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# Critical Thinking and Analyzing Assumptions in Instructional Technology

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# CRITICAL THINKING AND ANALYZING ASSUMPTIONS IN INSTRUCTIONAL TECHNOLOGY

by

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# ABSTRACT

## CRITICAL THINKING AND ANALYZING ASSUMPTIONS IN INSTRUCTIONAL TECHNOLOGY

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In the field of instructional technology critical thinking is valued both as a practice for those in the field and as a skill or habit to teach and measure. However, traditional conceptions of critical thinking are limited in their usefulness and restricted to particular kinds of thinking and reasoning. Conceptions of critical thinking in instructional technology are dominated by these traditional perspectives. Missing is a substantive dialogue on the nature of critical thinking. despite the fact that such dialogue is a part of critical thinking scholarship outside of instructional technology. One of the primary limitations of traditional critical thinking is the failure to emphasize the recognition and analysis of underlying assumptions. Assumptions underlie every theory and practice in any field of discipline. Critical thinking itself cannot be practiced without the influence of assumptions, both acknowledged and implicit. In order for a critical

thinking approach to facilitate analysis of assumptions it must be sensitive to the characteristics of assumptions and the roles assumptions play in everyday life.

For this thesis, I propose a model of critical thinking that involves principles and practices that aid the professional in recognizing and evaluating assumptions, revising assumptions when needed, and adapting practices to align with assumptions. Such critical thinking in instructional technology has the potential to improve the practice of current theories, advance theories in the future, and guide practitioners in decision-making.

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# Introduction

Instructional technology has been influenced by innovative work within numerous scholarly fields, foremost among those being psychology, technology, education, and philosophy. The diversity of influences on the field, and the rapid pace of intellectual and technological change in general, have brought with them a proliferation of promising ideas, theories, and practices to draw upon in the work of designing instruction. Underlying each of those theories and practices are assumptions. Those assumptions not only guide the formation of theories and practices, but also lead scholars and practitioners in a direction that is informed by those assumptions. For this reason, critical thinking about assumptions is an important endeavor. As I will argue, such analysis of assumptions allows members of the field of instructional technology to more effectively implement chosen theories and practices by carefully considering the implications of assumptions. Furthermore, by recognizing existing assumptions and implications and considering alternative assumptions with different implications, scholars and practitioners can engage in the work of revising or replacing assumptions as they see the need to, thereby seeking continual improvement of theories and practices. In this thesis, I focus on the role of critical thinking in the field of instructional technology and, more particularly, the analysis of assumptions as a key aspect of work in the field. I argue that the field of instructional technology must consider new conceptions of critical thinking in order for critical thinking itself to play a useful role in the development of the field.

*Critical Thinking and Assumptions*

The importance of critical thinking and its contribution to scholarly and practical work is so commonly accepted that few if any would question its relevance. Educators and scholars across disciplines often refer to the need to foster critical thinking in students (Case, 2005; Paul, Martin & Adamson, 1989), faculty (Zeigler, 1995), and professionals (Porta & Dhawan, 2006; Schumm, Webb, Turek, Jones & Ballard, 2006). While the need for critical thinking might be accepted almost without question, there are other questions that need to be asked about this often taken-for-granted educational activity. For many decades the common perception of critical thinking centered on methods of science and logic-guided work in teaching and measuring critical thinking. These views were soon supplemented by an informal logic movement which came to be the generally accepted view of critical thinking. Recently scholars have begun to challenge what they perceive as the traditional, dominant trends and definitions of critical thinking. These debates have enriched the thinking and scholarship of the critical thinking movement; however, they have not significantly influenced the work related to critical thinking in many disciplines, including instructional technology.

Often overlooked are the issues raised by critical thinking scholars outside of the field of instructional technology that could enrich the field's understanding and use of critical thinking. Among these issues are questions about what thinking is, what role it plays in a person's experiences, and how critical thinking can be encouraged given these alternative views. Of particular interest is that aspect of critical thinking that can help students and scholars critically examine the theories and practices of the field by

recognizing and analyzing the assumptions of instructional technology as well as their own personal assumptions.

An *assumption* is an idea or proposition that is thought to be true and often taken for granted (Yanchar & Slife, 2004). Assumptions are a fundamental part of the human experience. People make assumptions in their work as well as in their everyday decisions and interactions. Some scholars have persuasively argued that assumptions inevitably underlie the way people see things and perform their work (Brookfield, 1987; Yinger, 1980), even when people are not aware of these background beliefs (Kagan, 1992; Slife & Williams, 1995; Yanchar & Slife, 2004). In this sense, assumptions are enabling, rather than limiting; they are what actually allow for the possibility of activity, decisions, and so forth. From this perspective, it is impossible to theorize or to practice in the field without assumptions to guide one's work; assumptions are inevitable and shape an individual's activity at every step.

I propose a model of critical thinking for the field of instructional technology that can help scholars and professionals (a) critically examine assumptions underlying the theories and practices of the field and (b) become aware of and evaluate their own theoretical assumptions and the implications of those assumptions in their own work. Recognizing assumptions and their implications can be helpful in two general ways. First, scholars and students can perform critical assessment of the theories, ideas, and practices currently available in the field, as well as those ideas and practices that will continue to be introduced in the future. Second, as scholars move toward formulating their own theories, ideas, and practices, they can critically examine their work to uncover any unstated assumptions they might be making. Additionally, scholars who have carefully

examined their own assumptions may develop new ideas and practices by considering the implications of those assumptions and how they might influence practice. Critical thinking for this purpose, then, becomes a way to better understand theories and practices as well as a way to guide thinking in the development of new theories and practices.

In this thesis I follow these steps: First I review the literature on critical thinking and discuss the state of the critical thinking today, including traditional approaches as well as critiques of those approaches and recommendations for new ways of approaching this important practical and scholarly activity. I also review the literature that discusses analysis of assumptions as an important part of critical thinking. Then I examine the literature in the field of instructional technology to consider how critical thinking and assumption analysis are approached in the field. Based on my review of the literature, I describe a model for critical thinking that focuses first and foremost on assumption analysis. Such a model is intended to expand the way critical thinking is approached in instructional technology and to facilitate the work of analyzing assumptions by students and practitioners in the field. Finally, I demonstrate the tenets of my critical thinking model by critically analyzing the assumptions of a common platform and topic in instructional technology; I have chosen the topic of web-based instruction as the context for this demonstration.

### *Situating this Project*

Before I begin a more detailed review of the literature, I would like to clarify some terms. In doing so, I situate the work that follows.

*The meaning of critical thinking.* The term *critical thinking* is often used casually and thus may have different meanings for different people. In this thesis I demonstrate

the diversity of views regarding the meaning of critical thinking. Commonly critical thinking is defined broadly as thought activity directed toward understanding something (Ennis, 1987; Facione, 1990; Halpern, 1998; Siegel, 1988). Later, I elaborate on this definition, showing nuance to different definitions and I eventually demonstrate that this common definition is not adequate because it doesn't deal with important aspects of critical thinking.

Critical thinking is a transdisciplinary area of endeavor in which a cross section of people from various disciplines are contributing and advancing scholarly work and literature. I will sometimes use the term *field of critical thinking* when I am referring to this transdisciplinary meta-field.

*Critical thinking vs. critical theory.* The term *critical thinking* should not be confused with *critical theory*. *Critical theory* is a theoretical approach that views conflicts of groups (e.g. race, class, gender) and the oppression of groups as the primary source of problems in society (Crotty, 1998). Critical theorists' objective is often to give voice to underrepresented or oppressed groups through various methods of research, practice, and critique. The works of Habbermas (1991), Horkheimer (2002), and Freire (2000) are recognized as foundational works for contemporary critical theory. This form of critical theory has been advocated in instructional technology, most notably, for example, in the 1st edition of the *Handbook of Research for Educational Communications and Technology* (Jonassen, 1996). In their chapter, Nichols and Allen-Brown (1996) describe how critical theorists critique educational technology for issues such as the way technologies can be used to perpetuate class oppression and the ways traditional views of science limit analysis and research in the field of educational technology. They suggest

that scholars in the field of educational technology should use research methods that avoid the deficits of scientific approaches such as action research. They further recommend that educational technologists should be engaged with how their work relates to social justice and relationships in society through issues such as feminism, race, capitalism, the military, politics, ethics, and ecology. This approach is representative of critical theory because of the criticisms of the forces and mechanisms in instructional technology that perpetuate certain power structures.

*Critical thinking*, as I use the term should not be equated with *critical theory*, although critical theory does engage in its own form of critical thinking and analysis. Most scholars use the term *critical thinking* more broadly, to refer to some type of thought activity for analyzing any number of topics. Indeed, the broad use of the term is what allows for the diversity in definitions that exists. Some use *critical thinking*, for example, to refer to the activity of analyzing research design to see how carefully it adheres to scientific method (Meltzoff, 1998). Others use the term to describe the activity of analyzing and evaluating what one sees (Lacy, 1987). Others use *critical thinking* to refer to reflection and reasoning (Ennis, 1985). These examples, which come from diverse domains, have something in common. Most definitions of *critical thinking* tend to focus on thought activity directed at evaluating something. In this broad sense then, critical thinking is also employed in the practice of critical theory; critical theorists are thinking carefully about a given topic to evaluate it. However, what sets critical theory apart is the focus on the power structures and oppression in society. In fact, some scholars have said that the practice of critical thinking should be directed at promoting social justice (Biesta & Stams, 2001). In other words, critical theorists can use critical

thinking to advance their work. Thus, critical thinking is a practice that critical theorists engage in, but so do many other scholars who are not critical theorists. They engage in critical thinking for purposes quite different from those of critical theorists. Any confusion of *critical thinking* and *critical theory* is likely caused by the seeming coincidence that both terms share the word *critical*.

*A field of instructional technology.* In this thesis I deal primarily with professional practices and concepts endemic to the field of instructional technology. The task of defining this field is not easy because opinions vary on what the field entails, what it should be called, and what its primary purposes should be. But it is that diversity in approaches and theories that makes instructional technology a field, as opposed to a theory of practice (Januszewski & Persichitte, 2007).

Work in the field has actually been influenced by a number of other fields including psychology, education, and philosophy (Saettler, 2004; Snelbecker, 1999). However, the field of instructional technology is also characterized in part by its own recent history which is sometimes signified as beginning in the early 1900s and evolving with training practices started during World War II, post-war developments in theory, and the rapid increase of technological tools available in the 20th century (AECT, n.d.; Reiser, 2007; Saettler, 2004). The domains of the field include design, development, utilization, management, evaluation, theory, and research (Januszewski & Molenda, 2007; Seels & Richey, 1994). I have chosen to define the field in part as those who engage in the work outlined in the current definition published by the Association of Educational Communications and Technology (AECT): "…the study and ethical practice of facilitating learning and improving performance by creating, using, and managing

appropriate technological processes and resources" (Januszewski & Molenda, 2007). This alone would be a broad definition as there are likely many people in various fields who seek to facilitate learning or improve performance by using technological processes and resources (although, the complete definition by AECT, which is 384 pages in length, potentially distinguishes itself by giving a more precise discussion about each of the terms used in the definition quoted above). Another component of the field is the participation in various discourse communities. The community that, in part, defines the field of instructional technology engages in the exchange of ideas and responses through common journals, conferences, listservs, and other means of discourse. Journals vary in terms of focus and process. Examples common to the field include *Educational Technology Research and Development* (ETRD), *Educational Technology, Tech Trends*, and *Instructional Science*. Those who participate in the field often participate in common conferences sponsored by organizations like AECT and the Association for the Advancement of Computers in Education (AACE). Those involved in the filed of instructional technology also engage in discourse through web resources such as the popular and international listserv *ITForum*.

Hence, my definition of the field of instructional technology involves not only the kind of work described above, but also the communities of people who engage together through shared resources and ideas. It involves the work defined by AECT (Januszewski & Molenda, 2007), the common history (Reiser, 2007), and the shared resources for community participation.

## Review of Literature

For this literature review I will first discuss critical thinking in general and describe historical trends and definitions. Important to this discussion is a consideration of assumptions and implications; thus I will discuss efforts on the part of some to make assumption analysis more prominent in the field of critical thinking. I will describe the nature of assumptions and argue that it is their ubiquity that makes them so central to any complete version of critical thinking. I will then focus my literature review on critical thinking in the field of instructional technology. Based on my review of that literature, I will argue that there is a need for a practice of critical thinking in instructional technology that emphasizes analysis of assumptions.

### *Critical Thinking: Definitions and Approaches*

*The critical thinking movement.* In order to provide some background in critical thinking, I will first discuss critical thinking in general and how some scholars have defined and discussed the concept. Much of the scholarly work on critical thinking is situated in literature related to education. In education, critical thinking is treated in two general ways: primarily, it is treated as an overarching concept for the entire domain, and sometimes it is treated in the context of a specific educational sub-discipline (i.e. educational psychology, educational biology, etc). Less frequently, critical thinking is treated outside of the educational context as an important practice for people to develop in their lives. In this thesis, in order to understand critical thinking in a complete sense, I review all of the literature, both that in education and that which is more general. I do this

because the two contexts share common definitions and understandings. Thus, a more complete picture is created by taking the two kinds of literature together.

The practice of critical thinking as a method can be traced to Plato, Socrates, and the Socratic Method (Morgan, 1995; Paul, 1992; Thayer-Bacon, 2000). Some people claim that John Dewey was among the first to formalize discussion of critical thinking when he talked about reflective thinking (Morgan, 1995). I find use of the actual term *critical thinking* as early as 1907 (Stevens, 1907) and, while it was not defined by Stevens, it was used to mean something like analytic thought. The term *critical thinking* appears as a practice that educators were concerned with teaching and assessing in the 1930s and 1940s (Anderson, 1942; Edwards, 1940; Glaser, 1941; Hart, 1939). During this period a definition of critical thinking began to emerge that represents critical thinking as a procedural kind of thought that uses method and logic to come to conclusions. Watson and Glaser's (1942) battery of tests of critical thinking revealed a common perception of critical thinking in its early days. The test focused on reasoning skills such as making inferences, generalizations, and applied logical reasoning. Those tests were a core part of the tests used by one of the authors, Edward Glaser, for his important work titled *An Experiment in the Development of Critical Thinking* (1941), which tests students in their mental abilities to employ logic and reasoning. Black, in 1946, affirmed Glaser's perception of critical thinking. In a text book titled *Critical Thinking: An Introduction to Logic and Scientific Method*, Black focused on deductive logic, induction, and the scientific method. The work of prominent scholars like Edward Glaser and Max Black demonstrates the view that critical thinking was a method based on formal logic with the purpose of making conclusions and ascertaining the correctness

of a claim or idea. That view of critical thinking as a logic-driven method became the foundation for decades of work that followed. Richard Paul, one of the foremost scholars in critical thinking today, acknowledged this in the dedication of his 1992 book, in which he says Glaser's aforementioned 1941 work "laid the cornerstone for the critical thinking movement" (Paul, 1992, dedication).

It was in the 1980s, that interest in critical thinking within education began to develop into a formalized movement (Paul, 1992). Of the various factors that fueled this interest was an executive order from the California State University System (Dumke, 1980) that required formal courses in critical thinking be taught in the all of its State universities. At about that same time, a commission of the U.S. Department of Education published a report, titled *A Nation at Risk* (United States Department of Education, 1983), which suggested that public schools in the U.S. were not doing enough to teach students useful skills for life, including thinking skills. The growing interest in teaching and measuring higher order thinking skills fueled educators' and scholars' interest in critical thinking. During this movement scholars became interested in understanding and defining more precisely the nature of critical thinking.

Various conceptions arose that represented different perspectives on critical thinking. Definitions of critical thinking had in common the characteristic of being broad and general. Robert Ennis (1987) calls it "reasonable reflective thinking that is focused on deciding what to believe or do" (p. 12). Paul (1987) deliberately tried to maintain an open definition in order to avoid the limitations of an overly-precise or overly-narrow conception. He summarized his definition as self-awareness of thinking with the goal of improving that thinking (Paul, 1992). Scholars differed in their definitions with regard to

the nature of critical thinking (Mason, 2007). Some considered critical thinking to be a set of skills applied to a situation (Ennis, 1987). Related, but narrower definitions construed critical thinking as the application of method and rules (Meltzoff, 1998; Stanovich, 2004). Some assert that critical thinking is a disposition or an attitude, although they take varying positions on the nature of that disposition (McCarthy, 1992; Siegel, 1988). Scholars assert that the skills of critical thinking are domain-specific (McPeck, 1981), while others believe that critical thinking skills are skills that can be learned and applied across domains (Ennis, 1987; Halpern, 1998). Moreover, scholars disagree on the philosophical assumptions underlying various critical thinking approaches (e.g. Johnson, 1992; McPeck, 1990; Thayer-Bacon, 2000).

The difficulty in coming up with a precise, agreed-upon definition is reflected in one effort to define and describe critical thinking. In 1988, a critical thinking project, whose findings are known as the *Delphi Report* (Facione, 1990), brought together 46 scholars from various fields who were recognized as having some sort of expertise in critical thinking work. They were asked by the American Philosophical Association to report on the state of critical thinking and critical thinking assessment. They worked for almost two years and produced a lengthy report defining and describing critical thinking. They constructed the following consensus definition:

> We understand critical thinking to be purposeful, self-regulatory judgment which results in interpretation, analysis, evaluation, and inference, as well as explanation of the evidential, conceptual, methodological, criteriological, or contextual considerations upon which that judgment is based. (p. 2)

Despite efforts to reach broad consensus, the Delphi report is not often cited and doesn't appear to be considered the authoritative work on critical thinking. Peter Facione, the lead scholar on the project is recognized as a respected authority on the topic of critical thinking, but the project itself is not referenced as often as is other work on critical thinking by other scholars.

A more commonly cited definition comes from Robert Ennis (1993): "Critical thinking is reasonable reflective thinking focused on deciding what to believe or do" (p. 3). It is possible that definitions like this are more often cited in critical thinking literature because they are simpler and broad enough to accommodate the different facets of critical thinking which researchers choose to focus on in their work. Based on my review of the critical thinking literature, Ennis' definition was one of the most commonly cited.

*Analysis and critiques of the traditional approach.* The various definitions described above represent the dominant trend through most of the past century's scholarship on critical thinking. That trend is to view critical thinking as an activity that consists almost entirely of rational, logical analysis in order to render judgments. And the kind of critical thinking promoted centers around formulaic activities and logical exercises to appraise the value of a statement or an academic work. This view is so dominant that it is often accepted implicitly. Indeed, the term critical thinking is common enough that it has reached a colloquial status in which some scholars and researchers feel comfortable using the term in their work without offering a definition or a discussion of the meaning at all (e.g. Dundes, 2001; Fowler, 1996; Katula & Martin, 1984; Mayne, 2004). Often those educators and scholars who write about critical thinking without defining it show in their writing that they hold a conception similar to the traditional view

of critical thinking as a rational, logical activity guided by method or reasoning (e.g. Hatcher, 1994; Ikuenobe, 2003; Meltzoff, 1998).

By the 1980s and 1990s, critical thinking had evolved into a kind of rational analysis that was guided by rules of scientific method and informal logic. Some scholars criticized the critical thinking movement because the rigid and logic-oriented procedures left out other important aspects of thinking and analysis, thereby restricting the capacity for the movement to achieve other worthy and desirable goals in education (Bailin, 1995; Giroux, 1994; Kaplan, 1991; McPeck, 1981; Thayer-Bacon, 2000). Walters (1990) called such emphasis the "vulcanization" of students (using a Star Trek reference to the excessively logical Vulcans) because the logic perspective excludes creativity and innovation, which she suggests are also aspects of rational thinking. Such limits were a part of what define critical thinking for Giroux who said (1994), "While all of the learning skills were important, their limitations as a whole lie in what is excluded, and it is with respect to what is missing that the ideology of such an approach is revealed" (p. 201).

Such scholars began to promote alternatives to the dominant conceptions. For example, one of the criticisms that some of these scholars described was that the qualities espoused by traditional critical thinking assumed a bias against women (Norris, 1995; Thayer-Bacon, 2000; Wheary & Ennis, 1995). Some said that traditional critical thinking privileged masculine ways of knowing and did not consider feminist epistemology (Burbules & Berk, 1999; Martin, 1992; Thayer-Bacon, 1993). From this feminist perspective, traditional critical thinking left out the relational aspect of thinking and knowledge construction and as such required a new model for knowledge and what was

needed was an emphasis on constructive thinking as a community (Thayer-Bacon, 1993). In addition to a gender bias, some scholars assert that certain aspects of critical thinking also contain a cultural or social bias (Alston, 1995; Bailin, 1995; Norris, 1995; Atkinson, 1997). Atkinson (1997), for instance, suggests that critical thinking may be more of a social practice than a set of generalizable skills. As such teaching critical thinking to students from different cultures would raise issues of transmitting cultural practices, rather than thinking skills or methods. Some views of critical thinking were from explicit critical theory perspectives. Scholars suggested that a new consideration of critical thinking was to emphasize concern for justice by liberating students from dogmatic ideas including those of critical thinking (Biesta & Stams, 2001).

Another critique of traditional views of critical thinking was that it was too empirical and, as such, failed to recognize critical thinking as situational (Anderson, 2001; Garrison, 1999). Indeed, from that standpoint it could be said that any attempt to define critical thinking will involve historical bias, therefore, any such attempt is situated, leading to the conclusion that there cannot be a universal definition of critical thinking (Anderson, 2001). Some critical theorists have been less extreme, and have suggested that critical thinking is, at least in part, bound up in its societal context and much of the reasoning methods are dependent on that context (Winch, 2006). Furthermore, those who advance a universal approach have thus far failed to prove the desirability of a "context independence of reasoning" (Winch, 2006, p. 70). In other words, traditional critical thinking is not adequate for all people in all contexts, but rather, it is adequate for limited contexts and people.

For critics, the traditional critical thinking movement had failed to deliver on its promise for universality; the approach was limited in what it could do for students. The fact that the critical thinking movement had evolved into a recapitulation of informal logic resulted in a failure to develop other ways of thinking and knowing that help students develop autonomy (Kaplan, 1991; Winch, 2006). Some recommended new conceptualizations of critical thinking, seeking to replace old assumptions with new assumptions. Indeed, any approach to critical thinking can be said to be based in one set of assumptions or another. Some critics have suggested that critical thinking must involve an awareness of assumptions in order to allow more robust understanding and more complete critical analysis (Brookfield, 1987; Yanchar, Slife & Warne, 2008).

*Analysis of assumptions as a practice of critical thinking.* Recognizing and analyzing assumptions is considered by some to be, one aspect of critical thinking (Brookfield, 1987; Fisher, 2001; Mezirow, 1994; Paul & Elder, 2001; Watson-Glaser, 1942). Here I will describe how some critical thinking scholars describe assumptions as a part of critical thinking. From their descriptions I will also show why analysis of assumptions is considered by some to be a necessary part of critical thinking. An assumption is an idea or proposition that is thought to be true or taken for granted (Yanchar & Slife, 2004). There are different kinds of assumptions. To begin with, there are everyday assumptions related to ordinary decisions that a person makes such as assuming there is news to view when one turns on the news on TV or assuming the store is open when one drives to it. Such trivial assumptions are common, even constant, in everyday life and are a necessary part of action and decision-making. Equally common to everyday experiences are the larger assumptions that one holds about knowledge, people,

and the nature of existence as well as other general beliefs about life. A person makes assumptions about what determines an individual's actions (e.g. why a child is behaving badly or kindly). A person makes assumptions about what kind of knowledge is worth knowing (scientific knowledge that is proven through observation or knowledge that is felt and perceived on a spiritual or emotional level). Such assumptions constitute the "intellectual background" for theories and practices (Yanchar & Slife, 2004, p. 85).

Brookfield (1987) calls assumptions the "seemingly self-evident *rules about reality* that we use to help us seek explanations, make judgments, or decide on various actions" (p. 44, emphasis added). These kinds of assumptions are fundamental to human experience because it is by such assumptions that we "structure, interpret and make sense of our world" (Yinger, 1980, p. 16). While an awareness of all kinds of assumptions might be helpful in different circumstances, I will focus on those that pertain to philosophical beliefs and values as they apply to scholarly and professional work because, as I will argue, such assumptions form the basis for many, if not all of one's decisions and practices in scholarly endeavors.

In the critical thinking literature, assumptions are treated to varying degrees of analysis. Some critical thinking scholars acknowledge the analysis of assumptions with very little elaboration (Halpern, 1998). Similarly, among professionals and educators who talk about critical thinking in the context of their particular field (e.g., teaching English or training medical students, etc.), assumptions are often dealt with minimally, (Gangel & Sullivan, 1994; Kamin, O'Sullivan, Deterding & Younger, 2003; Swords, 1990; Tsui, 2002; Walker, 2003) in that they do not discuss them at length or describe what kinds of assumptions may be important to their field.

In contrast to the work of those who do not deal with assumptions, there are scholars, both those immersed in the critical thinking field at large and those who are situated in their own discipline, who give attention to assumption analysis as a part of critical thinking. For instance, some who are primarily concerned with logic and reasoning in critical thinking recognize the importance of identifying an assumption that is used to support an argument (Ennis, 1987; Watson-Glaser, 1942). Some of the educators and professionals who focus on critical thinking in their respective fields feature the analysis of assumptions as a major part of the critical thinking endeavor (Laughlin, 1992; Warren, 1994; Slife & Williams, 1995; Yanchar, Slife & Warne, 2008). And there are those who work in the critical thinking field who provide elaborate descriptions of how assumption analysis must be included as a characteristic of critical thinking (Brookfield, 1987; Mezirow, 1994; Yanchar, Slife, & Warne, 2008).

For those who focus specifically on assumption analysis (e.g., Brookfield, 1987; Mezirow, 1994), thinking critically about anything, whether an idea or a theory or a methodology, is not complete without a consideration of its underlying assumptions. Mezirow (1994) offers a good conceptualization of what it means to analyze assumptions. He suggests that analyzing assumptions means reflecting on the "origins, natures, and consequences" (p. 223) of assumptions—one's own and those of others (see also Brookfield, 1987; Yanchar & Slife, 2004). Thus, analysis of assumptions includes considering where they come from, what they mean, and where they lead, or in other words, what implications those assumptions have. Additionally, critically thinking about assumptions includes exploring new and alternative ideas in order to revise or replace old assumptions (Brookfield, 1987; Shoemaker, 1990; Slife & Williams, 1995).

*Underlying Assumptions and Implications*

To this point I have discussed how some critical thinking scholars think assumptions should be analyzed. In order to argue that this activity is a significant and necessary part of critical thinking, I will discuss the nature of assumptions. I will describe several important features of underlying assumptions: 1) Everyone has assumptions about underlying philosophical issues and values; 2) Assumptions can be implicit, in other words, they can be held without one's awareness of the assumptions; 3) Assumptions are ubiquitous; and 4) Assumptions have implications.

*Everyone has assumptions.* The first point I argue is that everyone holds assumptions about philosophical issues such as beliefs about what knowledge is, how it is gained, the nature of being or existence, and what constitutes one's values. One does not need to be well versed in any philosophical tradition in order to hold philosophical views about topics in everyday life. Assumptions about good government are held by people who may have no background in political science and philosophy. In response to an undesirable event (e.g. personal job loss or a social injustice), some people might take the position that the government is responsible for solving the problem. In contrast others might take the position that the government should not become involved in the issue as it is not an issue that lies within government purview. Each perspective is based on assumptions about the role and purpose of government as well as assumptions about a citizen's role and capacity in society.

Similarly, people develop assumptions about the nature of learning and instruction. The person who gains an education in a traditional western school where books and teachers are the main tool of instruction may develop the view that knowledge

is something independent of the individual and can be transmitted and acquired through media such as books and lectures. On the other hand, the person who is raised in an agrarian society in which members of the society are trained largely through apprenticeship may view knowledge as something that grows through experience and exists as a part of the person who has actually done the work required to develop knowledge of a trade. In this sense, a person develops and holds assumptions about the nature of knowledge. Thus, assumptions are a fundamental feature of a person's experiences and beliefs.

This notion is true also in the realm of academic and scientific work. People have assumptions about what constitutes good, scholarly research and how that research should be conducted. For instance, much of the scientific tradition has grown out of objectivist assumptions about knowledge and the world (Bernstein, 1983; Burgess-Limerick, Abernathy & Limerick, 1994; Crotty, 1998; Slife & Williams, 1995). Indeed, method itself has been demonstrated to rest on a foundation of background assumptions—that is, underlying concepts that give a method purpose and form and that determine the kinds of data produced (Burgess-Limerick, Abernathy & Limerick, 1994; Danziger, 1985; Slife & Williams, 1995; Yanchar & Williams, 2006). Moreover, as is well known, statistical analyses in the behavioral sciences also make crucial assumptions about samples, populations, and their various features (Danziger, 1985). Assumptions underlie not only a person's individual actions, but also the individual's scholarly and professional work as well as the collective work of groups and communities of scholars.

*Assumptions are often implicit.* Another important aspect of assumptions is that they can be tacit or implicit. In other words, they often underlie one's experiences and

work whether or not the individual is aware of those assumptions (Kagan, 1992; Slife & Williams, 1995). Brookfield (1987) describes them as being "so internalized that they are perceived as second nature or common sense" (p. 90). And in some cases, one's actions might indicate that the individual's beliefs are so embedded or implicit that they are different from the professed beliefs (Kane, Sandetto & Heath, 2002; Schon, 1983). In the brief examples I described above in which individuals developed assumptions about knowledge, the individuals did not need to be aware of their assumptions nor of the source of their assumptions. It is common for people to form assumptions without any explicit awareness of them. A person may have the experience of being asked why she did something and it is only then that she becomes aware of the assumption. For this reason, some have called them implicit assumptions (e.g. Cosgrove, 2007; Pressick-Kilborn, Sainsbury & Walker, 2005) or tacit assumptions (e.g. Sfard, 1998; Schwarz, 1996). Ennis (1982) called them needed assumptions, because while they are not used by a person making an argument, they are needed for the argument to make sense. Slife and Williams (1995) called them "hidden" assumptions because such assumptions are often transmitted in practices without anyone's awareness that they are transmitting them.

*Assumptions are ubiquitous.* Assumptions underlie everything a person does and believes. They are an important part of all aspects of an individual's life. Yinger (1980) said that one's assumptions ultimately "become the lens and filter for everyday experience, dictating what one sees and how one interprets it" (p. 16). Indeed, assumptions shape and inform big decisions as well as small decisions (Brookfield, 1987).

Thus, assumptions are ever-present, even without one's knowledge and, as some have claimed, it is impossible to theorize or to practice without those assumptions guiding one's work at every step (see Koetting, 1996; Slife and Williams, 1995; Wingo, 1974). Wingo made that very point in talking about public education:

> Behind every approach to teaching method, behind every plan for administrative organization of the schools, behind the structure of every curriculum stands a body of accepted doctrine—assumptions, concepts, generalizations, and values…Very often however, the very presence of this body of ideas goes unnoticed. Its acceptance is largely unconscious and based on tradition (in Koetting, 1996).

*Assumptions have implications.* Assumptions are important because they have implications for one's work and practice (Brookfield, 1987; Slife, Reber & Richardson, 2005; Slife & Williams, 1995). Slife and Williams (1995) called implications "the consequences of an idea or theory" (p. 17). Researchers have demonstrated that assumptions about teaching and learning have implications for how people engage in related activities (Gobbo & Girardi, 2001; Jarom, 2007; Kagan, 1992; Nespor, 1987; Smagorinsky & Smith, 1992). For instance, the individual who assumes knowledge is an external thing which can be transmitted and acquired through books will choose to teach others through the use of books. If that individual were assigned to develop training for new employees, his first choice might be to explain everything the new employee needs to know in a book and have all new employees read the book before beginning their job. On the other hand, the individual who believes that knowledge develops principally through practical involvement and hands-on experience might organize a program where

all new employees are paired with experts and trained by performing their work under the guidance of an experienced mentor. In these examples, each assumption has implications for how the assignment of training new employees is carried out.

Given the pervasive influence of assumptions and the implications those assumptions can have, it can be concluded that assumptions, of one kind or another, underlie the collective knowledge and practices of instructional technology as well as the individual practice of those who work in the field. By evaluating the theories and practices within the field of instructional technology, one can detect assumptions, hidden or not, and their implications.

### *Critical Thinking in Instructional Technology*

To this point I have discussed critical thinking as it is commonly treated along with some of the emerging perspectives in the critical thinking literature. I have argued that one of the most significant aspects of critical thinking ought to be the analysis of assumptions. In order to understand how assumptions and critical thinking are treated in the field of instructional technology, I will now narrow my discussion of critical thinking and assumption analysis to literature and work of those within the field. In doing so, I will describe how scholars and practitioners in the field have defined and treated critical thinking. I will also describe how the practice of analyzing assumptions has been treated in instructional technology both as a part of critical thinking and as a practice in and of itself. I will demonstrate that critical thinking—and more particularly, thinking critically about assumptions and implications—as a formal topic has been considered minimally in the field. There are, on the other hand, good examples of critical thinking in action, even though the term *critical thinking* is not explicitly used to describe the practice.

*The meaning of critical thinking in instructional technology.* By and large, when critical thinking is addressed in instructional technology, researchers tend to view it as a process driven by methods or by informal logic (Angeli, Valanides & Bonk, 2003; Daud & Husin, 2004; Lebow, 1995; Muirhead, 2001; Yeh, 2006). These definitions tend to fit some form of the broad definitions discussed earlier that have dominated the field of critical thinking, where critical thinking is defined as applying thought to make judgments or decisions (Ennis, 1993).

Sometimes scholars neglect to include a definition of critical thinking in their discussions. In the absence of a definition, the common understanding of what critical thinking is might be inferred from how writers use the term. In these cases it is most common to see critical thinking used interchangeably with terms like *higher-order thinking*, *in-depth learning*, and *metacognition* (Marra, Moore, & Klimczack, 2004; Jonassen, Carr, & Yueh, 1998). Another common perception of critical thinking in instructional technology usage is that it means something akin to reasoning or careful logic (Saye & Brush, 2002; Cambell, 1998). These conceptions are all similar to, even if more vague than, the common definitions offered by Ennis (1993), Paul (1992), and others.

*Limited discussion of critical thinking in the field.* Within the field of instructional technology, there has been very little discussion of what critical thinking is, the nature of critical thinking skills and dispositions, whether critical thinking can be taught, and how it might be assessed. With few exceptions, critical thinking is considered in instructional technology in the context of discussions about how to teach or facilitate critical thinking skills for students. I refer to works with titles like *Developing Critical Thinking Skills in*

*Computer-Aided Extended Reading Classes* (Daud & Husin, 2004) and *Computers as Mindtools for Engaging Learners in Critical Thinking* (Jonassen, Carr, & Yueh, 1998). Of course this focus is to be expected in a field whose ultimate concern is education. But what's missing is rich discussion of the different perspectives of critical thinking.

The overwhelming tendency in instructional technology is to view critical thinking as a kind of rational process designed to arrive at logical conclusions. And in its most vague forms it represents a nebulous kind of rigorous thinking. This view is not problematic in itself, as such thinking can make valuable contributions to the field. However, as I tried to demonstrate previously in this review of the literature, in the transdisciplinary field of critical thinking (outside of instructional technology), there has been a good deal of discussion about various critical thinking topics such as what exactly critical thinking is, how students might engage in it, how it can be taught, how it might be assessed, and how emotions and dispositions contribute to critical thinking.

There have been minimal attempts by some scholars within IDT (Jonassen, 2000) to expand or revise an understanding of critical thinking with ideas from various post-modern perspectives. The aspect of critical thinking that I have focused on is characterized by its potential to be a means of helping people consider the assumptions of their theories and practices. This perspective of critical thinking is rarely addressed in the body of instructional technology literature.

Another interesting feature of the discussion of critical thinking is that it is sometimes not defined at all in the scholarly literature (Marra, Moore, & Klimczak, 2004; Leh, 2002; Saye & Brush, 2002; Chambers, 1999; Rath, 1997; Sherry & Trigg, 1996). In fact, some researchers include for the journal in which they are publishing the term

*critical thinking* as one of the key words used to identify their article, even though they never actually use the term in the text of the article (e.g. Ley & Young, 2001; Shambaugh & Magliaro, 2001). It is likely that the term *critical thinking* is often not defined because it has some general meaning for most people, thus scholars may not always feel the need to discuss definitions. Furthermore, many scholars may not be aware of the various conceptions of critical thinking that currently exist in the scholarly work. That researchers can write about critical thinking without offering a definition demonstrates how little discussion is actually taking place. Leaving out a definition would not be possible in a community where there is ongoing discussion of the nature of and varying approaches to critical thinking.

As Jonassen (2000) notes, the definition one uses of critical thinking is both influenced by and influences how one expects students to think and how one teaches critical thinking. In that light, it is important to understand and discuss what critical thinking is, thereby clarifying how students should engage in critical thinking and how it can be fostered. The discussion of critical thinking in instructional technology can be expanded to reconsider definitions and practices as well as other theoretical positions on the topic. Such discussion can influence what professors and educators expect for students in the field of instructional technology. An expanded discussion can also influence the work of designers and practitioners who seek to develop learning environments and tools that foster critical thinking. In short, scholars and practitioners in IT could benefit from critically thinking about their views of critical thinking.

In summary, there are two major trends in the way critical thinking is addressed in instructional technology: 1) discussions in the field have been influenced almost

exclusively by the most common definitions and 2) discussions have generally not gone beyond those definitions to consider more expansive or alternative conceptions of critical thinking. From those trends I derived the focus of this thesis: critical thinking is not contributing to instructional technology as a formalized means for analyzing underlying theoretical assumptions.

*Critical Examination of Assumptions in Instructional Technology*

I have examined how critical thinking is considered in instructional technology and shown that, while some scholars in other fields advocate using critical thinking as a means for the evaluation of assumptions, by and large this discussion has not yet occurred in instructional technology. Because I am interested in how critical thinking can help students and scholars in instructional technology analyze assumptions, it is relevant to examine how scholars in the field are currently engaged in the analysis of assumptions. In this section I will look at how theoretical assumptions are evaluated in instructional technology. I will show that, although the practice is not common, there are some scholars who engage in the practice of evaluating assumptions. I will also discuss some of the limitations to how assumptions are analyzed in instructional technology.

Some scholars have recognized that instructional technology would benefit from careful consideration of the theories embraced by the field. As early as 1970 Donald Ely proposed that philosophical declarations of the then emerging field of instructional technology should be recognized as tentative and changing as the field evolves. Thirty years later he suggested that the continuing evolution of the field is aided by practitioners' paying attention to and developing their philosophies (Ely, 1999). Ely's call for attention to the field's philosophies recognizes the significant role that philosophical

beliefs play at the macro level—the level that deals with the field as a whole. As I have demonstrated, in order to fully understand and develop philosophies, it is necessary to understand the assumptions that guide those philosophies. In other words, since philosophies are assumptions put into practice, considering philosophies means considering assumptions also.

While Ely suggests that considering philosophies—and by definition assumptions—can shape the field as a whole, Hannafin and Hill (2007) propose that the endeavors of those who work in instructional technology to understand underlying assumptions will contribute to their own individual efforts to develop and design. They suggest that practitioners "need to better understand these approaches—the materials and methods as well as the core foundations and assumptions—if [they] are to benefit from them" (p. 59). In other words, making sure that instructional technology work is grounded in theory and consistent with assumptions could improve the designer's work. This proposition, which emphasizes individual practice, is complementary to Ely's which emphasizes development of the whole field. Given the broad impact that analyzing assumptions can have it is useful to see how such analysis has been practiced in existing literature.

Explicit attention paid to assumption analysis mostly comes from the recent emergence of new theories in instructional technology, most notably post-modernism (Solomon, 2000; 2002; Voithofer & Foley, 2002) and constructivism (Hannafin, 1996, 1997; Hannafin & Hill, 2000; Jonassen, 1991; 2000; Osguthorpe & Osguthorpe, 2007; Spector, 2001). Much of the discussion has focused more specifically on constructivist and relativist assumptions in contrast to cognitive and behaviorist views.

In the early 90s, constructivism was emerging as an increasingly popular theory in education and instructional technology. David Jonassen (1991) contributed to the discussion by analyzing the assumptions of cognitivism and behaviorism and contrasting those with the assumptions inherent in a constructivist approach. Jonassen's work provides a good example of how a consideration of assumptions can help guide the work in instructional technology. He discussed the assumptions of cognitivism and behaviorism and placed them in the same category by asserting that they are both based in an objectivist epistemology and a dualistic ontology. He then demonstrated how a constructivist view represents a shift epistemologically and ontologically. He also demonstrates how a constructivist perspective has different implications and applications in practice. Jonassen was suggesting that the field should consider a paradigm shift to this new perspective.

Nearly a decade later, Jonassen and Land (2000) said that the intervening time had seen "revolutionary changes in learning theory" (p. iv) due to shifts in the underlying philosophical assumptions in the field. They edited a book (Jonassen and Land, 2000) with contributions from various scholars in instructional technology who described theories and practices, such as communities of practice, student-centered learning environments, activity theory, and situated cognition, which are in various ways informed by this new set of assumptions that Jonassen called the paradigm shift in instructional technology.

Indeed, during the 1990s, many professionals and scholars in instructional technology began to consider the assumptions of behaviorism, cognitivism and constructivism and the implications those assumptions have for work in the field (e.g.

Dick, 1996; Hannafin & Reiber, 1991; Lebow, 1995; Petraglia, 1998; Rieber, 1992; Spector, 2001). The past 20 years have witnessed major changes because of a shift toward constructivism. That shift has brought into the field's collective awareness recognition of the assumptions and implications of objectivism and constructivism.

Based on this review of how scholars in IT have analyzed assumptions, I have found that the discussion is limited in three distinct ways: (1) the number of authors engaged in the discussion is limited, (2) the scope of assumptions discussed is limited, and (3) there has been little discussion directed at recommending the practice of analyzing assumptions to all members of the field. I will discuss and demonstrate each of these limitations.

*Number of authors is limited.* After reviewing the instructional technology literature, it seems that most of the work related to assumptions is limited to a small group of scholars and much of the work comes from some of the same authors. I suggest that the idea of examining assumptions has the possibility of benefiting anyone who practices it. As I discussed earlier by becoming aware of assumptions, a practitioner might consider alternative assumptions and decide to change the design of an intervention, or a researcher might alter an approach to assessment after recognizing an assumption underlying a particular method of assessment. If an awareness of assumptions has the potential for helping people in all areas of instructional technology, then it is desirable that the practice of reflecting on one's work and critically thinking about assumptions become a common part of the field. In other words, rather than finding evidence of analysis of assumptions among a small group of scholars in instructional technology, there should be consistent and frequent evidence of the practice in journal

publications, theses, dissertations, and textbooks. This would be a sign of a field which is very aware of its assumptions and is constantly seeking to understand and improve assumptions and the related theories.

*Scope of assumptions is limited.* Another characteristic of the discussion of assumptions in instructional technology literature is that it is restricted to a narrow range of topics. A majority of the work related to theoretical assumptions has to do with the relatively recent trends toward a constructivist/situational perspective. Much of this work centers on comparisons of behaviorism and constructivism (or some similar dichotomy) and the implications of those contrasting views (Hannafin & Hill, 2006; Jonassen, 1991; Spector, 2001). There are other assumptions to consider. For instance, there are assumptions about processes and practices in instructional design, assumptions about learner agency, assumptions about time, and assumptions about efficiency that all influence the work of instructional technology. (For an example of an analysis of some of these assumptions, see McDonald, Yanchar and Osguthorpe, 2005.) There is a second component to this limitation of the scope of analysis and that is the reliance on the dichotomy itself. When scholars talk about the assumptions of the field in terms of objectivism vs. relativism or behaviorism vs. cognitivism, they are limiting their consideration of alternative assumptions to two dichotomous options. This can be described as a false dichotomy where an either/or decision is presented as the only option and no middle ground or third position is considered.

*Discussion of the need to analyze assumptions is limited.* Another gap in the literature concerns infrequent discussion of the need to analyze assumptions. I have discussed the work of a few scholars in the field who demonstrate critical evaluation of

their assumptions, but that is different from actually discussing the need to do so. While there is some work involving the analysis of assumptions, there are even fewer instances of scholars encouraging colleagues and students to engage in the practice. As I have acknowledged, some members of the field have advocated such a position (e.g. Ely, 1970, 1999; Hannafin & Hill, 2006; Osguthorpe & Osguthorpe, 2007; Spector, 2001). However, I propose that one important aspect that should be a part of the work and scholarship in instructional technology is a discussion of the importance of analyzing assumptions as well as efforts to transmit those ideas to students in instructional technology. Those who recognize the importance of this activity can encourage colleagues and students to be more explicit and more careful in analyzing the assumptions of the field and of their own work. Scholarly writing could include discussions of assumptions as commonly as research papers include discussions of the methods used; a researcher would not write without including a section that discusses the assumptions that underlie his or her work.

While there have been some very important contributions by scholars analyzing assumptions in instructional technology, there are still areas where more work could be done. As I have found in my review of the literature, the practice of critically analyzing assumptions could be more common for more people. Given the significant role that assumptions play in the work and theories of the field, it seems that scholars would be justified in adopting formal practices to teach their students and encourage their peer to routinely and systematically analyze the assumptions that underlie their work. These apparent limitations could be addressed by a shared model of critical thinking that informs the practice of analyzing assumptions. And so, as I have previously emphasized,

the purpose of this thesis is to propose a model of critical thinking that facilitates the broad and consistent analysis of assumptions in instructional technology.

*Conclusion*

Critical thinking is widely accepted as an academic virtue. Given the importance of practicing, and being able to teach, critical thinking, it is equally important to consider the debates on critical thinking and enrich the discussion of an approach to critical thinking in instructional technology. I have shown that there has been little discussion in the instructional technology field of what critical thinking is and how it should be approached. One significant aspect of critical thinking that I have emphasized is assumption analysis. The analysis of assumptions in instructional technology has been limited in three ways: 1) the number of people who discuss or mention assumptions is limited, 2) The scope of the assumptions discussed is somewhat limited, and 3) There has been a limited discussion of the *need* to recognize and evaluate assumptions.

I propose that there is a need for a formal conception of critical thinking and assumption analysis for scholars and students in instructional technology. By a formal conception I mean attempts at defining and outlining what constitutes the practice of critically thinking about assumptions. Attempts at formal conception would also provide a resource for students and others who are learning to recognize and understand their own assumptions as well as assumptions underlying the theories and ideas that they study. At a recent conference session that I attended where critical thinking about assumptions was the topic, many of the attendees were eager to find resources and suggestions for teaching such critical thinking to others. Some expressed the concern that it was difficult to even get their students to see what they meant by assumptions. Even though formal definitions

and attempts to outline conceptions of critical thinking will have their own assumptions and possible weaknesses, they can provide resources for people to begin discussing assumptions and to begin finding ways to teach critical thinking.

## An Alternative Approach to Critical Thinking: Principles and Practices

In order to practice and teach critical thinking in instructional technology without some of the problems that I have considered here, I propose a model that incorporates both an alternative view of critical thinking and practices that are informed by that view. A central idea in my thesis is that critical thinking is incomplete without analysis of assumptions. Therefore, this model is based on the work of those who have emphasized assumption analysis in critical thinking. This work has primarily taken place in other fields and I draw on the work of some of those scholars to introduce this alternative approach to critical thinking for the instructional technology community (Slife & Williams, 1995; Yanchar, Slife & Warne, 2008). The approach to critical thinking I advocate avoids some of the problems with traditional views of critical thinking, primarily by focusing on the examination of assumptions.

Before I discuss this model of critical thinking there are two important points to clarify about the model. First, this model should not be seen as a kind of method, consisting of firm rules to be followed. Rather this model consists of principles and practices that emphasize the importance of considering assumptions to think critically about one's work. There are methods of critical thinking which are based on rules designed to be applied in a formulaic way. For instance, some have advocated that critical thinking in psychology amounts to scientific and logical rule following (Meltzoff, 1998). Such methods for critical thinking are not necessarily bad or unhelpful. However, I and others assert that critical thinking is not complete without considering assumptions (Brookfield, 1987; Slife, Reber & Richardson, 2005; Yanchar & Slife, 2004; Yanchar, Slife and Warne, 2008). Moreover, consideration of assumptions is limited when one set

of rules for critical thinking is accepted and applied without considering the assumptions of that method. So the model I propose is not intended to be a definitive set of rules, but rather an approach which can facilitate the analysis of assumptions and as such, an approach that should be subjected to the same critical thinking that I recommend.

The second point is that this model of critical thinking and detecting assumptions is not designed to eliminate assumptions. Indeed, I have tried to argue that assumptions are inescapable and ubiquitous. Rather than detect and eliminate assumptions, as though they were inherently bad, the purpose of this model is to recognize assumptions, making it possible to evaluate and modify assumptions and make sure that practices and theories come into alignment with those assumptions that individuals and communities choose to hold.

This model or strategy of critical thinking that I introduce here should help students, practitioners, and scholars accomplish three things: (a) recognize and examine their own assumptions as well as the implications of those assumptions, (b) identify the assumptions and implications underlying existing or emerging theories and practices in the field, and (c) consider alternative assumptions and possible revisions to existing assumptions. My discussion of the model of critical thinking and analyzing assumptions that I propose is made up of two parts: the principles, which form the central part of the model, and the practices, which are used as suggestions and serve as examples of the model in practice. I will first describe the principles that inform this model. Then, I will list and describe the practices.

*Principles of the Critical Thinking Model*

This strategy of critical thinking is based on certain principles which are informed by the assumptions and arguments which I have made so far in this thesis. In this section of my thesis I will describe each of the six principles that provide a foundation for this critical thinking model (for additional reading on these topics see Yanchar, Slife & Warne, 2008):

1. *Fundamentality of assumptions*
2. *Cyclical nature of critical thinking*
3. *The necessity of community sharing*
4. *The nature and dispositions of the community*
5. *Critical thinking as productive activity*
6. *Openness of critical thinking*

*Fundamentality of assumptions.* Assumptions are the prior, often implicit familiarity one has with the world and the background understanding that provides a lens for interpreting that world. Thus, assuming is inescapable. As I have previously explained, assumptions inform the way people view their experiences and their world, and they inform the decisions and practices of instructional designers, technologists, and scholars in the field.

The fact that assumptions underlie everything—from practices to theories to opinions to decisions—means that even the practice of thinking critically about assumptions is guided by one's own assumptions. This is true because of the inescapability of assumptions. One cannot escape assumptions; neither can one escape assumptions when interpreting those assumptions. Thus, when one tries to think critically

about a problem, one does so through the lens of one's own assumptions. And when one attempts to identify one's assumptions, again, one does so through the lens of one's own assumptions. There is no neutral ground from which to view assumptions; assumptions are only viewed through the lens of assumptions. Given this notion of how assumptions influence the practice of critical thinking, a reasonable question is how exactly should one examine assumptions? The inescapable influence of assumptions means that one cannot think critically without relying on those assumptions. This problem necessitates the second principle of the critical thinking model.

*Cyclical nature of critical thinking*. Because assumptions are inescapable, one must begin with whatever understanding he or she has to begin thinking critically and analyzing assumptions; this means beginning with one's assumptions in order to analyze assumptions. This creates a potential problem in that analyzing one's own assumptions through the lens of those very assumptions may not provide the most complete understanding. It's like looking at a red painting through red tinted glasses; the painting would look very ordinary and not particularly red. This problem is described in terms of the methods one uses to conduct research: "Methods inevitably invoke a type of circularity that predetermines the nature of results" (Yanchar & Williams, 2006). Analyzing one's assumptions with one's assumptions can appear to be a kind of circular reasoning in which an argument makes a claim that is based on an earlier claim in the same argument (Rips, 2002). This kind of circularity is made even more problematic because the basis for a judgment in critical thinking is often unrecognized due to the fact that assumptions are often unseen and tacitly held. When this happens there is the risk

that an individual will reinforce his own assumptions by relying on those very assumptions to make judgments about the assumptions.

However, recognizing this circularity can result in helpful practices. In order to analyze assumptions one must begin with the assumptions already in place. Then as the individual begins to recognize assumptions, he begins to see the assumptions in other contexts as he interacts with a community of practice. The process of continually recognizing and analyzing the assumptions in varying contexts brings about a cycle in which the individual's understanding continually grows. This process of alternately focusing on the assumptions and the contexts in which the assumptions play a role is like the hermeneutic circle. The idea of the hermeneutic circle is that one's understanding of something is only understood when referencing the whole context to which that thing pertains (Crotty, 1998). By referencing the whole, the part is understood and by referencing the part, the whole is understood. Understanding assumptions is aided by recognizing the context to which those assumptions pertain and that context is better understood as the assumptions are understood. Crotty (1998) described the Hermeneutic circle by referencing Heidegger's view that we bring our understanding of being and use that understanding to gain greater understanding of being.

It is important to emphasize the point I have tried to make here: circularity is a necessary part of analyzing assumptions. Such analysis can still be productive if one moves, in cycles between analyzing the assumption and analyzing the assumption as a part of a greater whole in various contexts and as a part of other assumptions. To extend the metaphor of circularity, these circular motions tend to be more like spirals in which a general direction toward greater understanding is produced through circular motions,

rather than circles which are doomed to repeat themselves. In this way, one's understanding of one's own assumptions should advance and continually be refined.

This circular process is advanced by the introduction of new ideas. Each time a person revisits an experience, he is not the same and the experience is not really the same. This is so because he has had the experience before and changed from it. Thus, a person can never exactly repeat an experience because he is a different person when he revisits that experience. When he reads a text for the second time, he cannot read it the same way he did the first time. In this sense, the element of newness—new thoughts, perceptions, and understandings—is what makes the hermeneutic circle a progressive spiral instead of a repetitive circle. In light of the importance of newness, other sources of newness can aide one's understanding of assumptions. A community of people with diverse beliefs and perspectives can provide more of the new experiences that facilitate movement in this cycle which aids the individual in understanding his own assumptions, subjecting them to analysis and revising them and continuing in the process of subjecting those assumptions to analysis and revising them. This circular process is akin to the hermeneutic circle in that interpretation arises from continually referencing one's own assumptions which are established by referencing the greater body of possible ideas and alternative assumptions and ideas. This circular process is facilitated by engaging with the community.

*The necessity of community sharing.* By interacting with others and engaging in dialogue about particular ideas and the underlying assumptions, one is able to reference the alternative ideas that aid in the analysis and possible revision of one's own assumptions. Engaging in this community dialogue is crucial because it allows exposure

to ideas and the possible discovery of new perspectives and new assumptions. Furthermore, one's assumptions are often invisible to one's self until he or she is made aware of them through dialogue with others. If an individual is engaged in the work of recognizing and analyzing her own assumptions, exposure to new assumptions can help her recognize and understand her own assumptions.

The aspect of community dialogue in discovering assumptions addresses the problem discussed earlier of circular reasoning. When a person tries to analyze his own assumptions, he can only do so through the lens of the assumptions he holds, thus reifying those assumptions. His assumptions are used as if they are the reality of the situation and they are thus left unexamined. Dialogue with a community and exposure to other assumptions potentially help to avoid reification of assumptions in two ways. First, an awareness of alternative assumptions aids the process of analyzing one's own assumptions. Where reification occurs because of analyzing one's assumptions via those same assumptions, exposure to alternative assumptions, allows the individual to analyze assumptions through a different set of assumptions. Alternatives allow the individual to consider how his own assumptions provide a perspective through which he may explain daily phenomena in life and how those alternative assumptions might also explain the same phenomena. Often, considering the contrast of something helps to understand the thing itself. The process of considering alternative assumptions and their implications helps the individual understand his own assumptions better.

The second way that community dialogue addresses the problem of reification is by having others participate explicitly in the analysis of one's own assumptions—asking others to help identify and examine what is often left unexamined. The process of sharing

assumptions in dialogue places the assumptions in a position to be analyzed by others who may possess alternative assumptions. Thus, the assumptions are analyzed through a different lens. This community sharing contributes to the cyclic process I described earlier.

*The nature and dispositions of the community.* Interaction in a community brings to bear certain questions: How will the community operate? How will people interact? There are features of the community that are a necessary part of critical thinking. Rather than list them in my discussion of the community above, I list them separately because they go beyond describing the community interactions; they are also a part of the nature and disposition of the members of the community and of the individual who engages in critical thinking and analysis of assumptions. There are at least three features of the community that are important to critical thinking: (a) caring, (b) connection to others, and (c) constructive critical thinking.

The community must have a caring nature at the center of its interactions (Martin, 1992). Caring as a central feature of academic discussion and scholarly dialogue means that those engaged will act in the best interest of others. Martin (1992) based the need for care and respect on her assertion that critical thinking must have a moral foundation. This view of critical thinking as a moral activity complements recent work in the field of instructional technology that suggests that instructional design be seen as a moral endeavor (Osguthorpe, Osguthorpe, Jacob & Davies, 2003). Such critical thinking means that critiques of work and analysis of others' ideas will be done in a way that is both helpful and respectful.

Members of the community will also see their connection to others as a motivating influence. This notion is based in the work of scholars who see the connection to others in a community as a way of existing. The connection to others means that their actions and beliefs are inextricably connected to each other person's actions and beliefs.

It follows that in a community that is both caring and aware of the connections to community that critical thinking would be a constructive activity. Rather than view critical thinking as a form of fault finding, it may be viewed as a process whereby people share and jointly analyze ideas and assumptions with the intention of improving practices and the ideas that inform those practices. Thayer-Bacon (2001) emphasizes that critical thinking is an activity where in the community constructs understanding jointly by calling it "constructive thinking" (p. 5) rather than critical thinking.

*Critical thinking as productive activity.* Some scholars have suggested that the defining characteristic of critical thinking is that it is a skeptical approach to texts and claims and that critical thinking is a way to assess the validity or lack thereof of statements or ideas (Ikuenobe, 2003; McPeck, 1981; Siegel & Carey, 1989). In contrast to that notion, the purpose of this model of critical thinking that I propose is to, as a community of practitioners, reexamine assumptions and possibly revise them. The purpose of such activity is not to engage in philosophical debates for the sake of pondering and debating, but rather to contribute to the research and practice in instructional technology. Therefore, critical thinking should be perceived as a productive activity designed to generate new ideas and inform work in a helpful way. Critical thinking in this sense can result in assumptions that are the genesis of new theories and practices.

*Openness of critical thinking.* Critical thinking that is situated in a circle of examination within a community is not intended to arrive at an ultimate or final complete set of theories and assumptions. To do so would be contradictory to the principles and purposes of critical thinking discussed in this model. Instead, the critical thinking model proposed here is an open, evolving process that continually accompanies the work of scholarship, practicing, and designing. Openness of critical thinking and of the model proposed here is a necessary feature for several reasons.

Previously I discussed the circularity of critical thinking. Any critique or analysis must be based on a certain set of assumptions or, in other words, the critical thinking must begin with and be informed by certain beliefs and assumptions. Yanchar, Slife & Warne (2008) refer to this feature of critical thinking as "perspectival" (p. 276). Because critical thinking is unavoidably perspectival, it is then vulnerable to analysis of the assumptions and beliefs that guide that critical thinking.

Furthermore, because of the ubiquity of assumptions which I have discussed here and others have also discussed (Brookfield, 1987; Yinger, 1980; Yanchar, Slife & Warne, 2008), critical thinking should always be a part of one's practice, to help avoid unawareness of assumptions and the unintended implications of assumptions. If one were to follow a final, defined set of critical thinking rules, then that individual would risk analyzing assumptions without awareness of his own assumptions. The attempt to create a defined and final set of rules for this model of critical thinking would risk implicitly recommending that one practice without analyzing one's own assumptions. Openness to critique and change of one's critical thinking is a natural companion to the practice of continually examining one's own assumptions.

The sciences and technology are fields of perpetual evolution. New theories and new practices are regularly introduced and over time new paradigms and beliefs gradually gain acceptance in a community. This is manifest in the recent history of the field of instructional technology. During post World War II days, theories of instructional design relied on behaviorist theories and research practices. Then, theories and ideas from cognitive psychology began to influence the work of educational technologists. Most recently, there has been a shift in theories of learning as instructional technologists have pursued ideas based in constructivism. This more recent shift is based not only in a change in theories of learning (behaviorist vs. cognitive processing vs. constructivism), but in a philosophical shift or a paradigm shift from empiricism to a more contextual, relativistic perspective. If hidden assumptions often bring problems with them, as many have argued, then continued examination of such assumptions seems important indeed.

The principle of openness means that the very model which I discuss is not meant to be final or all-inclusive, but rather is open to change and adaptation. The assumptions on which I base this model are open to reexamination. And the model should be evaluated and adapted to varying contexts. Furthermore, through the processes of examination and dialogue, others may wish to make recommendations for additional principles that should be considered. Thus, this critical thinking model is open to revision and analysis that can improve the model and adapt it to needs in the instructional technology community.

*Practices of the Critical Thinking Model*

The core of the critical thinking model presented here consists of the principles which I described in the previous section. The principles would lead to practices in the

way designers and scholars approach their work, whether that work be designing instruction, developing research and theory or teaching methods and critical thinking in instructional technology. In this section I describe practices that extend from the principles of the critical thinking model. These practices serve as examples of how the critical thinking model is practiced. However, I do not suggest that critical thinking is limited to these practices. Rather, the habits of critical thinking based on the principles described above would include activities such as these while reflecting on theories, practices, or one's own work with the aim of uncovering assumptions and examining and evaluating them. Furthermore, where some people may find it difficult to uncover assumptions that they implicitly hold, these practices can help to develop critical thinking skills that examine assumptions.

*Possess an awareness of basic assumptions.* A useful starting place for critically thinking about one's work is a consideration of some basic, common assumptions. While there are many kinds of assumptions one could hold, there are some that are particularly relevant to the field and work of instructional technology, to the extent that these could always be referenced. Some philosophical issues are so fundamental to human beings that assumptions in those areas will influence a variety of beliefs and activities in educational practices, including how people view learning and instruction.

Many scholars agree that assumptions about the nature of knowledge (epistemology) are fundamental enough that they influence how people approach learning, interpret their own learning experiences, and make decisions in their learning. Slife and Williams claim that epistemological ideas are fundamental because "knowing is vitally involved in every discipline" (p. 65). Hofer (2001) described the broad influence

of epistemology in all aspects of human experience: “In our most mundane encounters with new information and in our most sophisticated pursuits of knowledge, we are influenced by the beliefs we hold about knowledge and knowing” (p. 3). The question of the nature of knowledge has received attention in instructional technology as scholars have discussed constructivism as an alternative to objectivism (Duffy & Jonassen, 1992; Jonassen, 1991). This debate addresses whether knowledge is something external to the learner and can be delivered to the learner, often called objectivism, or whether knowledge is only constructed by the learner, commonly referred to as constructivism.

Another philosophical concern centers on the importance of context. This is related to ontological matters. This view deals with the extent to which things in life, including people and knowledge, can be detached from their context and still retain their meaning and being. One extreme is an acontextual view which holds that any thing or concept can be isolated from its context without losing its purpose and meaning. The other extreme is the contextualist view which maintains that all things in life have their meaning because of their context and therefore, cannot be understood without their context; changing the context changes the meaning of the thing. How one answers this question has implications for research methods as well as instructional practices. The acontextualist view allows for a construct or object to be abstracted from its context and observed as an isolated, self-contained unit. This view enables the empirical research, which relies on abstraction and objective study in controlled conditions. The contextualist view promotes a kind of research that considers a given construct and its context as one whole and the two must be studied together in order to understand either. Because of the

dependence on context, observations from such research are also inextricable form the context and therefore not generalizable in the traditional, lawful sense.

Another area in which assumptions have implications for learning and instruction is that of human agency. This issue deals with the extent to which humans are agentic individuals, solely responsible for their decisions and whether other things or conditions can determine the behavior and choices of an individual. Deterministic views include biological determinism, social determinism, and in instructional technology there has even been discussion of technical determinism (McDonald, Yanchar & Osguthorpe, 2005).

These assumptions I have described above are just a few examples of philosophical assumptions that have implications for instructional technology. Others may also be identified. Consideration of such fundamental assumptions aides the individual in recognizing the depth at which assumptions can operate and how pervasive they can be. It also helps the practitioner begin to engage in critical thinking at the level of assumptions. When one considers issues such as these, that person is more able to critically think about his or her own work.

*Examine motives.* To discover assumptions that underlie one's own work, a person might ask "Why am I doing ___?" This kind of reflection can lead the designer to pay attention to why decisions are made. Is he choosing to include video examples of a motor skill because he believes that people learn better from modeling than textual descriptions? Perhaps follow up questions would help, "Why would video demonstrations be better than some other method? What do I believe about how people learn this kind of skill?"

When the designer begins to examine motives, answers might be either practical or theoretical. Practical motives include “because it was requested by a manager” or “because it needs to be distributed to a large number of people in various locations.” Theoretical answers may be something like “because this best addresses how I believe learners process knowledge” or “because this best reflects the need for learners to set their own goals.” Whether practical or theoretical, an examination of motives can lead to more questions and the discovery of other assumptions.

In the case of practical motives for making a design decision, analyzing those motives can uncover simple assumptions as well as alternatives to those assumptions. For example, a design feature was requested by a manager, perhaps the designer assumes that the manager had a reason, when in fact there was no compelling reason, but rather the request was just intended as guidance to give employees something to start with. Or perhaps the designer assumes that she can’t suggest alternatives to the manager. Recognizing these assumptions can lead to further dialogue with managers. And alternatives that may be more appropriate can be considered. If a format was chosen because instruction needs to be delivered by distance to many people, perhaps the designer is assuming that this is the only method through which distance learning can be made available. Recognizing this assumption can lead the designer to consider alternative formats for delivering distance learning and then the designer can use other values and assumptions to choose between several distance learning delivery methods.

It is possible that an examination of motives will result in answers such as “I don’t know why I’m doing this; it just seemed like what people do for this kind of instruction.” In cases where a designer finds that he or she has made decisions for reasons

such as “this is just what’s done” it can be useful for the designer to question why a practice has come to be what it is in the first place. Perhaps the designer’s own assumptions about a practice haven’t heavily influenced the decisions of a design, but there are still assumptions that informed the practice that is being replicated. Furthermore, the designer may discover assumptions related to personal values with questions such as, “Why do I choose to design this in the same way as everyone else before me has designed this kind of product? Do I value uniformity of these products more than I need to? Should I be guided more by other values as I make these design decisions?” The process of reflecting to discover motives and assumptions may not always be a neat process. Asking one question may lead to several more. But the process of reflection should ultimately lead to the discovery of a set of assumptions that have worked together to arrive at the present design. And such reflection and discovery can lead to alternative assumptions and alternative actions.

*Discover assumptions.* In the previous process of examining motives I suggested that further questioning and examination can lead to recognition of more assumptions. This step helps the designer see how those reasons are connected to theoretical beliefs or assumptions. Here the designer asks, “Given that I do this, what does that say about ___?” One might fill in the blank with terms like *learning*, *knowledge*, or *human agency*. It is during this kind of reflection that the designer more clearly sees how decisions and designs are connected to assumptions about the world and human experience. This kind of reasoning and dialogue is facilitated by an awareness of different kinds of assumptions.

Consider, as an example, the practice of constructing scaffolds as embedded interaction in an instructional computer-based program. The simplified definition of scaffolding is that it is the process of providing support in doing something that one—the learner—cannot yet do without help (Wood, Bruner & Ross, 1976). Designers who design instruction to be hosted on a computer system sometimes attempt to incorporate helps or scaffolds in their system to aide the learner in the learning process (Chen & Bradshaw, 2007; MacGregor & Lou, 2004). However, the designer might pause to consider what the efforts to create computer-embedded scaffolding say about learning and sociality. Can a computer program represent a person and simulate a human interaction such as scaffolding? To accept that practice, then one must also accept that it is not social interaction that gives meaning to one's experiences, but the processes that are sometimes enabled by other humans. On the contrary, Pea (2004) suggests that perhaps the aspects of human interaction that make scaffolding possible are those of interacting with "someone who's performances and knowledge one could personally aspire to as a cultural issue and involving at it's core a sense of identity, an affiliation with that person and their values, language and activity components as a part of a community of practice" (p. 437). This is fundamentally an ontological question about the individual vs. social nature of human beings, brought on by considering what a practice says about the nature of human beings.

*Examine implications.* In order to thoroughly analyze assumptions, one must also consider the implications or consequences of those assumptions (Slife & Wiliams, 1995). This kind of analysis examines where the assumptions lead. The practitioner might ask questions such as, "If that is what I believe about___, then what would be the most useful

kind of experience for a learner?" The designer considers how a certain belief about something like learning or human motivation leads to a corresponding design of a learning environment.

For example, a belief that has wide-reaching implications is that of the necessity of context. Contextualism is the belief that nothing can be understood without its context, but must rather be viewed holistically (Jaeger & Rosnow, 1988). Yanchar (2005) summarizes this postulate:

> Contextualism implies that the meanings or qualities of any individual, part, or element are not self-contained or inherent in the part, individual or element, but derive instead from its relationship to other parts or elements and the larger whole (or context) within which it is situated. (p. 172)

That view stands in direct contrast to an atomistic view that a thing can be abstracted from its context and retain its meaning such that it can be understood or learned (van Merrienboer, 2007; Yanchar, 2005). The instructional designer who holds a contextualist view would ask, "If that is what I believe about context, then what does that say about how people learn?' The answer would be that learning cannot be organized around discrete learning objectives, but rather knowledge must be gained in the context in which it is found in the world. That is part of the premise behind designed learning experiences such as cognitive apprenticeships (Collins, Brown & Newman, 1989), The Adventures of Jasper Woodbury (Cognition and Technology Group at Vanderbilt, 1992) and TALL—Technology Assisted Language Learning at Brigham Young University (South, Gabbitas & Merrill, 2008). The contextualist assumption also has implications for instructional design models. In traditional models, "complex contents and tasks are reduced into

simpler elements…. [This approach] does not work well if the elements are interrelated to each other. Then the whole is *more* than the sum of its parts" (van Merrienboer, 2007, p. 73). Another example of the implications of the contextualist assumption is found in research methods. An atomistic approach to research relies on operationalizing and abstracting a given construct and studying it in a controlled lab-like environment. However, a contextualist view has implications for how research is conducted. A construct or intervention must be studied and understood in its context. This view leads to research methods such as design-based research (Design-based Research Collective, 2003) and classroom design experiments (Cobb, 2000).

*Evaluate assumptions and implications.* Evaluating assumptions and implications means making judgments about them. One would ask questions such as, "Does that assumption reflect what I really believe?" This is different from the previous step in which the individual examines the implications of assumptions in an effort to better understand those implications. In this step, the individual uses criteria to make judgments about those implications. For instance, it is common in the behavioral sciences and psychology to talk about what determines a given condition or result. The focus on determinism and causation necessarily emphasizes the primacy of events—that is, what happened before a given condition or result in order to cause it. (Slife & Williams, 1995). The focus on determinism leads researchers and practitioners to look for the cause in past events. In education this determinist perspective is most readily seen in behaviorist approaches, which look to the stimuli associated with rewards and punishments and elicit behaviors. While the behaviorist view was the dominant view in educational technology several decades ago, it is still influential. Educational psychology and instructional design

texts consider behaviorism an important part of the theories that explain human learning and behavior and recommend behaviorist practices as a part of the designed learning environment (Driscoll, 2004; Ormrod, 2007). Slife and Williams (1995) point out that many scientists agree that determinism, of which behaviorism is one type, is incompatible with the notion of human agency or free will. And so, if the scholar or instructional designer who is contemplating the use of behaviorist recommendations in a work, stops to trace how determinism attributes cause to some prior event or condition, he may recognize this deterministic claim of behaviorism. He can then compare it with his beliefs about human agency. If he believes that humans possess agency and must choose their actions, that belief is incompatible with the assumptions of determinism. Becoming alerted to this incompatibility of the assumptions of a practice with his own beliefs, the individual can begin to consider new ideas and practices as alternatives to the behaviorist approach.

Another way to evaluate assumptions is to consider how a given assumption fits with other assumptions. Such analysis can be addressed with questions like “How do my assumptions about ___ fit with assumptions about ___?” As an example, I return to the practitioner who is considering behaviorist practices in an instructional design. The designer also holds assumptions about the nature of knowledge and knowing. Suppose that the designer professes a common perspective in instructional technology today: the designer believes in constructivism and that individuals are not the recipients of external knowledge, but rather they must construct knowledge. How then do these assumptions fit together? The constructivist view is based in the belief that knowledge is connected to its context. This is a monistic view of the human experience. The behaviorist view, on the

other hand, is dependent on a dualistic view of the world in which the individual is separate from the surrounding world, and all external experiences are perceived and transmitted to the internal world of the learner. Critically thinking about assumptions can lead the individual to find common ground between different assumptions. The process of trying to rectify those differences leads to a consideration of alternative assumptions.

*Consider alternatives.* Considering alternative assumptions really serves two purposes: it allows the individual to revise assumptions after evaluating them, and it can help the individual better understand his or her own assumptions by exposing them to alternatives. In order to consider alternative assumptions the individual could ask, "What alternative assumptions might exist?" In the case of the professional who finds that deterministic assumptions of behaviorism contradict beliefs about agency, he can consider alternatives to a deterministic view. Slife and Williams (1995) suggest that a dilemma potentially exists when considering determinism and agency in large part because of assumptions about linear time and causation. They identify this determinism that underlies most causation in the behavioral sciences as efficient causation which involves the movement of things across linear time. They then describe alternative assumptions which reject linear time and view actions and goals of individuals as one whole. Some philosophers find in this alternative view of time and causation a way to understand human agency. (For a more detailed explanation of causation and human agency, see Slife and Williams, 1995, chapter 4.)

Sometimes it can be difficult to imagine alternatives to the assumptions that one holds because it is through those very assumptions that one must arrive at alternatives. This is the circular nature of analyzing assumptions I discussed earlier. Community

sharing and dialogue is an important part of considering alternatives. It is through encountering other ideas and assumptions that one can become aware of alternatives. And, as I mentioned previously, the analysis of assumptions should always include a consideration of the implications. When considering alternative assumptions to see where those assumptions lead, one should again consider the consequences or implications by asking, "Given that alternative, how would this learning environment or instructional piece be different?"

*Practicing the Model*

The model of critical thinking presented here and supported in scholarly literature (Brookfield, 1987; Hostetler, 1994; Mezirow, 1998; Slife & Williams, 1995; Thayer-Bacon, 2000, Yanchar, Slife, & Warne 2008;) is a composite of ideas and principles. Rather than a sequential series of steps, this model is made up of principles and practices that work together and iteratively. The principles provide a guiding understanding of assumptions and the practices offer suggestions for how one might engage in critical thinking given those principles. In some ways, the principles are assumptions themselves and the practices are consequential decisions that extend from the assumptions. Putting them into practice should not be formulaic. The model is practiced continuously as a form of reflection during practice and can guide the instructional designer or researcher during in the process of making decisions.

## Example of the Critical Thinking Model: Web-based Learning

To demonstrate how the model which I have discussed can help to uncover and analyze assumptions, I will develop an example of the practice of critically thinking about assumptions based on a common practice in instructional technology. This section is intended to demonstrate how the critical thinking model can lead to a better understanding of issues related to practice and theory. The example is not an example of how someone would use the model per se, but an example of how critically thinking about assumptions can uncover hidden ideas that underlie the practice. The purpose of the example is to demonstrate the ideas that can be uncovered through critically thinking about assumptions. I have chosen to use web-based learning as the context for this activity. The emphasis of this section is not web-based learning; in fact, any other practice could be used instead of web-based learning. Rather, the purpose of this section is to show how the model of critical thinking provided here can help the practitioner analyze assumptions when using web-based learning as a frame for an instructional design.

### *Background of Web-Based Learning*

Web-based learning, also referred to as online learning, refers to learning environments that are hosted and delivered on the internet or an intranet. It shares the characteristics of hypertext or hypermedia learning (Azevedo & Cromley, 2004; Moos & Azevedo, 2008) in that both are designed to allow the user to navigate through information that is associated by links and web-pages. Because web-based learning relies on learner control and often incorporates multi-media, it is considered to be a tool well-

suited for instructional technology, with its focus on instructional practices facilitated by new technologies and learner-centered control (Brush & Saye, 2001).

Designs of web-based learning environments are varied, even when derived from a constructivist-oriented literature base. Despite the various constructivist and learner-centered affordances of web-based learning (Kauffman, 2004; Lehman, Kauffman, White, Horn, & Bruning, 2001), its implementation varies ranging from practices that are highly structured and instructor centered (e.g. Cho, 2004; Dickey, 2008) to practices that are ill-structured and student-centered (Khalifa & Lam, 2002; Kauffman, Ge & Xie, 2008). Thus, web-based learning serves as a good example of a practice that can vary widely depending on the assumptions and purposes of the designer. This fits my proposal that a critical thinking approach that considers assumptions can influence the decisions of the practitioner or scholar.

*Critically Examining the Motives to Uncover Assumptions*

The instructional designer who is considering developing a web-based learning environment can use assumptions to guide the decision making process of instructional design. As I have previously argued, assumptions will always guide that decision making process, whether or not the designer is aware of the assumptions. By becoming aware of assumptions, the designer can act deliberately in making decisions and ensure that the assumptions that guide the design are those that are aligned with other values and beliefs.

As described in the practices of the critical thinking model, examining motives is a useful way of discovering assumptions that are already guiding one's work. Here the designer asks why he is using a web-based platform for the learning environment. In some cases a web-based platform may be chosen because it incorporates a new and

exciting technology. When a format is chosen because of its technology, the designer should consider whether the technology is really the best technology for meeting other goals. Using an ill-fitted technology for the sake of technology can result in poorly designed learning experiences (Cuban & Kirkpatrick, 2001).

Instead of allowing unrecognized assumptions to guide the choice of a learning platform, the designer can instead choose the assumptions and values that he or she believes should guide the design of the learning environment. A web-based learning environment affords several capabilities that are particularly well-suited for a student-centered learning environment. Student-centered learning environments are purposely designed to be open to allow learner control and learner choice of goals, and ill-structured to allow various ways for the learner to solve problems (Brush & Saye, 2001; Hannafin & Land, 1997). This open and ill-structured environment can promote constructivist experiences in learning. Because a web-based learning environment is made up of hyperlinks and web pages capable of displaying interactive and multimedia activities and representations, it allows a designer to build a student-centered environment.

*Designing and the Role of Assumptions in Web-based Learning*

The instructional designer who thinks critically about his work may ask specific questions to tease out other assumptions that were not considered by an analysis of motives. In this critical thinking model, I recommend considering fundamental ideas such as the nature of knowledge and learning. A necessary part of thinking critically about the assumptions is considering the implications those assumptions have for one's work. As the instructional designer examines those implications, he will find that different assumptions can lead to drastically different design and implementation of instruction.

Instruction developed for web-based delivery has varied widely in design (Khalifa & Lam, 2002), perhaps, in part, because of the varying assumptions of those who design the instruction.

Fundamentally significant assumptions about knowledge and learning can help the instructional designer make important decisions. By critically thinking about these assumptions the designer examines the implications that those assumptions hold for the ultimate design and eventually lets that examination either guide the design of instruction or guide the individual in modifying his or her assumptions. The instructional designer who holds assumptions that learning is primarily mediated by the learner and knowledge is something that exists within the learner is more aligned with a constructivist perspective (Hannafin & Hill, 2007). If knowledge is situated in the individual and constructed through the individual's own experiences and mediation, then the designer would seek to create learning experiences in which the learner engages in those processes. Rather than provide direct instruction for the learner to acquire knowledge, the designer creates contexts in which the learner negotiates goals and learning paths. A web-based learning environment provides a variety of features that the designer can use to create this environment. Hyperlinks allow the designer to create a non-linear path rich with information in which the learner controls the path and the learning experience. For example, some educators create learning environments for the web that are authentic and open so that the learner can engage learning in a context and construct knowledge through it (see for example, the WISE project in which primary and secondary education students engage in online science experiments centered on an inquiry approach to science education: http://wise.berkeley.edu/).

The implications of contextual, constructivist assumptions about learning and knowledge not only influence the general design of a learning environment in terms of structure and student-centeredness, they also influence the tools and features the designer might consider. For example, a web-based design that is student-centered and ill-structured places certain demands on the learner (Hannafin, Hannafin & Gabbitas, in press; Land, 2000). In order to negotiate learning goals and a learning path, and to make decisions during learning, the learner must be able to monitor and regulate his or her learning (Azevedo & Cromley, 2004). Tools can be designed in a web-based environment to help the learner regulate learning and make useful decisions (e.g. Kauffman, 2004; Kauffman, Ge & Xie, 2008; Wang & Lin, 2007). Furthermore, when the learner engages in constructivist learning, he or she may need help in detecting misconceptions and building theories. For this, tools and pedagogical agents can be designed which act as scaffolds to assist the learner during web-based learning (e.g. Chen & Bradshaw, 2007; MacGregor & Lou, 2004; Yung, 2009).

Thus, assumptions about learning and the nature of knowledge have implications for the design of instruction and the tools needed to support learning. Contextualist or relativist beliefs lead to beliefs about what kind of learning experience and what kinds of tools are needed in a web-based learning environment.

*Conducting Research and the Role of Assumptions in Web-based Learning*

As with any platform or instructional design strategy, research is a significant endeavor, both from the perspective of the researcher who develops a research design as well as the instructional designer who may be influenced by research-based recommendations. Decisions and judgments relevant to designing and using research can

be guided by a consideration of assumptions. Researchers can critically examine assumptions to make sure that a research design is appropriate for a given learning environment. And instructional designers can think critically about assumptions to choose the research that guides their design choices.

*Asking the right questions and the assumptions of research designs.* Critical thinking about assumptions in research can lead to research that is matched to the instructional approaches and assumptions. Research designs that don't share the same assumptions of the learning environment that provides the context for research ask questions that were perhaps never intended to be addressed in the learning environment. In this sort of incongruous research setting, the research results may or may not be useful, and the results can't be used to say anything about whether the learning environment helps meet the intended purposes.

Research in web-based learning has been influenced in large part by cognitive psychology. Mayer's highly influential work in multimedia learning (2005), which focuses on the effects of multi-media designs on cognitive processing and cognitive load, has led to a number of studies based on his cognitive theory of multimedia learning (CTML). The cognitive approach to multimedia learning is repeated in a number of studies similar to Mayer's work with emphasis on different aspects of multimedia design and cognition including the effects of worked examples on cognitive load (Renkl, 2005), the role of prior knowledge and working and long-term memory (Kalyuga, 2005), and navigational aides and conceptual activation in memory (Rouet & Potelle, 2005). Because web-based environments are typically multimedia as well, researchers in web-based learning embrace many of these ideas which are based on cognitive psychology.

The field of cognitive psychology is based on certain assumptions about knowledge and being. Cognitive psychology is based in an objectivist view which holds that knowledge is independent of the individual (Crotty, 1998; Hannafin & Hill, 2007). Additionally the work of cognitive psychology is based in empirical methods of scientific research. These assumptions are in conflict with some of the assumptions of constructivists who often hold a contextual, relativist view of knowledge (Hannafin & Hill, 2007; Yanchar, 2005). Thus when constructivists who are working in web-based learning rely on the empirical studies of cognitive psychology, they are embracing assumptions which are fundamentally incompatible.

When critical thinking helps the researcher detect these conflicting assumptions, alternative research and research designs can be considered. Many of those who embrace a contextualist or relativist paradigm believe that because no entity can be properly understood outside of its context, research methods must involve observations of real-world environments with due consideration given to all aspects of that environment (Yanchar, 2005). They also believe that, because one context is different from another, research results cannot be generalized to entire populations, but can only be adapted to other contexts. These assumptions about the nature of *being* lead the researcher to rely on methods and research that are very different from the empirical approaches of cognitive psychology.

Despite the differences between assumptions in cognitive psychology and constructivist learning, it is not uncommon for researchers to blend research and ideas from the two paradigms in the same scholarly work. For instance, in one study (Chen & Bradshaw, 2007), scholars laid out a theoretical framework based on constructivist ideas

and literature that espouses contextualist assumptions and then conducted an experimental study that used scientific methods and quantitative analysis of results. It has been argued that the assumptions of scientific method, with abstracted subjects, operationalized constructs and sampling of populations for the purpose of generalizing results is contrary to the relativist, contextualist view that constructs of the human experience are abstractions that fail to consider the context of the construct and generalize results from one context to groups of entirely different contexts (Crotty, 1998; Danziger, 1985; Yanchar, 2005). This analysis of assumptions suggests that certain research methods are incompatible with particular theoretical frameworks. Another potential for conflicting assumptions in scholarly research comes when researchers provide a framework for their study by citing previous studies which, themselves, contained conflicting assumptions. If the cited studies themselves rely on conflicting assumptions, then the conclusions they make are, at best potentially irrelevant to the present study, or worse, they contain questionable conclusions and fail to provide substantive support for the present study. Choosing research studies with conflicting assumptions to establish the basis for a study ignores the different implications those studies might have for one's own research. Researchers who are using web-based platforms for student-centered, constructivist learning environments may wish to be cautious in how they reference previous research and in how they design their own research.

*Considering the relevance of the research.* Research considerations are also important insofar as they influence practitioners and instructional designers making decisions. Cognitive research in web-based learning has led to certain recommendations

concerning, for example, the delivery of content using simultaneous modalities (Mayer & Sims, 1994), scaffolding via pedagogical agents (Moreno, 2005; Yung, 2009), and aiding navigation with prompts and site maps (Shapiro, 2005). However, a different view of those same results may offer a different explanation of the results, and consequently, different recommendations for practice and design. So an instructional designer's work may be changed by critically thinking about assumptions and the research he or she uses to inform design work.

For example, in cognitive load theory, there exists the idea that working memory must be able to process information and can be overloaded with too much information (Van Merrienboer & Sweller, 2005). Research studies which present multiple representations of information through various stimuli suggest that working memory can only process limited amounts of information in various modalities. Various recommendations exist about how much information can be presented through different stimuli (visual, aural etc.) simultaneously and how redundant it should or shouldn't be (speaking, writing, diagrams etc.) in order to not overload the working memory (Mayer, 2008). This approach is based in cognitive psychology assumptions about how knowledge is acquired through the processing of the brain.

However, another set of assumptions in which knowledge is viewed as embedded in the lived experience of the person, would not consider the processing limitations of the brain. Rather, the emphasis would be on the lived experience that is represented in a multimedia presentation. Simultaneous messages through multiple stimuli may be confusing because they represent different communications from different sources at one time—like listening to several speakers at once. But one represented lived experience

might include video of a single individual talking and writing a diagram on a board at the same time. This experience is created with several modalities of information at the same time and potentially redundant, but because they all create one experience, the learner may not be overwhelmed, as is believed in cognitive load theory. Using contextualist assumptions to guide one's work, rather than focus on the number of modalities and the overload of the brain's processing, the designer would focus on the experience created.

I am not arguing that the cognitive perspective of working memory or the contextualist's view of the lived experience is the better explanation of the phenomena observed in psychological studies. Rather, I am illustrating how a different set of assumptions about the world can be used to interpret the same data and lead to very different recommendations. This practice is in accordance with the recommendations of the critical thinking model proposed in this thesis, which includes considering assumptions of extant theories and work, considering the implications and considering alternative assumptions and what those implications might be.

Additionally, by thinking critically about the assumptions of practices and research, the instructional designer is engaging in a reflective practice that avoids rule following. One of the problems with design by rule following is that the designer risks not understanding the reasons for rules and practices and therefore, not faithfully implementing the practices. Some have suggested that rule-following in design leads to uninteresting or less-effective instruction (Dick, 1995). One reason for this problem may be because the assumptions which inform his work remain in the background and may actually conflict with the practices he seeks to implement. Such a conflict can lead to a failure to actually implement a given set of practices or to a flawed implementation.

However useful and valuable a set of design rules may be, if not understood at the level of underlying assumptions, their implementation may not be as effective. Thus thinking critically about the assumptions of practices and theories can aid the designer to both faithfully implement practices when deemed useful and to arrive at new or alternative practices when existing practices are determined to be less useful.

*Privileging the Technology*

There are various ways web-based learning could be designed, as well as various ways to research issues associated with that platform. The variation depends on the assumptions of the designer or researcher. Given the wide variety of designs possible, it is not sufficient to refer to web-based learning as if it were a monolithic approach. Yet the number of studies that deal with web-based learning generally, with no distinction of types of instructional design (e.g. Chumley-Jones, Dobbie, Alford, 2002; Wang & Wu, 2008) suggests that some may view web-based learning as a single entity in which the various implementations and designs are merely variations of the same learning environment. To view web-based learning thus privileges the technology over the instructional approach and design, as though the technology alone were the primary influence on learners' behavior and learning experiences. Such a view is a kind of technological determinism in which the technology is seen as determining the experiences of those who use it (Kritt & Winegar, 2007).

Technological determinism is the view that technology is the primary force for causing change in society (see Postman, 1992). To hold such a position assumes that the technology itself has inherent characteristics that are more influential and powerful than other considerations such as the agency of the individual and the values of a society. In

this same sense, imbuing the technology with such deterministic influence can happen in education and instructional technology. McDonald, Yanchar and Osguthorpe (2005) describe how technological determinism is manifest in instructional technology. They point out that in the 1950s and 1960s, when programmed instruction was growing in popularity, some believed that the machine itself determined optimal learning experiences for the learner. They then suggest that today some scholars in instructional technology make the same assumption about web-based or online learning; such scholars claim that the technology itself has the power to cause active learning and to make learners engage in better inquiry and learning (see Crane, 2000; Ellsworth, 1994). The problem with this kind of technological determinism is that it places "an unrealistic faith in technology without considering other factors crucial to learning" and those who hold this deterministic view "may assume that adding technology is enough" without paying attention to those factors (McDonald, Yancahar & Osguthorpe, 2005, p. 90).

Instructional designers and researchers who treat all web-based learning as a single entity, without consideration for other design characteristics, assumptions about learning and the experience of the users, are acting on a kind of technological determinism, whether implicitly or explicitly. By placing emphasis on a critical thinking practice that uncovers and evaluates assumptions, practitioners detect tacit ideas that privilege the technology over other factors. Also, because the critical thinking model recommended here promotes an awareness of fundamental philosophical assumptions, designers consider other ideas such as assumptions about the nature of knowledge and the ontological experience of the user who is engaging new knowledge, and are thus more

likely to keep in balance the privileging of one deterministic factor to the neglect of others.

*Concluding Thoughts on the Importance of Assumptions in Web-Based Learning.*

Web-based learning and instruction is an exciting medium for a number of reasons: it offers convenience and the capacity for delivery across great distance, it uses features that allow a non-linear, ill-structured design that is seemingly ideal for student-centered learning experiences, and the multimedia presentation that now seems germane to the web offers various ways to deliver and experience information. Thus scholars and researchers with a variety of beliefs and theoretical groundings are contributing to the work in web-based learning. However, often it seems to be treated as a single, self-contained entity manifesting its own characteristics. As such, scholars may be inclined to accept any web-based activity as comparable with others because of the common platform. However, by critically thinking about the assumptions that underlie various designs of web-based learning and research conducted with web-based learning, it becomes apparent that web-based learning is potentially seen in a variety of manifestations, each different according to the assumptions that guide the designer or scholar who directs the work. By demonstrating how assumptions—both tacit and acknowledged—guide the work of designing web-based learning environments, I suggest that the same activity is possible with a number of practices in instructional technology. It is the assumptions that define the practices, not the unique characteristics of the practices themselves, and by understanding the assumptions that guide the work of others and one's own work in a given area, the scholar/designer can achieve desired goals in a more useful, coherent way.

## Conclusion

Critical thinking is still a valued and necessary part of academic scholarship and technical design and development. However, common models and frameworks for critical thinking do not adequately allow for full analysis of one's positions and work. A critical thinking framework must consider the need for and difficulty of analysis of assumptions. In this thesis I have introduced for the field of instructional technology a framework for critical thinking that fully considers assumptions. This model can be useful for practitioners and scholars alike. Because it is a re-conceptualization of what critical thinking is, it serves those who talk about critical thinking explicitly as well as those who work and practice in their own specialized area and critically think about their own work. This model is also useful in that it addresses some of the difficulties of analyzing one's own assumptions. It is a difficult task to see the ground on which one stands, however, an awareness of the issues, careful thinking, and participation in a larger community can help one gain added understanding of one's own hidden assumptions.

This model does not represent a whole-sale replacement of other critical thinking models. Where it does not conflict with the assumptions of other approaches, this model can provide a complement to those efforts to critically examine one's work. Where other models advocate evaluating one's work by a set of standards or values, this model helps the individual to see the assumptions behind the model or the standards and values they employ.

I have demonstrated that assumptions are unavoidable and ubiquitous. Thus, I must acknowledge that my own arguments here and the critical thinking model which I

have advocated are based on assumptions. I hope I have been as faithful as the model I advocate in reflecting on my work, considering my own assumptions and considering alternatives throughout this process.

Continued dialogue on this subject should bring added insights into how to usefully and critically think about one's work and one's assumptions. One way that this process could be facilitated is through research that practices the tenets of this model and observes the experiences of those who try to develop their work using these practices. Such experiences may lead to additional key principles or key practices that make critical thinking about assumptions more useful. This thesis has been a conceptual effort to present a model. Additional research into how this model is learned and adopted could aid in the transmission of this work, thus, helping the work go from the realm of ideas to the realm of practices.

This thesis is not potentially significant only to those interested in critical thinking. When one begins to understand the nature of assumptions—that they are ever-present and that they have real effects on practice—then one begins to realize that the need for critically thinking about assumptions extends to all who work in the field of instructional technology. Such work has the potential to shape the field of instructional technology as it continues to evolve and change. Furthermore, the work of critically thinking about assumptions has the potential to inform and shape the products and instruction that result from the work of instructional technologists. While the challenge of thinking critically about assumptions may seem time-consuming or burdensome, it is no less significant than the care researchers take in the design of their research or the attention designers give to their design practices. Thinking critically about assumptions

can become a regular and consistent feature of work and research in instructional and technology design.

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