motivates teaching programs, but there hasn't been much research into the topic.

Schneider, T. M., Wantz, R. A., Rice, T., & Long, J. A. (n. d.). Components and implications of distance learning in counselor education. *Journal of Technology in Counseling.,* 4(1). Retrieved December 10, 2006, from http://jtc.colstate.edu/Vol14_/Wantz/Wantz.htm

Of the graduate counselor education programs surveyed, over 50% offer online courses. Schneider, Wantz, Rice, and Long suggest continued training in distance learning for instructors and students. These authors suggest research to construct universal proficiency standards for distance education participants.

7 ways to improve student satisfaction in online courses. (2006, May). *Online Classroom, 1-2.*

Pierce College requires a one credit hour course of all students to acclimate them to online courses. This course is similar to traditional college success/study skills courses.

Selwyn, N. (2003). Apart from technology: Understanding people's non-use of information and communication technologies in everyday life. [Electronic version]. *Technology in Society, 25*, 99-115.

Of the graduate counselor education programs surveyed, over 50% offer online courses. Schneider, Wantz, Rice, and Long suggest continued training in distance learning for instructors and students. These authors suggest research to construct universal proficiency standards for distance education participants.

Shelton, K., & Saltsman, G. (2006, August). Faculty issues in online education. Review of the book *An Administrator's Guide to Online Education*. Retrieved October 21, 2006, from www.universitybusiness.com

An Administrator's Guide to Online Education is considered by Shelton and Saltsman as a useful source in higher education. The book focuses on distance education theory, best practices, current research, and a current literature review.

Sheppard, S. (1998). A model for peer and student involvement in formative course assessment. *Journal of Engineering Education*. Retrieved February 17, 2005, from the Find Articles database.

In the 1990s, Peer Review teaching was implemented to establish an institutionalized, collaborative teaching atmosphere. The methodology used is based on seven issues of effective teaching, self-reflection, and interviews. These ideas eventually developed into the ME-PEER project

Stame, N. (2004). Theory-based evaluation and types of complexity. [Electronic version]. Abstract obtained from *Evaluation, 10*(1), 58-76. Theoretically based evaluations

for higher education have opened the way for a “theory of change” approach to evaluation considering the complexity of integrated and comprehensive programs.

Teaching the teachers to use technology and assessment. (2006, February 15). *Distance Education Report, 10*(4), 4 & 6.

The faculty development workshop of Georgia College and State University was designed to train teachers in technology and assessment. Training is for online and traditional faculty. The training is based on teaching philosophy and encourages a culture of assessment. The model has four steps: 1) Determine goals and outcomes. 2) Identify assessment tools to evaluate outcomes. 3) Design activities to practice. 4) Use assessment data to inform/affirm teaching.

Terzi, S., & Celik, A. (2003). *Teacher-student interactions in distance learning*. Paper presented at the International Education Technology Conference and Fair, North Cyprus, Turkey.

With rapid growth of distance learning, teacher goals, educational goals, and student learning must be evaluated. A study was conducted to show the importance of teacher-student interaction. This improves knowledge and aptitude in isolated environments.

Theory-driven motivation study aims to assist retention. (2002, November 15). *Distance Education Report, 6*(22), 5-6.

Retention methods generally include discussions pertaining to the affective impact on the student. Jamison suggests student motivation as a predictor of completion rates. Using motivational predictors, the online instructor could know more about students and the reasons they are taking particular classes.

Thorne, G., Thomas, A., & Lawson, C. (2005). 15 strategies for managing attention problems. *Center for Development & Learning.* Retrieved November 29, 2006, from the Google database. Strategies to maintain students with attention problems should be creative and offer multiple methods of instruction, delivery, and student engagement.

To Be Intelligent. (n. d.). (Original work published 1997). *21st Century Learning Initiative.* Retrieved November 30, 2006, from http://www.21learn.org/publ.edleadership1997.html

The author suggests that the capacity for self-organization is more valued and that the brain does not have to be taught. With new research and new understanding about the brain, people are in a better position to become better learners.

University of Illinois searches for a universal platform. (2003, January 1). *Distance Education Report, 7*(1), 5. The University of Illinois-Champaign-Urbana is determining, as of 2003, which course management system to use as a universal platform for online courses. At the time of publication, the university was debating between Blackboard and Web CT. Blackboard's well-organized Building Blocks offer more variety than Web CT, but Web CT features tighter, more sophisticated tools.

Using blogging tools to streamline course revisions. (2003, November 15). *Distance Education Report, 7*(22), 5. Distance education course quality suffers when instructors choose not to update online courses or when updating is inconsistent. A blogging system is used in the Athabasca University's Centre for Distance

Education to update efficiently and without risk of irreparable damage to the course.

Wernemyr, C., Westerdahl, B., Roupe, M., Suneson, K., Allwood C. M. (2003). *Users' experience of a virtual reality architectural model compared with users' experience of the completed building*. Paper presented at the 1st International Conference on Advanced Research in Virtual and Rapid Prototyping, Goteborg, Sweden. Retrieved October 17, 2996, from the Find Articles database. Experiments using a virtual reality office building used to demonstrate and teach employees about a new worksite compared well with the real building. The employees' reactions were more positive after realizing the actual building was well-represented in the virtual experiment.

What brain research tells us about learning. (1996, Summer). *Wingspread Journal*. Retrieved November 30, 2006, from The Johnson Foundation Wingspread Conference Center Web site: http://www.johnsonfdn.org/summer96/connect.html\ This article discusses new theories on how the brain learns and the implications of this knowledge. Renate and Geoffrey Caine, authors of *Making Connections: What Brain Research Tells Us About Learning,* are leaders in synthesizing new brain research. The Caines purport application of brain research to development in multiple fields. The Caines are the developers of the twelve brain principles.

Why brain-based learning for the calcium challenge? (n. d.). Retrieved November 29, 2006, from Cabot Calcium Crisis Challenge Web site: http://www.calciumcrisischallenge.com/brain-based.html

Students learn best when they have the correct amounts of sleep, exercise, nutrition, and hydration. Students can be categorized as Hands On, Audio, or Visual Learners. By contribution to these, teachers can allow for uninhibited brain processes to occur and therefore increase learning.

M. Simonson (Ed.), *Proceedings of selected research and development presentations*. Washington, D.C.: Association for Educational Communications and Technology. Retrieved November 30, 2006, from University of Colorado at Denver Web site: http://carbon.cuden.edu/ ~bwilson/sitid.html

Course implementation and design are inseparable. Real-world implementation can be as important as a theoretically-based design. Wilson purports that a constructivist or situated approach to course design takes old ideas and gives new impetus to them.

Winstead, L. (2004). Increasing academic motivation and cognition in reading, writing, and mathematics: Meaning-making strategies. [Electronic version]. *Educational Research Quarterly, 28*(2), 30-49.

The cognitive approach is learner-centered and guided by a teacher facilitator. Cognitive approaches include cooperative learning, reciprocal teaching, cognitive apprenticeship, and anchored instruction.

Young, S. S.-C. (2004). In search of online pedagogical models: Investigating a paradigm change in teaching through the *School for All* community. [Electronic version]. *Journal of Computer Assisted Learning, 20*, 133-150.

This article discusses a study examining the online instructor role and possible pedagogical models. Potential models and characteristics of exceptional online instructors are examined.