LONERGAN'S METHOD: A FRAMEWORK FOR ANALYZING ONLINE LEARNING IN DESIGN EDUCATION

BY

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LEONA ROUSSEAU

A Thesis/Practicum submitted to the Faculty of Graduate Studies of The University of Manitoba in partial fulfillment of the requirement of the degree

of

MASTER OF INTERIOR DESIGN

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ABSTRACT

Online learning environments are being employed with increasing frequency for post-secondary teaching and learning. Academic programs are being pressured by administration, learners and other stakeholders to offer courses and or entire programs online and must decide how to meet these growing demands without compromising quality. Gradually, design courses too, in whole or in part, are among those being offered online. Despite existing studies the ability and capacity of online environments to foster and or enhance the learning process in design education has not been ascertained. Factors defining how the cognitive process of learning might be fostered or enhanced remain unknown as are the specific advantages and disadvantages of online environments as a viable new learning environment for design education.

This thesis utilizes Lonergan's Method of Human Understanding (his cognitional theory) as a theoretical framework from within which to analyze online learning environments as a means to determine what, if anything, online environments may uniquely contribute to the cognitive process of learning to design. Only by analyzing online environments within a framework that at once defines the cognitive process of learning and the cognitive process of learning to design will insight and understanding be gained as to the potential of online learning environments in design education. An integrative inquiry was the research methodology employed for this investigation. As explained by Marsh (1991), this form of integrative inquiry draws on salient knowledge from existing studies that is pertinent to and may enlighten the research issue. Existing studies are then screened and synthesized into a useful format.

Results of the study indicate that online learning environments have the potential to facilitate and or enhance the cognitive process of learning to design primarily at the level of Experience and at the level of Understanding. Due to the predominantly reflective nature of the higher, more complex cognitive levels of Judgement and Decision, online environments may lack the potential to contribute significantly at these levels of cognition.

Lonergan's Method: A Framework for Analyzing Online Learning in Design Education

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CHAPTER 1
About this Study

Introduction

Online environments have become a significant influence in our lives with both positive and negative effect. Their presence and persistent use yield both advantages and disadvantages. With escalating use in all business sectors, the complete integration of this technology in post-secondary education has become vital, but how is it best utilized or applied in the academic realm? Post-secondary education has embraced and adopted online environments for teaching and learning and will soon be faced with the impact of those swift decisions. Online environments have been touted as having far-reaching benefits to teaching and learning by those with zealous expectations, infectiously spurring further acclaim. In stark contrast, critics argue that while more information may be available there is less knowledge, clearly to the detriment of learners. There is a critical need for what Hlynka calls a "dispassionate middle-ground", a sober look at what online environments realistically have to offer. What might they contribute to learning itself? How can they support the acquisition of knowledge, or can they? How do online environments truly differ from any other media or learning environment? Will online environments fulfill the promise of 'revolutionizing' education, or merely join their predecessors in a cache of teaching and learning strategies.

Statement of the Problem and Significance of the Study

Online learning environments are being employed with increasing frequency for post-secondary teaching and learning. Academic programs are being pressured by administration, learners and other stakeholders to offer courses and or entire programs online and must decide how to meet these growing demands without compromising quality. Gradually, design courses too, in whole or in part, are among those being offered online. Online courses are often implemented without

seriously considering or comprehending the impact, the advantages and disadvantages, to learners and the learning process. What predominantly has and continues to occur is a rash of quasi-learning experiments conducted as if online environments were merely another teaching tool or technique. There are very few studies that even remotely attempt to address the impact of online courses on learning in design education. Despite these existing studies the ability and capacity of online environments to foster and or enhance the learning process in design education has not been ascertained. Factors defining how the cognitive process of learning might be fostered or enhanced remain unknown as are the specific advantages and disadvantages of online environments as a viable new learning environment for design education.

This thesis utilizes Lonergan's Method of Human Understanding (his cognitional theory) as a theoretical framework from which to analyze online learning environments as a means to determine what, if anything, online environments may uniquely contribute to the cognitive process of learning to design. If online learning environments cannot be shown to facilitate or enhance the cognitive process of learning to design they will be difficult to advocate as new learning environments for design education. By analyzing online environments within a framework that at once defines the cognitive process of learning and the cognitive process of learning to design, insight and understanding will be gained as to the potential of online learning environments in design education. In turn, this new understanding may inform design faculty and administrators as to its appropriate role in design education and ways it may most accurately and effectively be integrated into design curricula.

Research Questions

The initial research questions identified for this study were based on a preliminary literature search to verify the need for and importance of conducting the study. As the study evolved, more

complex and central questions arose and were refined throughout the research process. The prominent questions addressed by this study include:

- What parallels can be drawn between Lonergan's cognitional theory and the cognitive process of learning to design?
- What, if anything, can online environments uniquely contribute to the cognitive process of learning to design?
- What are the advantages and disadvantages of online learning environments relative to the cognitive process of learning to design? What is gained? What is lost?

Research Methodology

An integrative inquiry was the research methodology employed for this investigation. As explained by Marsh (1991), this form of scholarship draws on salient knowledge from existing studies that is pertinent to and may enlighten the research issue. Existing studies are then screened and synthesized into a useful format. According to Marsh (1991) an integrative inquiry includes: establishing need for the said knowledge and verification through a preliminary literature search; search and collection of existing literature and research pertinent to the investigation; reviewing, analyzing and selecting relevant information from the literature and research collected; developing an appropriate framework within which to organize data and draw new relationships, perspectives or insights; and lastly to integrate and interpret the findings to form a useful material product. For this study, existing research from the areas of online learning and online learning environments and design education were collected, analyzed and synthesized within a new context, a unique conceptual framework, in order to gain new insights and understanding of online learning environments, their impact on knowledge acquisition and their potential in the realm of design education. Findings from existing studies of online learning and online learning in design education were extracted then related to and organized within the levels of Lonergan's method, the conceptual framework.

A preliminary search of literature and research regarding the application of new and emerging technologies with emphasis on the internet, in interior design and architecture education, verified

the need for this study. There was a significant lack of studies involving learning theory and cognitive processes in relation to educational technologies and online learning environments in particular.

A more extensive literature search and documentary analysis yielded a collection of data that spanned several distinct areas of study each having their own breadth, depth and array of issues. The predominant areas included: contemporary theories of learning and understanding, interior design education (learning and learning environment), and theories of online learning and the online learning environment (often referred to as internet pedagogy).

Collected literature and studies from these areas were systematically examined and relevant knowledge extracted. Data was then organized and analyzed within a conceptual framework that focused specifically on the cognitive process of knowing or learning and its relevance to the cognitive process of learning to design. Lonergan's Method of Human Understanding (his cognitional theory) was selected as the conceptual framework for several reasons:

- The method offered a unique philosophical perspective that takes into account the complex layers of human consciousness, responsibility, morals and ethics, the role of human error in learning and 'two ways' of knowing: through discovery and through verification of authority;
- The method is universal, applying to all humans and deals with knowledge acquisition at a fundamental level, (rather than focusing on specific aspects of learning such as memory, outcomes, observable behaviour and the like as other learning theories do);
- There are parallels between the method and the cognitive process of designing and learning to design (both problem-solving processes);
- The method provided a means to analyze the impact and potential of online learning environments at each level of the cognitive process, each level of consciousness, as well as the whole.

Lonergan developed and applied the method to his research in the discipline of theology and intended for others to apply and understand it in relation to their own fields that it may provide

new insights. The findings of this study were ultimately synthesized, interpreted, and summarized.

Parameters, Assumptions and Scope

This study focuses on aspects of interior design education specifically but due to the overwhelming similarities and relationship to the broader architectural education, studies from both distinct fields will be drawn upon. Additionally, the findings may be generalizeable to architectural education and perhaps in part to landscape architecture and city planning, as all of these disciplines within the built environment share some common teaching and learning practices from delivery methods to the unique studio environment and their departments and programs are often housed within the same academic units. This study acknowledges but does not identify, describe, or highlight the unique differences of each distinct discipline mentioned above. The disciplines are "driven by different demands, and therefore have been affected differently" by certain changes. "Regulatory regimes, technologies, development processes, and supportive educational systems vary" with each discipline. They "have different histories and are in different stages of evolution...[thus, each discipline] is unique in structure and in the roles of its associations" (Price Waterhouse, 1998, p. 22-23).

Since the interior design profession requires preparation through post-secondary educational programs, it will be assumed that herein, *design education* means formal interior design education at the post-secondary level. To ensure design education data was obtained from sources of the highest quality, the study focused mainly on FIDER (Foundation for Interior Design Education Research) accredited courses and programs or architectural programs with equivalent accreditation.

When online environments, internet or online courses or programs are referred to in this study, it

should be assumed that they are either:

a) used in conjunction with traditional teaching and learning methods such as face-to-face with some course components online;

or b) stand-alone, meaning they are offered entirely online

Online environments and or their contents with respect to learning may be defined as any area or means accessible within or available through the Internet or world wide web that are at the disposal of learners.

Overview

Chapter One explained the essence, significance and scope of the study. **Chapter Two** provides a review and summary of existing literature and research from relevant fields including contemporary theories of learning and knowing, online learning and online learning environments, and existing examples and research of online environments employed in design education. **Chapter Three** outlines Lonergan's "generalized empirical method" (his cognitional theory) that serves as the conceptual framework within which online learning will later be analyzed in Chapter Four. Chapter Three also examines and draws parallels between Lonergan's method, the cognitive process of design, and the cognitive process of learning to design, thereby laying the foundation for subsequent chapters. In **Chapter Four** online learning environments are analyzed within the framework of Lonergan's Method to determine what, if anything, they may uniquely offer to enhance learning in design education. **Chapter Five** integrates and interprets the research findings and sites advantages, benefits and implications. Recommendations for future research are also discussed.

CHAPTER 2
Review Of Existing Literature and Documentation

This chapter provides a review of existing literature pertinent to the thesis topic. The thesis topic and central research questions incorporate three distinct areas of inquiry for which no precedents exist and as such a thorough examination and understanding of each area was necessary. The literature examined for this study can be divided into three primary categories: learning and knowing; online learning and online learning environments; online learning in interior design education. These distinct areas of research were identified with recognition of some overlapping issues. The literature related to learning deals mainly with prominent learning theories and their proponents from the fields of psychology and educational psychology, as well as a contemporary philosophical perspective. Existing theories of learning and cognition formed the foundation for the study and selection of a conceptual framework. The second category comprises a collection of research surrounding issues related to online learning in online learning environments in higher education and were later organized into the conceptual framework. The third and final category of literature concentrates on the unique and highly specialized content, curricula, learning objectives and processes of interior design education and online learning. Data from this area was related to findings from the second category then synthesized into the conceptual framework. The amount and availability of literature and examples regarding online learning and online environments grew steadily as this study progressed.

Learning

"Learning defies easy definition and simple theorizing" (Merriam and Caffarella, 1991)

The genesis of learning theory occurred within the realm of philosophical thought, amongst Platonian, Aristotolian, and Socratic perspectives. These early views were the foundation on

which later studies and learning theories were developed, and are distinguishable still (Gleitman, 1987, p.13; Merriam and Caffarella, 1991). While knowing and learning as process and product continued to be explored by philosophical thinkers, others such as Ebbinghaus (Hergenhahn, 1988) and later Wundt, began to examine learning through scientific means. Educational psychology had dawned—the scientific study of the human mind and knowing. Theories of the learning process are said to be useful as "a vocabulary and conceptual framework for interpreting" learning as it occurs and by drawing "our attention to those variables that are crucial in finding solutions" (Hill, 1977, p.261) to practical problems. Due to the enormous complexity of the subject, namely the human mind, and the extensive scope of potential investigations, most research continues to focus on particular aspects of knowing and learning such as behaviour, memory, motivation, instruction, development, nature/nurture, transmission or personality type and differences. What follows is a brief overview and summary of prominent theories on the learning process and related theorists salient to understanding the thesis topic at hand.

Behaviourist Theory

Behaviourist theories about the learning process focus on the change in a learner's behaviour as a direct result of environmental, rather than internal, events or controls. Behaviourist theory holds that "behaviour can be learned through reinforcement" (Arend, 1999). Stimuli in the external environment can be used to elicit responses or behaviours. Those behaviours can be reinforced with primary or secondary, positive or negative reinforcers or not be reinforced at all, to determine whether or not that behaviour is likely to occur again under the same or similar conditions (Gleitman, 1987).

Proponents of these theories assert that even advanced learning, from reading to complex problem-solving, can be attributed to basic behaviourist principles. Three major contributors to

behaviourist learning theory were Ivan Pavlov, Edward L. Thorndike and B.F. Skinner. Pavlov's theory of classical conditioning explains how learners unintentionally form mental associations between stimuli presented simultaneously or in close proximity, causing either stimulus to later evoke a likened response—this is known as associative learning (Gleitman, 1987). He eventually identified four main processes involved in classical conditioning. Thorndike developed the S-R or stimulus-response theory of learning which explains how the learner's mental connection of stimulus and behavioural response to that stimulus, can be "strengthened or weakened by the consequences" of the behaviour (Merriam and Caffarella, 1991, p.126). As a result of his experimental findings, Thorndike developed three related "laws of learning". Skinner elaborated on 'operant conditioning' and himself coined the term. His studies in operant conditioning emphasize rewarding desirable behaviour to encourage the learner to repeat it and punish undesirable behaviour to discourage the learner from repeating it. Skinner's "work indicates that since all behaviour is learned, behaviour can be determined by arranging the contingencies of reinforcement in the learner's immediate environment" (Merriam and Caffarella, 1991). Skinner believed the vast majority of human learning "even something as complex as personality" (Merriam and Caffarella, 1991) could be explained by operant conditioning because most behaviour was controlled by reward and punishment (Mazur, 1999). In contemporary learning environments, behaviourist principles are seen in several learning and instructional practices, and as Merriam and Caffarella (1991) note "underlies much educational practice..." (p.128). According to Skinner (1971) it is wholly the responsibility of the instructor to design appropriate environments in which learners, will learn the desired behaviours and avoid the undesirable ones. With regard to behaviourist theory in higher education today, Arend (1999) stresses the importance of "individual practice with immediate feedback" (p.2). In online learning environments, she explains that "quiz or exam formats allow for multiple types of practice questions with immediate, computer-scored feedback" providing the reinforcement behaviourist principles necessitate. She admits that while primary reinforcers such as high quiz scores are

available in online environments, "we immediately see the lack of secondary reinforcers" critical to behaviourist learning and "thus the need to provide this type of feedback through other means" such as "personal comments" via email, "frequent and positive online feedback...and the occasional phone call can help ease this deficiency online" (Arend, 1999, p.2).

Cognitivist Theory

Simply defined, cognitive theory maintains that the learner acquires "items of knowledge (cognitions) such as what is where (cognitive map) or what leads to what (expectancy)" (Gleitman, 1987, p.A38). Evolving from basic principles of Gestalt psychology, cognitivist theory focuses on the learner's knowledge acquisition and mental or internal cognitive processes "including insight, information processing, memory, perception" (Merriam and Caffarella, 1991, Table 7.1, p.138). Merriam and Caffarella (1991) state that cognitivists believe "learning involves the reorganization of experiences in order to make sense of stimuli from the environment. Sometimes this sense comes through flashes of insight" (p.129). Hergenhahn (1988) explains learning from the cognitive perspective, as a problem-solving endeavour engaged in by the individual learner who "comes to see" the solution after pondering a problem (p.252). He writes:

> "The learner thinks about all the ingredients necessary to solve a problem and puts them together (cognitively) first one way and then another until the problem is solved. When the solution comes, it often comes suddenly, that is, the organism [learner] gains an *insight* into the solution of a problem. The problem can exist in only two states: (a) unsolved or (b) solved; there is no state of partial solution in between." (Herhenhahn, 1988, p.252).

The work of Jean Piaget, Jerome Bruner and Robert Gagne has had a substantial impact on cognitivist theories and their application in learning and instruction. Jean Piaget's major contribution was outlining the influence of cognitive development on learning. He stated that cognitive abilities develop and mature along with the body at stages determined largely by genetic code and as an individual is gradually exposed to experience through their interaction with the environment (Gleitman, 1987; Merriam and Caffarella, 1991; Berliner, 1999; Piaget,

1952). Bruner contributed to cognitivist learning theory through his work on perception and language development. Bruner believed perceptions were influenced by the learner's preconceived ideas which were already well imbedded. He viewed learners as actively seeking knowledge rather than as passive observers—a point that would gain significance throughout his work well into his constructivist theories. Bruner encouraged learning through discovery, in both his early cognitive theories and later elaborated on the importance of it in constructivist principles. He defines learning through discovery as "a matter of rearranging or transforming evidence in such a way that one is enabled to go beyond the evidence so reassembled to additional new insights" (Bruner, 1965, pp.607-608). Robert Gagne's cognitive theory holds that certain learning requires prior learning, or prerequisites. This suggested that at least some learning must occur sequentially and prompted Gagne to develop his Conditions of Learning consisting of five hierarchical categories. The cognitivist focus on the individual learner, and learning process as problem-solving process, highlights similarities with later constructivist theory and Lonergan's Method of Human Understanding. The notion of learner 'insight' into problems or subject of learning, is also a pivotal stage of Lonergan's Method.

Arend (1999) states that cognitivists view "learning as a continual process, occurring throughout one's lifetime" and thus "should be applicable to real life" with "new knowledge" building "upon previous knowledge". She explains that cognitivists insist that material to be learned "will be retained and processed more effectively" if the learner discovers it "through a problem-solving approach rather than outside reinforcement" (Arend, 1999) as behaviourists believe. This idea of an authentic, problem-solving and knowledge-building approach to learning is consistent with later constructivist theory discussed by Bruner (1986) and with Lonergan's Method (Lonergan, 1992). Arend (1999) also contends that from a cognitivist learning perspective, online learning environments can be effective if learners are engaged in some form of real-life problem-solving such as "creating maps and charting weather patterns to see how they affect local agriculture"

rather than "listening to an online audio lecture on the same subject". Online resources may also prove useful to learners in other recommended cognitivist learning endeavours such as "case studies" and "guided discovery" (Arend, 1999).

Constructivist Theory

A constructivist conception of learning theory arose from cognitive psychology and learning theory as contained in the work of Jerome Bruner, who built on his cognitive theories and those of Piaget. In their "Constructivist Learning Design Paper" Gagnon and Collay (1996) acknowledge the work of John Dewey, Piaget, Bruner, Vygotsky and others, as representing the early school of constructivist thought on learning and instruction. In constructivist theory, the learner actively builds or constructs (hence the name) their own learning by synthesizing new concepts, ideas, and understandings with their existing knowledge. The focus, unlike the behaviourist view, is the individual learner and their unique perceptions and meanings of the world around them (Bruner, 1966). In "*Acts of Meaning*", Bruner (1990) explores the notion of "meaning-making", an idea central to constructivism, where meaning is constructed by individuals within the cultural context they live and interpreted and negotiated within the public domain (p.12-13). He goes on to write that these 'constructions' are "social realities negotiated with others, distributed between them..." since knowledge does not exist "in the head" alone nor "out there" (p.105). Jonassen, Mayes, and McAleese (1993) stress that in constructivism "meaning is a function of how the individual creates meaning from his/her experiences...what we know is internally generated by the individual rather than received from any external source". Jonassen, Peck, and Wilson (1999) explain "...constructivists believe that you cannot convey understanding" which can only "be constructed by learners" (Preface). In constructivist theory the learner directs their own learning, towards their own needs, at their own pace (Arend, 1999).

Seels (1989, p.11-15) compares and contrasts definitions of learning, types of learning and

"media strategies" required in behaviourist, cognitivist, and constructivist theories. In constructivism, learning is "personal discovery based on insight", emphasizing "problem-solving" and requiring a "responsive environment" for the learner (Seels, 1989). Both Jonassen (1993) and Arend (1999) concede that constructivist environments require learners who are responsible, intellectually mature and able to seek out knowledge, and thus these environments are most effectively incorporated at the post-secondary level of education. Jonassen contends "we believe that constructivist learning environments are most effective for an advanced knowledge acquisition stage of learning. This stage is most consistently required in universities. Therefore, universities are among the most appropriate venues for implementing constructivistic learning" (Jonassen, Mayes, McAleese, 1993). Constructivists argue that university courses would be more effective if the traditional objectivist principles were abandoned in favour of constructivist principles including: student collaboration; learner-centred and need-driven goals; case-based, real-world problems used; situated or authentic contexts formed; social negotiation of meaning; and reflective self-evaluation (Laanpere, 1997). Jonassen, Peck and Wilson (1999) argue "that students cannot learn *from* teachers or technologies. Rather, students learn from *thinking*..." (p.2). They elaborate on the previous claim with the following:

> "...the role of teachers and technologies in learning is indirect. They can stimulate and support activities that engage learners in thinking, which may result in learning, but learners do not learn directly from the technology; they learn from thinking about what they are doing" (p.2)

And according to Schon (1987) learners are learning by 'thinking-about-what-they-are-doing-while-they-are-doing-it' which he calls, 'reflection-in-action' (also cited by Jonassen, Mayes and McAleese, 1993, p.4). Following constructivist thought, Jonassen, Peck and Wilson (1999) also believe "technologies are more effectively used as tools to construct knowledge *with*" (Preface) rather than the widespread misconception that the technology has something to *teach* us. Many advocates of constructivist learning strongly support online learning environments for their innate ability to "allow students to explore further what interests them most about the topic [to be

learned] through web searches" (Arend, 1999). In their paper "Constructivist Learning on the Web", Wilson and Lowry (2001) note the relative value of the web for hypertext and document sharing, but emphasize its capacity to be "a vehicle for realizing the vision of educational thinkers like Dewey, Piaget, and Vygotsky who long ago advocated a constructivist or meaning-centred approach to learning" (p.1). Jonassen and Wang (in press) outline the advantageous affect of online learning environments with respect to constructivist principles.

> "We believe that hypertext is among the best examples of constructivistic learning environments because acquiring knowledge from hypertext requires the user to engage in constructivistic learning processes. Learning from hypertext is task driven. It depends largely on the purpose for using the hypertext which in turn drives the level of processing" (Jonassen and Wang, in-press).

Jonassen, Peck and Wilson (1999) demonstrates how higher level learners can utilize online resources to assist in achieving the constructivist ideals of building knowledge through discovery and clarifying individual understanding through social interaction and communication.

> "...learners who articulate a personally meaningful goal or intention can explore the internet in search of ideas that help them to construct their own understanding. Sharing their own understanding by constructing personal and group web sites completes the knowledge construction cycle" (Preface).

Taylor and Maor (2000) have developed the "Constructivist On-Line Learning Environment Survey" to measure how higher-education learners perceive the online environments in which they are learning. The survey and its results serve as the basis for evaluating the effectiveness of these environments to "engage" learners "in enriching their ways of knowing" (p.1).

Individual Learning Styles and Preferences

Some learning theories are based on the innate cognitive differences in each individual learner, referred to as learning styles and preferences. The following research addresses those learner differences and their impact on the learning process. Carl Gustav Jung's theory and research on psychological types served as the foundation for much of the learning theories within this scope. Jung held that one's personality was divided into two basic types which alternate in near

equilibrium in normal individuals: extroversion and introversion. He expanded this to include the opposites of sensing/intuition and feeling/thinking. Jung saw regular mental activity as a two part process consisting of, perception—awareness and acquisition of new information, and deciding—decisions or conclusions about that information (Jung, 1921, trans. 1923). However, as a psychologist, Jung was concerned with disturbances or unbalanced cases of personality type rather than those that constituted 'normal' or balanced type.

It was the work of Myers and Briggs that developed and more importantly, applied Jung's Type theory for the 'normal', general population. They elaborated on Jung's eight basic Personality Types to arrive at a total of sixteen unique Types in all. Isabel Briggs Myers and her mother Katharine Cook Briggs created a means for the application of Jung's theory which lacked a test or indicator to identify an individual's Personality Type. Briggs Myers and Cook Briggs developed the Myers-Briggs Type Indicator personality inventory (MBTI®). In "Gifts Differing" (1995), Myers explicitly defines each of the sixteen identifiable types including the details of "how we gather our information, process it, come to conclusions or decisions, and communicate our thoughts and wishes to others" (xiv). According to Myers (1995), personality type has profound impact on learning and instruction from kindergarten to graduate studies and beyond. In all life situations, including learning specific content in formal education such as university, the learner will rely primarily on their preferred ways of perceiving and judging. She cites specific case statistics of student failure and drop out rates in medical and law schools as an example of how type must be considered in learning and instruction (p. 49, 61, 158-160).

> "Type makes a natural and predictable difference in learning styles and in student response to teaching methods. An understanding of type can help to explain why some students catch on to a way of teaching and like it, whereas others do not catch on and do not like it. Two distinct problems are involved here. Catching on is a matter of communication. Liking it is a matter of interest" (Myers, 1995, p.139).

Content to be learned must be presented to differing types of learners in ways they can readily absorb the information and reflect on it. Opportunities for application must also vary. If learners are given choices which can be satisfying to divergent types, interest and thus learning is more certain.

Lawrence (1996) focuses specifically on the improvement of learning and instruction through understanding and application of personality type based on the work of Jung, Myers and Briggs. He asserts that type is "fundamental" in understanding the motivation and learning style of individual learners (Lawrence, 1996, p.5). Having analyzed extensive MBTI research conclusions, Lawrence outlines how each of the E/I, S/N, and T/F preferences affects learning as seen through the cognitive style of the learner, their study style, and instructional methods most suitable for them. For example, the cognitive style of extroversion indicates a preference for "learning by talking and physically engaging the environment" while for introversion "quiet reflection" is preferred (Lawrence, 1996, p.43). The research summarized by Lawrence also indicates preferences and suitability of the learning environment including technologies: the IS__ type preference for demonstrations, labs, computer-assisted instruction, films and audio-visuals while EN__ types by contrast, prefer reading, self-instruction, independent coursework, group projects, and interaction with people (Lawrence, 1996, p.41).

Considering Gardner's (1983) theory, the learning process must be discussed in terms of Multiple Intelligences. His theory is composed of seven distinct types of intelligence describing the unique aptitudes and preferences of learners in each. Gardner (1983) lists the following Intelligences: Linguistic Intelligence; Logical-Mathematical Intelligence; Spatial Intelligence; Bodily-Kinaesthetic Intelligence; Musical Intelligence; Interpersonal Intelligence; Intrapersonal Intelligence. The seven intelligences exist within each person but are not equally developed—

some naturally strong, some weak. Both neurobiological and cultural aspects influence the degree to which these intelligences are developed (Gardner, 1983).

With its multimedia, interactive format, communication and research capacities, online learning environments support many principles and needs of individual learning styles and preferences as described in the preceding theories. Arend (1999) is enthusiastic about the learning potential of online environments but cautions that while for some learners "the online environment may provide additional use of senses that help them better process and retain new information", others, like those preferring auditory senses, tend "to do well in traditional face-to-face classroom environments". Again, presentation and access to learning material in multiple formats is strongly recommended in order to "appeal to all learning styles" (Arend, 1999). Arend (1999) also notes that "online courses are never conducted entirely online (students will always read, write, and study offline)".

Lonergan's Method of Human Understanding

Lonergan's Method of Human Understanding or "generalized empirical method" and later "transcendental method" is a departure from the learning theories expounded in other literature as mentioned. It offers a comprehensive explanation of the process of human knowing and thus learning as a process of knowledge acquisition. Creamer (1996, p.196) defines cognitional theory as being "about the process by which knowledge is acquired". Lonergan's cognitional theory "what am I doing when I am knowing?" can be summarized as follows: "...all conscious and intentional operations of knowing occur by means of a dynamic interlocking pattern of experiencing, understanding, judging and deciding" (Creamer, 1996, p.66). It is through this four-level method (which Lonergan later expands to six and renames 'transcendental method') that humans come to know reality—"levels which constitute the process of human knowing" (Creamer, 1996, p.170). Each level of the method requires a deeper level of consciousness and

thus an increasingly clearer knowledge of reality. Lonergan assures that "the order of the assembly is governed...by concrete motives of pedagogical efficacy" (Lonergan, 1992, p.11). According to Lonergan, his latter Transcendental Method is "a method for achieving knowledge" called so "because the levels of consciousness are so foundational...They transcend all other methods and are operative in all other methods" (Creamer, 1996, p.205-206).

Central to Lonergan's "generalized method of inquiry" as it has also been called (Creamer, 1996, p.201) is "insight"—"the act of understanding" (Creamer, 1996, p.67) and the same act that prompted Archimedes to declare 'Eureka!' (Lonergan, 1992, p.196). In psychological terms, insightful learning is defined as "understanding the relations between components of the problem" (Gleitman, 1987, A43). One's experience and questions can lead to insights which spur new questions and reveal further insights and so on.

> "Such is the spontaneous process of learning. It is an accumulation of insights in which each successive act complements the accuracy and covers over the deficiency of those that went before" (Lonergan, 1992, p.197).

Lonergan did not intend the method to be prescriptive. The goal being "personally appropriated" for the knower or learner (Lonergan, 1992, p.12-13), working through the levels of one's own consciousness to arrive at one's own 'truth'(knowledge). This echoes the primary principles of constructivist learning theory as previously mentioned. In discussions of Method, Lonergan refers to the work of Piaget on the development, the progressive transformation, of human intelligence. He also notes the symbolism and 'archetypes' described by Jung, as important. On knowledge, Lonergan also refers to the "new learning", the movement from traditional thought to modern thought, which he describes as "not merely an addition to old subjects, but their transformation" (Lonergan, 1993, p.16). It is a complete reconceptualization of a subject given the influx of new knowledge and understanding gained and viewed within the context of present, contemporary time. Lonergan's Method will serve as the conceptual framework for analyzing online learning in this study.

Online Learning and Online Learning Environments

A significant proportion of the literature, from books to conference presentation abstracts, addresses the more logistical issues of online learning and environments such as the convenience of anytime, anywhere access, test data banks, usage of email and hypertext, online chat rooms, threaded discussions, multimedia features and the like. These components are often explained as supporting or enhancing learning without reference to any particular learning theories as conceptual framework for analysis. There is far less research that focuses on how learning in online environments impacts the learning process, such as what they might uniquely contribute to that process and ultimately the quality of knowledge gained through that process. Some research is concerned with the transfer or application of instructional principles or methods from the traditional in-class, face-to-face environment to the online environment (Arend, 1999), which others claim is ineffective (Laanpere, 1997). The ADEC (American Distance Education Consortium) compiled a list of principles to be used as guidelines for developing and evaluating web-based courses and learning environments which encourage a variety of media and are generally consistent with constructivist principles.

The widespread debate over the incorporation of online learning and learning environments in higher education has its proponents and its critics. At its most extreme there are those who wholly praise these environments as beneficial to learning (i.e. Hahn and Stout 1996; Khan 1997) and those (i.e. Emberely,1996; Postman 1985, 1990) who see them as largely destructive to learning. Critics such as Emberley (1996) decry that the virtual university is leading to the destruction of the scholarly culture and reducing rigorous reading, study and research to "surfing" the net for questionable resources and the like. But even Emberley admits that if the technology is to play a permanent role in academia, it could be used advantageously to unite the best and brightest individuals in the world: scholars, researchers and learners globally. Like Emberley, others criticize the educational substance and lack of humanism of new technologies, calling their broad

use "amusing" and "informing ourselves to death" (Postman, 1985, 1990). Several studies indicate an apprehension to fully embrace online learning and its expedited application in higher education. There are concerns that the technology is dominating and determining the learning and learning environment rather than sound learning principles. There is also concern over the seeming abandonment or more traditional learning practices and excessive use of the new learning medium (Taylor and Maor, 2000). Wilson and Lowry (2001), see the web as a valuable learning resource but equally as "a young and immature technology—frustratingly slow, often unreliable in content and access, chaotic, with content increasingly dominated by commercial interests", the "hype" of which continues to exceed "the reality". McKibben (1993) is critical of technologies like the Internet because they alter our perception, including obscuring the "subtle and vital information" gained through contact with the "real world" (p.23) and actually "rob us of information" (p.189) by biasing our senses toward the visual and auditory. He also criticises the emphasis on speed rather than "depth" and cautions against the proliferation of excessive information and its consumption. Online learning proponents like Jonassen (1999; 1993) hail online environments for their capacity to promote constructivist learning principles. Reeves (1997) believes the "pedagogical dimensions" of online learning hold the most promise, rather than the multimedia and global resources commonly touted. Online environments must not be seen as a panacea for learning enhancement, but as a "resource which must be designed to support effective instructional dimensions" (Reeves, 1997, p.3). The web "does not guarantee learning anymore than the presence of a library on campus guarantees learning" (Reeves, 1997, p.3).

The vast majority of literature occupies a middle-ground in the debate (i.e. Bennahum, 1998; Close, 1998), accepting both the potential benefits online learning may offer while acknowledging its apparent detriments. Feenberg (1999) addresses both advocates and critics by identifying some limitations of online learning, allying some fears regarding its widespread

implementation, and supporting its potential as a medium for learning through written communication and interaction (Feenberg, 1999). Close (1998) contends that the Internet itself is "a powerful enabler, not a solution in and of itself".

The literature also contains numerous case studies of online courses and examples of what might be called 'experiential research'. These include reports or studies drawing conclusions, positive and or negative, based on teacher or learner experiences with online courses and learning environments, or involve the development or analysis of evaluation surveys and findings (Knox, 1997; Hara and Kling, 1999, 2001; Taylor and Maor, 2000; Johnson, Aragon, Shaik, Palma-Rivas, 2001; Bullen, 1998). One case study documented the interactive learning in an online transcontinental seminar course (Mazzucelli and Boston, 2001). A commentary article in the "Technology Source" described the pedagogical advantages of virtual learning environments, which were said to enhance cognition and problem-solving (Johnston and Cooley, 2001). Taylor (1997) suggests newsgroups can be used to structure dialogue that fosters critical thinking and Markwood (1995) provides diverse case studies and examples of online learning courses and methods. Certain case studies of online courses have revealed barriers to learning including misunderstandings, technical difficulties, excessive email, lack of quality feedback, confusion and loss of subtle interpersonal communication cues such as facial expression and body language (Hara and Kling 1999, 2001; Mendels, 1999).

Bonk, Cummings, Hara, Fischler and Lee (1999) have developed a framework for the progressive integration of online learning in higher education. The study focuses on technological and pedagogical aspects of web-based instruction in relation to their impact on learning and potential for learning enhancement. Reeves (1997) proposes John B. Carroll's model for academic achievement as a new model for interactive online learning and encourages innovative research on the subject. Reeves (1997), Hlynka (1998) and countless others agree that research which

compares the advantages of one technology over another are ineffective. Reeves states that a theoretical framework for understanding "how or why different technologies might provide different learning experiences and results" (Reeves, 1997, p.7) is critical to this research. According to their study on the impact of web-based instruction on learning Lu et al. (2000) found "there is little solid evidence for the effectiveness of WBI [Web Based Instruction] on learning outcomes". The results of the study show use of "relevant WWW content does improve learning significantly" and that so called "surfing of irrelevant content on the web actually impedes learning". A study by McManus (2000) indicates that certain individuals "learn poorly" in linear online learning environments that restrict learner choices while other individuals learn poorly in online environments that provide too many choices. In their investigation, Herrington, Reeves and Oliver (2001) developed a model for online learning based on a model of 'authentic activity'. They claim that information or technology alone are not enough for effective online learning to occur. Reeves (1999) distinguishes learning "from" interactive programs and learning "with" interactive tools (p.2). He explains that research demonstrates learning occurs in both ways but instructional methods and the active participation of learners "matter most in learning". While research shows no significant difference between the effects of technologies, Reeves (1999) points out that some learning objectives are "more easily achieved with interactive learning than in other ways" (p.5).

Two large scale studies examined online learning in response to administrative and government pressure to embrace online learning at universities and colleges. Both studies concur that implementation of new network technologies must be informed and guided by sound pedagogical principles and pedagogical research both theoretical and applied. The first report offers several recommendations for achieving high quality online learning, among them the importance of employing expert professors who will devote regular and significant instructional time to communication with individual online learners and integrate collaborative work for learners

(University of Illinois, 1999). The study also found online learning resulted in varying degrees of benefit or detriment among different courses and learner groups (i.e. undergraduate students). The second study demonstrated confidence that when appropriately utilized, online environments can be used to: learn basic skills as well as critical judgement and reasoning; "enrich" and "deepen" learning; and offer high quality learning both as an addition to the traditional campus classroom and wholly online (Advisory Committee for Online Learning, 2001).

Some pundits agree that the best use of online environments in higher education are as compliments to traditional classroom learning, citing the loss of too many subtle and meaningful factors when courses lack human interaction in totality (Rudolph, 2001). Worzel (1997) states that the "best use of computers today is as tools or enabling technologies that allow students to do work they would be unable to do using traditional means". When used thoughtfully and judiciously to support course objectives for on-campus courses, rather than those wholly online, online environments have been shown to enhance learner satisfaction, participation and learning itself (Rudolph, 2001).

The debate over the quality and efficacy of online learning rages on as more colleges and universities offer courses online to compete in the new technological era of higher education.

Design Education Online

Literature regarding the online delivery of interior design courses or programs is scarce. An extremely shallow pool of research exists in this area. This lack of knowledge underscores the critical need for research in this specific area and in particular, the establishment of conceptual frameworks from within which to study what impact online learning may have on design education. Studies by Pable (1996) have indicated an overwhelming "unfamiliarity" with any form of distance learning in many design programs. This may be due in part to the long-standing

traditions of design education and the unique studio environment at its core. Of ten FIDER (Foundation for Interior Design Education Research) accredited interior design programs in Canada, none offer a single design course online. Of fifty-four FIDER accredited interior design programs in the continental United States only two have ever offered a course online and those were considered unique instances. Three of the programs specifically indicated they were in the process of developing at least one online design course. Many others indicated interest or future plans to develop such courses (see Table 1.0 in Appendix). It is difficult to establish or estimate how many programs or courses provide course information online such as lecture notes or assignments or utilize online environments for course communication because these decisions lie primarily with individual professors or instructors. This type of online usage was regularly incorporated by several of the sixty-four programs queried. It is assumed that like most post-secondary learners, design students regularly use the internet for research and reference of their own volition. Many architectural programs have experimented to varying degrees with virtual design studios and several prominent case studies are cited here. Most have employed the virtual environment as a means to collaborate with other programs and individuals at a distance. The following architectural programs have developed or have been involved in research or activity on virtual design studios: University of British Columbia; University of Manitoba; Massachusetts Institute of Technology (MIT); Cornell University; University of Washington; Texas A&M (collaborative with university of Mexico); University of Oregon; Harvard University Graduate School of Design; Hong-Kong University, China; University of Sydney, Australia; Utrecht University, The Netherlands; Kumamoto University; Washington University-St.Louis; University of Waterloo; ETHZ, Switzerland.

Thus, the literature that follows provides an overview of existing studies concerning the varied ways online environments are being incorporated experimentally in interior design courses or programs. These serve to highlight some of the issues essential to understanding design education

and how the learning process may be affected when design education is online. The vast majority of research addressed online instructional methods and or logistical issues and only somewhat generic implications to the learning process or product. At its very core, design education is learning to understand and find creative and pragmatic solutions to the problems or challenges posed by human interior environments. The question remains: what can online environments uniquely offer to meet these ends?

As previously mentioned, many architectural schools have experimented with virtual design studios. One is an example of effective online collaborative work involving teams of design students and professors at five separate design schools. The studio was naturally centred on a specific design project calling for the investigation and design solution to an architectural problem. Members of the design team from participating schools communicated asynchronously online and sent video, graphic, drawing and text files as needed. The result was said to be "a new working environment of geographically distributed design practice and education" (Wojtowicz, 1995, p.3). Another experimental studio, the World Atelier Global Design Studio, was an experimental graduate level collaborative architectural design studio developed to encourage international communication. Students from the University of Manitoba and Tribhuvan University in Nepal worked both independently and in groups to address the plethora of design project issues and submitted design work via the Internet. Email and video conferencing online were used to provide critiques and feedback from professors and practicing architects participating in the project (Sinclair, 1997-98). The objective of the online studio and research was international and cultural enrichment rather than an investigation into online learning. However, the obvious advantages to learning lie in the collaboration of divergent students, professors, and practitioners achieved online.

The experimental Tex-Mex Virtual Design Studio brought together architectural students from

Texas and Mexico to learn to design in the international context they are likely to encounter in practice. The unique cultural and professional context made possible through the Internet, was intended to offer learners insight into the impact culture has on design decisions and stimulate "introspection and critical questioning of our own cultural particularities" (Vasquez de Velasco and Jimenez 1997c). The online studio allowed all stages of any project to be posted, viewed and evaluated by all individuals regardless of location. Results of the study indicated that "all the conventional instructional targets of a Design Studio were achieved and... non-conventional targets, particular to the Tex-Mex Virtual Design Studio, were largely accomplished" (Vasquez de Velasco and Jimenez, 1997c). The uniqueness of the online experience was noted as likely "reinforcing short term memory and the potential for retroactive introspection" (Vasquez de Velasco and Jimenez, 1997c; Vasquez de Velasco and Holland, 1998). The primary obstacle encountered was that utilizing the technological components proved distracting for instructors while critiquing student work (Vasquez de Velasco and Jimenez, 1997c., pp.167-180). This may further indicate that students too, could be distracted, and thus negatively affect the learning process. Vasquez de Velasco and Holland (1998) describe four pedagogical methods within an innovative model developed in an architectural design program that utilize online communications to link learners and professors from diverse international programs (i.e. Texas and Mexico). Learners have access to an international context and typically achieve above average scores on tests and assignments. The methods include: Synchronized Reciprocal Design Studio, Asynchronous Reciprocal Design/Construction Studio, Direct Reciprocal Exchange of Lectures, and Joint Debate. Students benefited from the diverse, multicultural perspectives and experiences, knowledge and expertise of international faculty, specialized reviewers and featured lecturers, previously inaccessible. The studios created productive student competition, increased motivation and the amount of time devoted to projects. Students readily recognized and discussed cultural differences with their international counterparts. Student debates were characterized as "intense" and limited by time, though some students maintained an ongoing debate via email. The

study results ranged from "successfully implemented" to "very positive" and "very successful" in terms of the overall effectiveness of the four methods in bringing about the desired learning outcomes (Vasquez de Velasco and Holland, 1998).

In one recent case study interior design and architecture students at two separate universities collaborated online to solve a complex design problem. The authors noted the importance of collaborative design yet the lack of collaborative learning approaches in design education. Some initial learning barriers were encountered due to the impersonal nature and lack of face-to-face interaction among team members. Traditional communication and design approaches were also used and the authors note the need for some initial face-to-face meeting for the distance portion to be successful. The collaborative, inter-university studio project enriched learning as a result of sharing of expertise, divergent ideas, design philosophies and processes made possible with the online learning environment (Matthews and Weigand, 2001).

Some interior design programs have considered and accepted the integration and impact of online environments for basic communication such as that between learners and between learners and faculty (Whitney and McLain-Kark, 2000). An interior design case study examined a design studio taught collaboratively by two universities using, in part, synchronous and asynchronous network features as a means of communication. Student work indicated "improvement" and general learner satisfaction with the online methods (North, Sterling, Ellis, 2000). North (1997) studied online computer conferencing as a supplemental communication forum outside regular design studio hours. The study examined whether the World Wide Web could enhance communication and increase student motivation for online interaction in the senior level interior design studio. The results showed students believed the online conferencing enhanced their learning and due to extensive web resources also enhanced the Programming stage of design. Students also employed online conferencing to assist one another in information gathering and

integrated graphics and illustrations into online discussions (North, 1997). In a study by Mikovec and Singer (1997) online methods were used in a design studio course to increase opportunities for students to have practicing design professionals critique their design work. Collaborative critiques among design teams and others are essential in design practice and as such are critical learning components of any interior design studio. Thus, increased opportunities for such critiques, online or through alternative modes, enhances the learning process and product.

Clouston and Sinclair (1997) translated existing traditional curriculum modules into HTML (Hypertext Markup Language), or web delivery format, to examine student response to the online modules. They state that "multimedia facilitates learning through multi-sensory engagement" and thus can enhance understanding in the highly visual design disciplines. Due to the customized nature of online learning environments, all learning styles and preferences may be accommodated given that the material is developed in an organized and flexible format (Clouston and Sinclair, 1997, p.8). Furthermore, they propose that the technology of online environments "affords deeper and arguably more profound benefits to pedagogy".

Participants of a panel discussion at the 1997 IDEC (Interior Design Educators Council) International conference presented their experiences with distance education. Hart created an interactive online instructional video for drafting and Singer developed online "cyber internships" allowing students to work collaboratively with design firms (DeVries, Hart, Pable, Singer, and Mikovec, 1997). A case study by Harwood (1997) employed interactive online video conferencing to create a "connected learning community" (Microsoft, Dec.1996) with guest lecturers from various universities in an experimental graduate design research methods course. In addition to lectures, topical outlines and articles were sent and followed by interactive online discussions between students and faculty. The study results indicated that despite some technological glitches, the videoconferencing proved "extremely beneficial" and appealing to

students due to its highly interactive nature (Harwood, 1997). North (1998, p.85) experimented with the online course development process for an introductory interior design course. The course involved textbook and website reading, discussions and assignments, with evaluation based on student discussion, participation and assignments submitted via email. While course development was the objective, online pedagogical methodologies were not referred to in the abstract which dealt primarily with the technological, economic and logistical issues of the course. The Interior Design Program in the Department of Architecture at the University of Nebraska at Lincoln, is currently offering an Interior Construction Documents course online for the first time. Online quizzes are provided for self-assessment, online discussion to reinforce content, and "animated sequences reinforce acquisition of knowledge and understanding" (University of Nebraska, 2001). Even FIDER (Foundation for Interior Design Education Research) has become open to the possibility of web delivery, having recently conducted major revisions of its accreditation standards. The new standards are said to be flexible enough to consider alternatives to traditional delivery methods for interior design courses, providing those courses meet the designated educational objectives (FIDER Standards Presentation, 2000).

A significant amount of research has been conducted in each of the three distinct areas reviewed: learning and knowing; online learning and online learning environments; design education and online learning in design education. However, with the incorporation of these distinct areas into one unprecedented study, it was necessary here to thoroughly examine and understand each area individually in order to address the research questions that incorporated all three areas.

CHAPTER 3
Lonergan's Method and Design Education

Lonergan developed and applied the "generalized empirical method" to the discipline of theology and intended others to apply and understand it in relation to their own fields of study. This Chapter first explains the basic structure and main facets of Lonergan's Method of Human Understanding then draws parallels between this cognitional theory and the cognitive process of design and thus learning to design.

> "To learn thoroughly is a vast undertaking that calls for relentless perseverance" (Lonergan, 1992, p.210)

For thousands of years philosophers and scholars from Plato and Aristotle to Thomas Aquinas and John Dewey, have contemplated the complex process and product of human learning. Over time, inquiries into learning moved from the philosophical into the psychological realm.

> "Originally, learning was within the purview of philosophical investigations into the nature of knowledge, the human mind, and what it means to know... Plato and Aristotle's views about how we know something underlie contemporary learning theory" (Merriam and Caffarella, 1991).

In the early to mid twentieth century psychologists such as Jung and Bruner postulated that significant differences in personality types or traits existed among humans, involving variations in their perception, encoding, memory and thus preferred ways of learning. Myers (1995) later elaborated on Jung's theory of personality types, indicating far-reaching affects on individual learning preferences and instruction.

Learning as Product and Process

Psychological definitions most often refer to learning as a change in behaviour. But Merriam and Caffarella (1991), state that such definitions "fail to capture some of the complexities involved—such as whether one needs to perform in order for learning to have occurred or whether all human behaviour is learned" (Merriam and Caffarella, 1991). More complete definitions include:

"Learning is a relatively permanent change in behaviour or in behaviour potentiality that results from experience and cannot be attributed to temporary body states such as those induced by illness, fatigue or drugs" (Hergenhahn, 1988, p.7). Maples and Webster (1980) offer this concise version: "Learning can be thought of as a process by which behaviour changes as a result of experience" (p.1). Learning as a process "(rather than an end product) focuses on what happens when the learning takes place" (Merriam and Caffarella, 1991, p.125) which is the central focus of this study. Three of the most prominent learning theories are behaviourist, cognitive, and constructivist as outlined in the Literature Review. While these and other learning theories focus on different, specific aspects of learning, Lonergan's cognitional theory is entirely "about the process by which knowledge is acquired" (Creamer, 1996, p.196) and explains the very essence of the human learning process because it reveals the internal cognitive method through which all humans come to know. These internal mental acts of human understanding, knowing, and thus learning, are prerequisites to any discussion on potential learning enhancement. If Lonergan's method (experiencing, understanding, judging, deciding) is the process by which humans come to know, the fundamental method of human cognition, the levels of the knowing and learning process, then the Method could serve as a model or conceptual framework within which to analyze strategies, including learning environments, to determine if they might enhance cognition, the knowing or learning process, at its various levels and thus as a whole. Thus, Lonergan's method will be used as a framework within which to analyze online learning environments to determine what, if anything, they may uniquely offer to enhance learning in design education.

Lonergan's Cognitional Theory

Theologian Bernard Lonergan examined and revealed what he believed to be the fundamental method of the human mind: how humans think, understand, and know; the internal "operations" (Lonergan, 1992) of the human mind. Lonergan's "generalized empirical method" (Lonergan,

1992, p.96) reveals the cognitive process of learning by providing a thorough explanation of the intricate, innate process by which all humans come to know, and thus learn. Lonergan defines a method as:

> "...a normative pattern of recurrent and related operations yielding cumulative and progressive results. There is a method, then, where there are distinct operations, where each operation is related to the others, where the set of relations forms a pattern, where the pattern is described as the right way of doing the job, where operations in accord with the pattern may be repeated indefinitely, and where the fruits of such repetition are not repetitions, but cumulative and progressive...To employ a technique is to know beforehand the result of its application. To employ a method is to seek knowledge of what won't be known until the method had been employed successfully" (Lonergan, 1972).

Lonergan posed and sought an answer to the question "What am I doing when I am knowing?", his cognitional theory (Creamer, 1996, p.66). He came to believe that "all conscious and intentional operations of knowing occur by means of a dynamic interlocking pattern" (Creamer, 1996, p.66) consisting of four primary levels which build on one another: experience, understanding, judgement and decision. This was Lonergan's Method of Human Understanding, or 'generalized empirical method' as he referred to it. In later years he expanded the method to include the sub- or pre-conscious level of "dreaming", occurring prior to the level of experience and aptly revised the name to "transcendental method" (Lonergan, 1972). The following diagram, derived from Creamer (1996, Table 5.1, p.74), illustrates Lonergan's multi-level Method of Human Understanding.

Level of Human Consciousness		**Questions Evoked at Each Level**
	KNOWING	
Responsible	**DECIDING** Deliberating	(what ought to be done?)
Rational	**JUDGING** Reflecting	(ask is our understanding correct? What is so? True? Valid?)
Intellectual	**UNDERSTANDING** Inquiry Conceiving	**(INSIGHT)** (relationships and meanings...)
Empirical	**EXPERIENCE** Remembering Perceiving Sensing	(imagining, anticipating, feeling...) (seeing, hearing, touching, tasting, smelling)
Sub-/Pre-conscious	**DREAMING**	

Figure 3.1 Levels of Lonergan's Method of Human Understanding

Each level of consciousness cited in Lonergan's method calls on a different and distinct set of human faculties. Ascending vertically through the levels the first, "dreaming", requires sub- or pre-conscious awareness and demonstrates that rather than insignificant, dreams have substance that plays an important role in the knowing process. The second level, "experience", requires data collection through the five senses and also calls on one's memory, imagination and intuition to inform. The more data or experience that can be observed or gathered, the more complete the level, which improves the potential for success at subsequent levels. The "intellectual" level necessitates investigation and the formulation of ideas and concepts based on the empirical and subconscious data from the previous levels. Lonergan believed it was within this level that "insight" occurred, during which all thoughts from previous levels merged in such a way as to bring about some clarification and understanding of the information or data. It is through "insight" alone that we make the leap from the level of pure data to understanding (Creamer, 1996). Insight is defined as mental acuity, a drawing of relationships between previously disparate bits of data, to suddenly see what previously went unseen. Understanding is not itself knowing but leads to knowing. Knowing requires judgments which Lonergan explains as distinguishing "alchemy" from "chemistry" (Lonergan, 1993, p.147). This elucidation of previous empirical and intellectual levels then leads to the following "rational" questioning of what is known up to that point. The "rational" level requires reflection on data that has been gathered, on thoughts and on insights gained, to determine whether things are what they seem; a double-check as it were, or verification of what is thought to be correct. Then, "judgements" may be made as to the quality, soundness, and accuracy of one's understanding at the current level. The succeeding level of consciousness "responsibility", calls for consideration and review of appropriate and ethical 'actions' that might be taken in light of one's understanding, at which point a final "decision" must be made. The decision is not absolute, but the "most probable" outcome or decision given our understanding of the situation, context problem or question, which will be elaborated on in the section that follows. Since each level depends on the knowing achieved in

the previous level one cannot successfully proceed to the next level until the objective, achieved through self-question and answer, of the preceding level has been satisfactorily met.

> "The transition from level to level is occasioned by an operator. We move from experiencing to understanding by asking questions; we move from understanding to judgement by asking critical questions; we move from judgment to decision and action by asking questions of the general form, is it worthwhile? The criteria of knowledge, objectivity, truth, reality, and value are immanent in the operators; they are contained in the questions we raise" (Morelli and Morelli, 1997, p.22).

Lonergan believed, as did Plato, Dewey and constructivists today, that the answers to such questions come from within, from the one seeking knowledge, the knower or learner; a critical facet to be further explored in latter sections of this Chapter.

"Most Probable" (Lonergan, 1992)

> "The traditional definition of science is certa rerumper causas cognitio, *certain knowledge of things by their causes*. But the outstanding feature of modern science is that it is not certain. It is increasingly probable" (Lonergan, 1993, p.146)".

The final outcome of the rational level deserves elaboration. The term "most probable" is critical here because it reinforces the indisputable fact that knowing is relative and limited to what we know to be true at a particular time and is subject to change in the future should new data or insights be discovered. The human mind can only be 'absolutely' certain of any knowledge when all possible questions have been asked and answered. "A man of good judgment is a man who has the wisdom to know when there are no further relevant questions, when the matter can be settled" (Lonergan, 1993, p.150).

The six-level method is open and dynamic in nature, like the mind itself, accepting new experience, insights, new inquiries, that may lead to the greatest degree of understanding and knowing. One's thinking oscillates between levels until satisfaction has been reached sufficient to proceed through to the final level. One moves freely back and forth within these levels and once a decision is made and acted upon, the process begins yet again with any new information or

insights. The method is not closed or rigid, denying or negating new data, insights or understanding in order to preserve or protect what was formerly considered 'known' or 'true'—this would serve only to hinder understanding and knowing. The method demonstrates the impossibility that what we come to 'know' is absolute—or known for absolute certainty. The answer, solution, decision arrived at cannot be absolute because we do not, cannot 'know' what will be 'known' in time to come. New data or insight may be available that could foreseeably alter a final resulting decision and or action. As humans we cannot know absolute truth, because we cannot know what will be discovered in the future—tomorrow, in centuries to come. All questions have not been asked or answered. There are countless examples of new discoveries, new data, new insights and knowledge that have radically altered our previous understanding: artificial flight, the human genome, DNA testing, magnetic resonance imaging (MRI) and other imaging technologies that have permitted unprecedented access to our inner worlds, to name only a few.

The following example[1] demonstrates the levels of the method as they are naturally employed by individuals toward a group decision. A trial jury must decide whether the individual who stands before them, accused of murder, is guilty or not beyond reasonable doubt. The jury members are presented with conflicting ***empirical*** evidence from the prosecution and the defence—dates, times, locations, finger prints, bullet casings, witnesses, expert witnesses, receipts, records and test results. The jury members must begin to develop ***intellectual*** concepts about what the data might be revealing. They try to connect the evidence and contemplate the arguments presented by the defence and prosecution—carefully comparing and contrasting. As they develop theories about the facts or data in the case ***insight*** into the evidence and connections comes to light. The jury members find the prosecution and their evidence very convincing, but have a responsibility

[1] Creamer cites the Columbo television series character and his crime-solving process to illustrate Lonergan's Method in a typical scenario. Lonergan himself offered a detective story as example in the Preface of Insight.

to weigh the accuracy of the data and their understanding (***rational***). They may request clarification of information and make judgements regarding the validity, relevance, or soundness of their understanding and the evidence from finger prints to witness testimony. Having satisfied concerns, the jury deliberates (***responsible***) and decides what ought to be done based on their relative understanding of the case as a whole. Their final decision and action is that the evidence overwhelmingly points to the guilt of the accused. The jury's action of a guilty verdict, their knowing, was the "most probable" given all the evidence, arguments, and insights considered during the time of the trial. But, as Lonergan's method illustrates, we must be open to the possibility of new data, evidence or insights that may (or may not) become available in the future, and that these new illuminations may or may not alter our understanding, knowing and actions based upon it. In the preceding murder case for example, new DNA testing and evidence might be available six years after the guilty verdict, which may or may not ultimately contradict the jury's guilty verdict by changing perceptions, understanding, insight, decision, and action. The new DNA evidence may have led to a new understanding and knowing that the accused was not in fact guilty. The jury's previous understanding and knowledge would not be wrong, but simply based on the data available at that time. In light of new data, the "most probable" action may become a verdict of not guilty. Previous 'knowing' is supplanted with present 'knowing' and once again subject to future 'knowing'. In order to fully, truly, and as Lonergan notes "objectively" 'know' or learn, we must be open to new information, data, experience, understanding, insights and values. We must constantly reflect, consider new possibilities, know that 'knowing' is subject to change, and prepare to accept the possibility, at least for the moment, even if such new facts contradict already deeply held knowledge. Thus, the product of the empirical method, achieved by the 'knower', is not certain and absolute truth but the 'most probable'.

"Errare humanum est": "To err is human" (Anonymous: Latin)

Within the method there is, as with all things human, much room for error and "misunderstanding" (Creamer, 1996). At any level of Lonergan's cognitional theory, a lack of completeness or thoroughness can result in misconceptions, misunderstandings and misguided judgement. These might be unintentional errors of omission for example, or merely the jumping to conclusions before adequate reflection. As free agents humans may "choose to be inattentive, unintelligent, unreasonable and irresponsible" (Creamer, 1996, p.70). One could be unwilling to consider certain experiences or gather all data, leading to incorrect insights, "false judgements" (Creamer, 1996) decisions and actions. One might also make decisions based on mere experiences or empirical knowledge alone, thus failing to ascend to higher levels of consciousness in the cognitive process. According to Creamer (1996) "Lonergan does not claim that the empiricist point of view is wrong, only that it is incomplete" (p.75). People may intentionally or unintentionally fail to acknowledge new evidence or data which would make resulting 'knowledge' more certain. They become convinced of what *was* the most probable belief, answer or solution and cannot let go or refuse to let go of the old belief despite new evidence to the contrary. Whatever the reason, failure to be thorough at every level will ultimately lead to a kind of 'unknowing' rather that knowing. The decision, answer, action, is then no longer the "most probable" because all components leading to the 'most probable' solution, decisions, knowledge were not taken into account. More seriously, we might decide what we ought to do, but choose not to do it or act on our decision.

"Self-Appropriation" and "the Knower" (Lonergan, 1992)

> "...any learning is an activity of the subject. It is *his* constructing of *his* world." (Lonergan, 1993, p.145).
>
> "...you cannot convey understanding. That can only be constructed by learners". (Jonassen, Peck, and Wilson, 1999, Preface).

Lonergan's Method emphasizes the 'subject' of the knowing, that is, the individual seeking

knowledge, the "knower" (Lonergan, 1992, p.353) rather than the "object" of the knowing. For Lonergan the objective is "self-appropriation"; knowing, learning, as a result of our own minds at work; experiencing for ourselves, understanding for ourselves, judging and deciding for ourselves and thus knowing for ourselves.

> "No one else, no matter what his knowledge or his eloquence, no matter what his logical rigor or his persuasiveness, can do it for you" (Lonergan, 1992, 12-13).

Creamer (1996, p.79) explains that truth "for Lonergan, is necessarily *my* truth; truth which *I* arrive at by means of the pattern of human consciousness expanding through empirical, intellectual, and rational, and responsible levels...what is absolute or normative in knowing is *not* so much the *object* I am trying to know but the process I follow in coming to know. It is the pattern of my conscious and intentional operations which forms the 'rock' on which I can build truth". Lonergan asserts that we cannot "recall" what another person has experienced, we must experience for ourselves, we must decide for ourselves, judge, and thus learn for ourselves; the intention being "to discover, to identify, to become familiar with, the activities of one's own intelligence" (Lonergan, 1992, p.13-14).

> "Thus, in Insight we are counselled not to learn from the book but from reflections on our own human consciousness at work...The dynamic structure of knowing he [Lonergan] has carefully uncovered is not *his* theory nor that of a philosophical school, nor is it something we can be taught, but it is *us*; it is ourselves as we search for an understanding of our experience, ourselves as we strive for what is true and good, ourselves as we engage in all aspects of life" (Creamer, 1996, p.72).

We learn from our own internal process, progression through the various levels of our own consciousness and not through the method as traversed by others. Dewey contends that the "student cannot be *taught* what he needs to know, but he can be *coached*"... and that the student "has to *see* on his own behalf and in his own way the relations between means and methods employed and results achieved. Nobody else can see for him, and he can't see just by being 'told'" (Dewey, 1974, p.151 as quoted in Schon, 1987, p.17). This conception of the 'knower' is also consistent with constructivist theory which focuses on the individual learner who builds or

constructs their own knowledge, meaning, and understanding.

> "Constructivists believe that knowledge cannot be simply transmitted by the teacher to the student or from us to you...we cannot 'teach' you what we know. You cannot know what we know, because you have not experienced all that we have (nor us what you have), and so even if we now share an experience, our interpretation will be different from yours because we are relating it to a different set of prior experiences"(Jonassen, Peck and Wilson, 1999, p.3).

Experience, insight, understanding, judgement, decisions and actions are unique to the individual although, through their own constructions, their own cognitional method, individuals may draw the same or similar conclusions to a problem or question and come away having learned the same general principles or objectives.

Lonergan's method is one of self-development and therefore is unique to the individual doing the thinking with all experience, insight, understanding, judgement and decisions being relative to that individual.

> "Self-appropriation is a strategy for meeting the demands of our times at the level of our times. The reflective self-possession Lonergan promotes is that of a truly contemporary self, a self experienced in thinking along with the most advanced intellectual endeavours of our day. While appropriation of a less developed self may be preferred to mere self-ignorance, only appropriation of a self at the level of its times equips one with the self-knowledge required to deal intelligently, reasonably, and effectively with the problems of one's times at the level at which they must be treated. Lonergan's invitation to self-appropriation, then, is also an invitation to self-development...Finally, self-appropriation is self-criticism and self-correction. To seek to take possession of oneself as intelligent and reasonable, free and responsible, is also to discover one's lack of openness, oversights, unreasonableness, irresponsibility, and incompleteness of development" (Morelli and Morelli, 1997, p.20).

Jung's (1921) and Myers' (1995) individual personality types and learning styles and preferences also relate to Lonergan's notion of the subject or knower. According to Lonergan (1993, p.84) "it is what you are interested in that gets into consciousness". At the level of experience individuals will vary in their preferred ways of perceiving and collecting information. Visual learners are inclined to remember what they saw and experienced, kinaesthetic learners to remember what they did, and so on. Each type will favour different senses and thus differ in the way they

experience. They will also vary in intuition, some favour internal instincts while others prefer to rely on concrete sensory data (Jung, 1921; Myers, 1995). They will also process this data differently. Ways of conceiving and judging are also distinct. Jonassen, Peck, and Wilson (1991) emphasize:

> "Meaning is in the mind of the knower...perceptions of the external, physical world that are unique to the knower, because each individual has a unique set of experiences that have produced a unique combination of beliefs about the world" (Jonassen, Peck and Wilson, 1999, p.4).

"Two Ways of Knowing" (Lonergan, 1992)

Lonergan identifies two ways of knowing or progressing through the levels of the generalized empirical method: one, from below upwards beginning with dreaming and gradually acquiring experience, insight, understanding, judging and deciding, discovering or achieving knowledge; and two, from above downwards, beginning with the given or known (answer, solution, 'truth') as from tradition or authority and descending through the levels in order to 'verify' given or existing 'knowledge' for oneself through one's own cognitive analysis.

> "What we must keep before us, then, as we reflect on human knowing is that it is not a question of either/or but of both/and—we learn *both* by means of the distinct but interdependent path from below upwards *and* by means of the distinct but interdependent path from above downwards" (Creamer, 1996, p.89).

To illustrate the two ways Creamer (1996) refers to a film in which the teacher instructs his students "to throw away their textbook article on poetry (written by an authority on the subject) and learn about poetry by writing it themselves based on their experience of the world around them. He represents education as a creative achievement (from below upwards)" (p.88). And without integrating the complimentary knowledge passed down through the ages (from above downward) we could not learn from the wisdom it offers.

> "A recognition of the interdependence and balance between the two ways, therefore, is required for authenticity. We receive the traditions and wisdom of our ancestors which we adapt to the needs of our times and places; we live by it, we critique it, we modify it, we add to it, and we pass that on to our descendents" (Creamer, 1996, p.89-90).

Lonergan's Cognitional Theory in Relation to the Cognitive Process of Design & Learning to Design

With respect to the field of interior design, parallels can be drawn between Lonergan's cognitional theory and the cognitive process of design and learning to design. Lonergan's Method at once correlates to the cognitive process of design and the cognitive process by which one comes to learn to design, because design is necessarily learning by doing; "learning to design...by engaging in design" (Schon, 1987, p.16).

The Cognitive Process of Design

Since the generalized empirical method reveals the process of cognition, of coming to know and thus learning, it also reveals the natural process by which we design. Upon close examination the parallels between Lonergan's Method and the cognitive problem-solving process of design become apparent. What follows is a brief account of the structure of the cognitive process of design as it may occur from the moment a designer is first introduced to the design problem up to the final decision or design solution.

Once a design problem or challenge arises and before all conscious thought there is ***dreaming***, which, through recollection and subconscious subtleties, later influences the designer's cognition at higher levels of consciousness in the design process. Zeisel, (1995) notes that "design is difficult to describe because it includes so many intangible elements such as intuition, imagination, and creativity" (p.3). Cognitively, these activities are seamlessly integrated in the process of knowing and thus designing. Next, empirical ***experience*** becomes paramount. Experience includes all knowledge through external (seeing, hearing, etc.) and internal (remembering, feeling, etc.) senses that the designer has gained and that is pertinent to the design problem at hand. Schon (1987 p.67-68) explains that the designer "has built up a *repertoire* of examples, images, understandings, and actions...it includes sites he has seen, buildings he has known, design problems he has encountered, and solutions he has devised" and these he says are

"accessible to him for understanding and action...each new experience...enriches his repertoire". The designer collects and absorbs data from existing conditions, defining its context, relevant research she has read, measurements and photos, sketches, existing design theory (Lonergan's from above downward), program requirements, interviews with stakeholders, past and recent experience, etc. This level of experience in the cognitive design process is described in Zeisel's (1995) design process example: "Posed with a design problem—let us say for a new elementary school—an architect gathers information about the specific site and about elementary schools generally. She does this by visiting the site, having discussions with clients and users, and study books" (p.3).

Building on the empirical knowledge gained at the previous level, the next level of the cognitive design process—understanding, is one of conceptualizing and inquiry by trial and error, where the designer begins to formulate mental images and solve small problems within the larger design problem or challenge. The designer begins in-depth inquiry, asking questions as to relationships and meanings between and among the data, developing concepts, generating ideas and schematics.

> "Through a series of trials, she generates a preliminary mental image of an 'elementary school', responding to the information she had gathered, her personal experiences, and mental images of schools she knows and likes...She draws general rough sketches or diagrams to begin to flesh out this image and reviews them with people in the office, with the client, and by herself. Possibly she even begins to present her concept by building rough working models. Stepping back from her presentations, she asks herself whether they do justice to her concept and to the information she has. She might feel she needs to gather more data to adequately assess them. In this way the architect tests and refines her concept and her information." (Zeisel, 1995, p.3-4).

Within the latter phase of this level the designer arrives at some ***insight*** and thus ***understanding*** of the data of experience which makes clear the design solution or how the parts will come together, the details, the "aha!" or so-called light bulb moment. The internal process of "imaging" or "visions of eventual solutions" by designers described by Zeisel (1995, p.11) and illustrated as

the "Eureka!" experience by Jones (1970) reinforces the critical role of insight in design. Tekippe (1996) defines insight as "that mental (or inward) activity by which the mind grasps the intelligible connections between things that previously had appeared merely disparate...often experienced as a sudden breakthrough" (p.50). Insight may occur quickly or slowly. Insight may be triggered by memories, an understanding of "the relation between present circumstances and previously garnered information...sparked by the memory of a past insight" or insight may be gained through "trial and error" (Tekippe, 1996, p.50-51). Schon (1987) emphasizes that in solving problems through 'trial and error', as in design, the trials themselves "are not randomly related to one another; reflection on each trial and its results sets the stage for the next trial...a pattern of inquiry" (Schon, 1987, p.27). According to Zeisel (1995) "designers use the design process to learn, through testing, from themselves" (p.11). Like Lonergan's cognitional Method itself, design is a dynamic process and in the cognitive design process the mind oscillates between thoughts. In coming to fully understand the design problem, designers must, at least in part, envision a potential design solution before investigating if it is a possible, probable, and then most probable solution to the said design problem; in essence 'knowing from above downwards' and verifying the solution. Zeisel (1995) emphasizes that "such predictions are not precise; they are approximate solutions that the design process is meant to make less approximate" (p.11) and "designers continually modify predictions about their final result in response to new information and insight" (p.6).

At the next level of the cognitive process of design the designer must make ***judgements*** about their understanding, concepts and possible solution. They reflect on the possible solution, question its merit, viability, verify that it meets all the defined needs and requirements, and ensure they have not overlooked any aspects. Is their understanding of the programming requirements, issues, concepts and solutions, correct? Is the proposed design solution appropriate? They modify, correct, re-work their designs, or perhaps even return to collect more data. In Zeisel's

(1995) example the designer "repeatedly checks to make sure drawings are true to the agreed-upon concept, to government regulations, and to performance standards dictated by theory and empirical work" (p.4). The cognitive design process, like Lonergan's Method is one of continual internal questioning and response through modification and refinement of thoughts and ideas. The questions become increasingly specific and directed and move from the empirical to the intellectual, to the rational and ultimately responsible.

As in Lonergan's cognitional theory, the final level of the cognitive design process requires the designer to be responsible, to deliberate and ***decide*** whether to act, to follow through and realize the design solution. They must ask not *if* the design solution can be realized but whether it *should* be. Is the proposed design ethical? Responsible? Sustainable? What positive or negative impact or ramifications might this solution have and for whom? What will be the consequences of their decision and resulting action? As Creamer (1996) notes, this critical facet of responsibility is integral to the 'knowing' process and outcome: "The end point of the knowing process is ethical, *not* just cognitional" (p.82). The cognitive process leading to knowing, necessarily involves the opportunity to criticize and correct oneself; to ask oneself the difficult questions pertaining to morals and ethics and respond with not merely a viable solution but the most appropriate and responsible solution.

Most Probable

As with the cognitive process in general, the cognitive process of design results in a solution that is not absolute but most probable. Zeisel (1995) found "designers aim to reach one acceptable response within a range of possible solutions" (p.6). This acceptable response coincides with Lonergan's "most probable" answer, solution, knowing. In the end, designers must select but one design solution and this must be deemed the most probable within the given circumstances and constraints, requirements and preferences for the design problem. Schon (1987) explains that

"designers juggle variables, reconcile conflicting values, and maneuver around constraints—a process in which, although some design products may be superior to others, there are no unique right answers" (p.42).

Zeisel (1995) notes three characteristics of the cognitive design process that coincide and reinforce Lonergan's cognitional theory in relation to the cognitive design process:

> "designers seem to backtrack at certain times—to move away from, rather than toward, the goal of increasing problem resolution"; "designers repeat a series of activities again and again, resolving new problems with each repetition"; and "these apparently multidirectional movements together result in one movement directed toward a single action" (p.14).

By comparison, Lonergan's method is dynamic and movement within and between levels of consciousness back and forth is the nature of the cognitive process. It is often necessary to step back from a problem or review facts in order to proceed or progress, though it may seem digressive. As Creamer (1996) noted with his Columbo example, reviewing details again and again, and returning to clarify or collect new information led to the solution of "small puzzles" within the larger problem each time. In his definition of method, Lonergan explains that "operations...may be repeated indefinitely...where the fruits of such repletion are not repetitions, but cumulative and progressive..." (Lonergan, 1972). And rather than multidirectional, cognition is fluid, yet occurring within a structured framework of progressively complex layers of consciousness with the single ultimate objective of knowing.

Learning to Design

In light of the parallels drawn between Lonergan's cognitional theory and the cognitive process of design it is necessary to examine the process of learning to design or design education; its intent, structure, and relation to the cognitive design process and Lonergan's cognitional theory.

While a design curriculum is comprised of manifold courses and their diverse content, this formal education has a singular, primary objective. Design education has, as its central aim, that

individuals learn how to develop creative, effective and appropriate solutions to design problems or challenges for "all spaces within environments built for human habitation" (FIDER, 2000). This is accomplished through design studio courses which are the principal means by which learners synthesize and apply knowledge gained in all auxiliary or supporting design courses such as design theory, colour, lighting, materials, drawing, graphic communications, drafting, detailing, history of art and architecture, construction and building systems, general arts and science electives (psychology, sociology, etc.) and like courses (See Figure 3.2). In almost all FIDER (Foundation for Interior Design Education Research) accredited design programs (2000-02 calendar courses) design studio courses dominated in credit hours per semester and per program overall in comparison to other individual course types or categories, attesting to their central role in design curricula and education. The focus and intent of design studio is what Schon (1987) succinctly describes as "learning to design...by engaging in design" (p.16). As simulations to the kinds of design problems or challenges they will face in practice, learners are given projects that closely resemble real-world design problems or those in an authentic context. Learners learn to develop solutions to these given design problems by working through the design process for themselves; the cognitive process of design by attending to the internal operations of their own mind. All other courses provide information or data needed to effectively solve design studio problems and in relation to Lonergan's Method, these courses provide for learners much of the data at the level of experience (See Figure 3.2). Since learners must engage in the design process in order to learn how to design, in this way then, the cognitive process of design also becomes the cognitive process by which learners learn how to design. Lonergan's cognitional theory then also describes the cognitive process by which one learns how to design. Each process involves gathering, synthesizing and creatively applying information and data from all available sources, considering possible solutions, their appropriateness and deciding on the most probable solution.

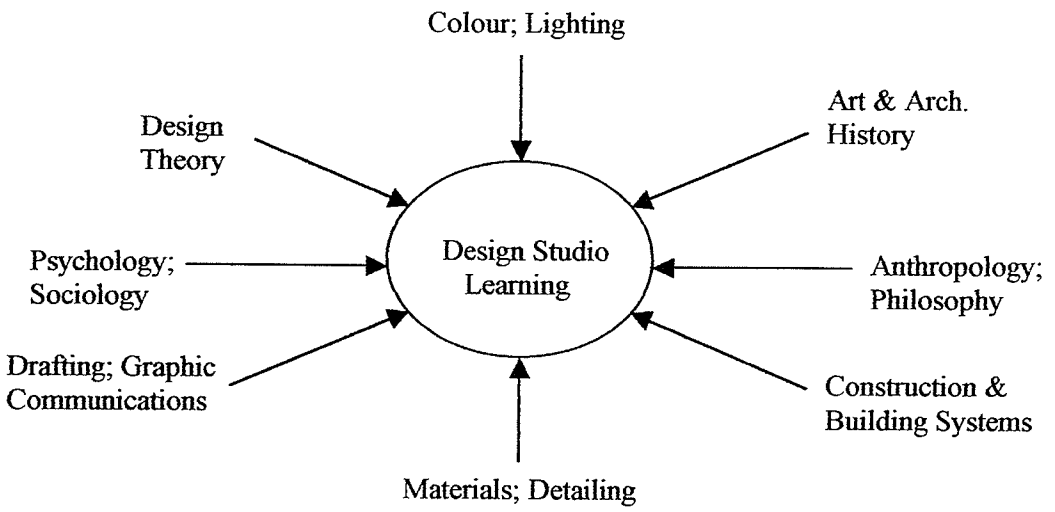


Figure 3.2 Relationship of Design Studio courses to other design courses

The most prevalent problem-solving approach taught in design schools to solve design problems in design studio courses follows the "Seven Universal Stages of Creative Problem-Solving" comprised of: Accept-Situation, Analyze, Define, Ideate, Select, Implement, Evaluate (Koberg and Bagnall, 1991). Kitamura (1994) refers to it as "that sacred process of problem solving many of us teaching in design schools throughout North America, Mexico, and Europe learned based on the teachings of the Bauhaus" (Kitamura, 1994). Learners are taught that these are the mental steps to follow in approaching given design problems and in developing creative, individual solutions.

Both similarities and differences can be seen between the Seven Universal Stages and the levels of Lonergan's generalized empirical method. Both begin with a collecting or gathering of empirical or experiential data or information; then progressing to a phase of formulating ideas, concepts, and a pattern of trial and error; then to a clarity of both problem and solution; to final decision and ultimately action. Lonergan's Method is unique in that it is not prescriptive but represents the basic operations of human knowing, the cognitive process itself and thus the process of learning, through which the mind solves problems from the simple everyday variety to the unusual and complex. For this reason the Method takes into account the complex layers of

human consciousness, responsibility, morals and ethics, human error, the dynamics of thought, knowing as a construct of the knower, the 'most probable' knowing as subject to "future additions and revisions" (Lonergan, 1992, p.12) rather than absolute which is within the limitations of what we as humans can know at a given time. Additionally, the Method integrates not one way of knowing but two, from below upwards and from above downwards; assimilating existing human knowledge with the discovery of the new.

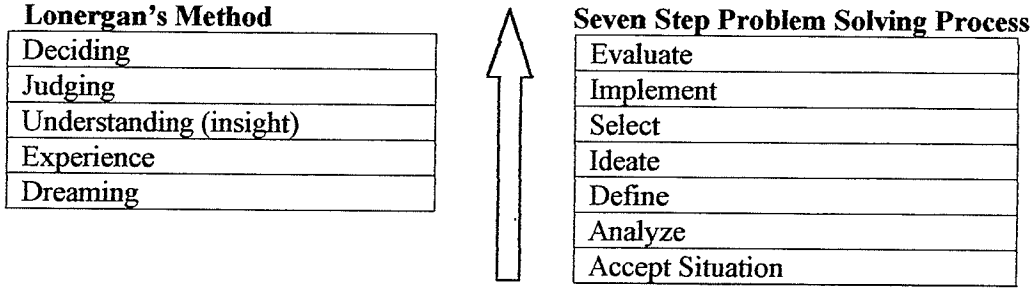


Figure 3.3 Similarities between the levels of Lonergan's method and levels of Seven Step Process

Learning to Design in Light of Lonergan's Method

> "[The learner] is expected to plunge into designing, trying from the very outset to do what he does not yet know how to do, in order to get the sort of experience that will help him learn what designing means. He cannot make an informed choice to take this plunge because he does not yet grasp its essential meanings, and his instructors cannot convey these to him until he has had the requisite experience. Thus, he must jump in without knowing—indeed, in order to discover—what he needs to learn" (Schon, 1987, p.93).

The following description outlines the cognitive process of learning to design within the conventional or traditional studio learning environment as seen at each of the four levels of consciousness in Lonergan's cognitional method. As previously noted, while only the learner or knower can experience, understand, judge and decide, there is an array of factors within the learning environment that facilitate the learner in knowing at each level of the cognitive process of learning to design. In the conventional design learning environment these factors include: critiques with instructors or "coaches", guest critics such as practicing professional designers, and

critiques from other design learners, juried critiques; guest lecturers in the same or related fields, demonstrations from instructors and others; design and architectural library resources; field trips or tours; knowledge from all auxiliary courses such as history, colour, theory, materials, etc. Design studios involve "demonstrations, design reviews, desk crits, and design juries, all attached to a core process of learning by doing" (Schon, 1987, p.43). In combination these factors create the scholarly culture and community of learners advocated by Lonergan (1992, p.197-198), Jonassen, Peck and Wilson (1999), Emberley (1996) and a host of others who trust in this tradition. Sometimes studio critics "may teach in the conventional sense, communicating information, advocating theories, describing examples of practice. Mainly, however, they function as coaches whose main activities are demonstrating, advising, questioning, and criticizing" (Schon, 1987, p.38).

In a conventional design studio environment the learner typically progresses through the cognitive process of learning to design as described in the following example. Stages of the cognitive design process are organized into the correlating levels of Lonergan's Method.

Experience (Sensing, Perceiving, Remembering). In design studio the learner is given a design problem to solve, for example, to design an interior office environment. The project program identifies spatial requirements and other details pertaining to the project including client and company profile, etc. This programming document contains the first pieces of information that the learner will collect in her search for data as she applies all her experience in beginning to solve the design problem. She will seek out new experiences related to office environments but also attempt to remember all that she knows about offices, recalling images and sounds and associated feelings of offices she has seen, been in, perhaps worked in, images of workstations and office furniture, the dynamics of the environments as people worked within them, recalling what she knows about offices from other courses such as office planning and design, photos,

sketches, drawings of historical, traditional, contemporary and award-winning office designs she has read or seen; theories behind those designs, the history and historical origins and types of offices, office concepts, colour theories, types of lighting used in offices, materials used in office design (commercial carpet, etc.). She will try to recall what others have said about office design but also collect new data about office design, drawing on the experience of instructors, people she knows who work in offices, opinions and comments from design magazine articles she has read, etc. She will draw on all that she has experienced that may relate to the project at hand and seek out new experiences until her knowledge at this level is sufficient to begin to piece the bits of data together at the intellectual level to which she will intuitively advance.

Understanding (Conceiving, Inquiry, Insight). As she begins to see relationships and connections between disparate pieces of data she will conduct related inquiries to further develop concepts: looking through magazines, reading magazine and journal articles on offices and office design, talking to instructors and designers, etc. In order to solve the particular office design problem given she will need to inquire further still until she develops a full understanding of the problem and conceives of potential solutions. She accomplishes this by conducting research through books, journals, related to the office design concepts she is developing, visit local office buildings with similar concepts, tours, perhaps question or interview office workers pertinent to the type of office she is designing. She collects images and makes notes and begins to formulate concepts and ideas about her project. She makes preliminary sketches of her concepts and ideas and discusses her ideas and concepts with her instructor during studio critiques. Her instructor provides her with feedback, questions and raises concerns about what she has said and drawn and makes suggestions for further inquiry and consideration. She returns to her initial drawings and concepts and develops new and refined versions as she investigates the office design problem—sketching, thinking and modifying her drawings and ideas again and again, moving, modifying and refining drawings as she thinks through the design problem. At regular intervals throughout

this process she meets with her instructor, who demonstrates alternatives to her design dilemmas, makes suggestions to spur or provoke her to think, raises questions and concerns about aspects/elements of her design. The critic can only guide her in the right direction through her struggles to understand the problem and see the solution. "Coaches vary in their predilections for showing and telling. Some refuse to draw, out of fear that the student's imitation will be blind and mechanical. Others only draw, distrusting mere words to convey something as inherently visual as designing" (Schon, 1987, p.101). The student watches, listens and asks questions during critiques, as the critic raises issues and concerns, points out problems, cites options or solutions to her designs; then the student goes back and begins to reflect for herself on what the critic said or what was discussed. The students overall perception of this interaction will play a role in how and if she applies the information provided. She will mentally evaluate the merit of the critics comments and decide accordingly. Due to the significant gap in experience between instructor and learner, there may also be unavoidable issues of communication that make critiques difficult and frustrating for all involved and render the exchange of comments futile. There is also a certain subtle knowledge that the learner is expected to grasp through experiencing design, but perhaps cannot seemingly be communicated or explained by the instructor.

> "[Students] do not at first understand the essential things...[the studio instructor] cannot explain these things with any hope of being understood, at least at the outset, because they can be grasped only through the experience of actual designing. Indeed, many studio masters believe...that there are essential 'covert things' that can never be explained; either the student gets them in the doing [of design] or he does not get them at all" (Schon, 1987, p.82).

She learns to see her work from someone else's, an expert's perspective because she is given a glimpse through the studio critics comments and drawings. This interaction with the critic is a form of cognitive inquiry where by watching the instructor, listening, and asking questions, she engages in a two-way analysis of her design ideas. In this way the learner also learns how to raise questions about her own work, what kind of questions to ask herself and how to constructively

criticize her own work and address issues and provide her with alternative ways to look at and address particular design issues as they arise.

She asks herself questions in drawing and modifying her design ideas, the "pattern of inquiry" described by Schon (1987): 'what if this went here? And that there? How can I make this area flow into this one? Into who's workstation should the natural light from these windows flow? How can the light be controlled? Through her experimenting and testing of possible design solutions "a 'what if' to be adopted in order to discover its consequences"...Each move is a local experiment that contributes to the global experiment" (p.57) of the whole design process. She is thinking-on-paper and drawing becomes the media through which she investigates and fleshes out ideas; "drawing functions as a context for experiment" (Schon, 1987, p.77). She tests cognitive thoughts, visualizations, on paper in a concrete way, verifying what, in her mind worked. She "must draw in order to discover the consequences" (Schon, 1987, p.96) of her ideas and design decisions. Many of her modifications will lead to dead ends but will inform future modifications and decisions. As she experiments and tests ideas and solutions through thoughtful trial and error over days and weeks, she may develop ideas for both further and advanced inquiry and continues to search or research through various means, including continued critiques with instructors and peers, visiting offices and speaking with inhabitants, seeking product information and samples for finish materials, reading further articles for inspiration and to compare design plans and ideas with her own thus far. As she works and reworks drawings, she gradually resolves small issues within the larger, leading to one or more insights into the data that sheds new light on the problem and clarifies her understanding, which in turn allows her to see how the parts may fit together as she hadn't seen before--one or more visions of potential solutions.

Judging (Reflecting). She then reflects on these potential solutions and raises rational questions about their validity. Are they truly potential solutions? Do they meet all the design criteria? Was

her understanding of the data correct? Did she overlook any aspect of the design? She reviews her program documents to ensure these possible solutions meet all requirements and concepts. She also receives critiques from her instructors and or others as to the rationality of her proposed solution. The feedback she receives will weigh into her own judgement as she will likely place more importance in the judgement of an expert. She will likely refine her solution to address any concerns or issues raised at this level of the cognitive design process. She may decide at any point to return to previous stages (levels of consciousness) to clarify any inconsistencies in order to successfully progress to the next level.

Deciding (Deliberating). Once she has arrived at a design solution that she is confident fully and most appropriately meets all the functional, aesthetic and conceptual requirements of the project she has only to deliberate and make the final decision. This level may prove difficult for the learner as ethical and moral considerations are virtually fictional with a merely simulated project context. Here, her instructor, other critics and guest lecturers play the crucial role of bringing reality to the learner. Through the expertise and experience of these individuals, coupled with readings, research and common sense on the learners part, learners can consider and ponder the potential consequences, impact and ramifications of their design solutions. They have long since answered the questions of whether or not it *can* be done and ask the more profound questions of whether indeed it *should* be done.

Most Probable

Design decisions are proposed responses to problems or challenges, and "although acceptable for the moment, [are] open to further testing and refinement" (Zeisel, 1995, p.67). The design solution the learner eventually arrives at is the best possible solution to the design problem given the data, their understanding of it, and their judgement of it. The design solution arrived at is not 'the' design solution, for there is no absolute solution, only the 'most probable'. As previously

discussed, the more thorough one can be at each level of consciousness the 'more probable' ones resulting knowledge or solution. Therefore, as a learner progresses from the first year of their design education to the last, their cognitive process develops as they gain increasing experience with design specific content (theory, materials, critiques with studio critics, mentors/instructors etc.) and related fields (psychology, anthropology, etc.) which is likely to lead to more complete understanding, sound judgement and responsible decisions or solutions. As a result, their ability to move from raw data to conceptualization, judgement and finally design solution has evolved, yielding solutions 'more probable' than those arrived at in their earlier years of design studio. And as they develop and evolve as individuals, so too do they as designers. Beyond merely effective and creative solutions design education must also teach ethical and responsible design. What is the right thing to do? The right action or decision? Kitamura (1994) contends that the current Seven Step process widely taught lacks the element of "responsibility" for design decisions and that it is "up to educators and practitioners to reframe a design process that takes seriously...moral and ethical responsibility". Lonergan (1992, p.23) emphasizes that the end result of the Method is also ethical, accounted for by questioning at the level of responsibility which sets such knowledge apart from the purely rational.

Mis-Understanding

While learning to design there are many missed opportunities and pieces of information such as failure to collect sufficient data or research before making lasting design decisions. With so much room for error any means of increasing success at each level of the cognitive process will enhance learning. In reaching a design solution, the less experience or data available at the empirical level the more likely for 'mis-understanding' at the intellectual level with subsequent judgement and decisions based on those misunderstandings. For example, a learner may lack sufficient information on the types, properties, appropriateness, code requirements, of floor materials available and approved for hospital application, and they fail to seek out that information, how

can they progress to true understanding of the design problem and ultimately the final design solution? Critical data will have been missed and the final design solution will not be the 'most probable' since all issues, requirements, have not been addressed. According to Lonergan's Method, this level of the cognitive process would not be complete, thus leaving the outcomes of subsequent levels incomplete as well.

The Knower

> "The drafting table is not a Ouija board, where we can expect the automatic appearance of messages from beyond; the messages expressed there come only from within" (Abercrombie, 1990, p.163).

In design education it is the learner, the 'knower', who, through their own unique experiences, perception, imagination, interpretation, insights, understanding, judgment, and decisions, creates a design solution and learns to design. Learning to design requires the learner to think for themselves, to work through the cognitive process of design themselves, to draw on their own experience, their own insights, come to understand, judge and decide for themselves what solution is most worthwhile, valuable, appropriate or ethical.

> "The student discovers that she is expected to learn, by doing, both what designing is and how to do it. The studio seems to rest on the assumption that it is only in this way that she can learn. Others may help her, but they can do so only as she begins to understand for herself the process she finds initially mysterious. And although they may help her, *she* is the essential self-educator. In this respect, the studio tradition of design education is consistent with an older and broader tradition of education thought and practice, according to which the most important things—artistry, wisdom, virtue—can only be learned for oneself" (Schon, 1987, p.84).

Schon (1987) explains design education as "reflection-in-action", where learners think about what they are doing while they are doing it, "learning to design by engaging in design" (p.16). The focus of this education is learning by doing where "students learn by doing, and instructors function more as coaches than as teachers" (p.20). Rather than teaching in the conventional sense, through lecture and the like, instructors 'coach' through "the right kind of telling", leading learners to think and understand intellectually, rationally, and responsibly for themselves.

According to Dewey (1974, p.15) the learner "has to see on his own behalf and in his own way the relations between means and methods employed and results achieved." While understanding cannot be conveyed through mere telling, the "right kind of telling may guide" the learner to understanding. The instructor provides experiences for the learner, to support the cognitive process but the onus to engage lies with the learner themselves. Design problems are ultimately solved within the world constructed by the learner or knower, a facet consistent with Lonergan's cognitional theory, Platonic thought, Dewey, Schon's reflective practicum and constructivist theory.

> "Since no two people can possibly have the same set of experiences and perceptions of those experiences, each of us constructs our own knowledge, which in turn affects the perception of the experiences that we have and those we share" (Jonassen, Peck and Wilson, 1999, p.4).

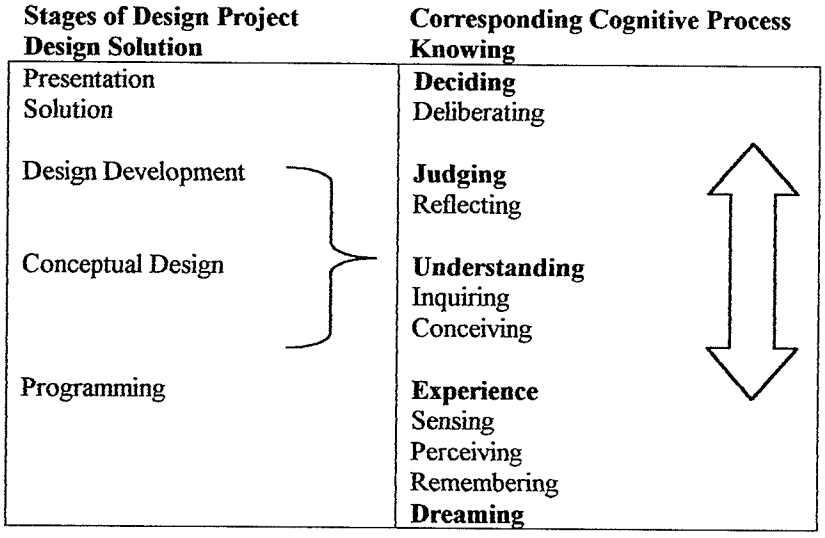
Learning styles and preferences as defined by Personality Type in Myers (1995) and Lawrence (1996) also significantly affect the cognitive process of learning to design with each learner having preferred ways of experiencing (sensing, perceiving, remember), understanding, judging, and deciding. Variations in what most interests individual learners, alone, will impact the cognitive process since "what is interesting gets into consciousness" (Lonergan, 1993, p.84).

Two Ways of Knowing

Design is not a solitary nor a finite process; it occurs in a kind of collaborative continuum over time. Designing and learning to design involves knowledge and understanding of previous design and historical precedent, from which adoption, adaptation, verification of existing knowledge and new discoveries all originate (Lonergan's 'learning from above downwards'). Reflection on past, existing theories and application and the cognitive process of others is also an integral part of designing from 'below upwards' which begins with experiential data (a physical space, dimensions, client needs, etc.), considering what others have done, similar projects, possible solutions that may inform. Learning and recalling what history has to offer is critical in learning

to design. It is through a rich tradition of historical documentation, guest lecturers and critics, peer juries, slides and the preservation of design solutions we inhabit daily that such history presents itself. Yet again, the onus remains on the 'knower' to perceive and synthesize such data within their own cognitive process; without it their 'solutions', 'knowledge' of a given design problem becomes less certain. Tekippe (1996) assures that insight is generally permanent and once achieved or understood "that insight may usually be counted on as background for future learning" including the insights gained by others where "the achievements and breakthroughs of one generation become the background insights of the next" (p.52) preventing successive groups from redundant efforts. While the internal, cognitive operations are those of the individual "Lonergan understands the whole process of coming to know as 'the work of many', a 'group enterprise'. Even academic research, generally thought of as a solitary ivory tower type of activity, he envisages as a collaborative enterprise carried out by a community of scholars" (Creamer, 1996, p.84). This is consistent with both Emberley's (1996) "scholarly culture" which he sees as critical to learning and with constructivist learning theory (Jonassen et al., 1999).

Figure 3.4 Design Process for Learner in Conventional Studio



This chapter examined the cognitive process of learning to design within the conventional studio

learning environment as seen at each of the four levels of consciousness in Lonergan's cognitional theory. Subsequently, Chapter Four will specifically analyze online learning environments within the framework of Lonergan's cognitional Method to determine what, if anything, they may uniquely offer to facilitate or enhance the cognitive process of learning to design.

CHAPTER 4
Analyzing Online Learning in Design Education within the Theoretical Framework of Lonergan's Method

The previous chapter explained the cognitive process of learning to design as it related to and reinforced Lonergan's cognitional theory. This chapter utilizes Lonergan's method (cognitional theory) as a conceptual framework within which to analyze online learning environments in order to determine what they may uniquely contribute to the cognitive process of learning to design. Elements of online learning environments are examined in relation to each level of the cognitive process of learning to design: experiencing, understanding, judging, deciding and knowing.

Experience

Experience is the first initial contact with what is to be known (Tekippe, 1996, p.81) and thus the design problem to be solved. Experiences are the "raw materials of insight" (Tekippe, 1996, p.83). The level of *experience* is characterized by sensing (seeing, hearing, taste, touch, smell), perceiving, and remembering (imagining, anticipating, feeling). At this level of the cognitive process of learning to design learner *experience* is facilitated or enhanced by various factors within the learning environment. The learner focuses on data collection through empirical means, becoming familiar with the fundamental facts of the design problem to be solved.

In conventional design learning environments this is achieved by studying books, periodicals, magazine articles, programming handouts and documents, viewing film, video, and or slides. With most design projects, primary design problem information is available in programming documents provided by the instructor or studio critic. If the learner is to develop portions of the programming themselves, then research required for that specific data will also be conducted. Learners may conduct site visits or tours of problem and project related interiors, listen to guest lecturers and presentations such as those by practicing professional designers, architects, and

others from various fields, becoming privy to their insights, solutions, and ideas for projects or problems similar to their own design problem. They will also draw on experience from existing memories including personal work experience, and their somewhat limited design "repertoire". Learners will need to draw on a vast array of knowledge gained through auxiliary courses including but not limited to design theory, colour, materials, history, detailing, anthropology, psychology. In the open studio learning environment learners compare data, share information and ideas through discussion with other design learners. They may have the opportunity to hold interviews or discussions with people who work or live in environments similar to their design problem in order to gain necessary information through the experience and views of others. At the level of experience, there is generally minimal input from studio critics except when guidance or direction is required by the learner in their gathering of data and information.

By comparison, online learning environments offer what might be called advanced versions of the same factors available in conventional studio learning environments and thereby facilitate or enhance learning at the cognitive level of experience. However, despite some apparent benefits, many are conditional, or pose equal detriments.

> "There is no point in using communications and information technology... unless it clearly improves the quality of learning in some way" (Laurillard, 1999, p.183).

Laurillard (1999, p.184) describes two kinds of interaction: person-to-information via technology and person-to-person via technology. The former refers to accessible online data or information and the latter to elements that facilitate communication between individuals or groups such as email, online conferencing and discussion groups and the like. Both are examined here in terms of their contribution or lack thereof, to the level of experience in the cognitive process of learning to design. Additionally, the impact of online learning environments in relation to learning styles and preferences at the cognitive level of experience will be considered.

Experience Through Online Information

There is a great breadth of resources online such as world libraries, databases, journals, and limitless product information from around the world. Learners are no longer limited to the materials available and affordable by the physical library facilities or resources on campus. They may also order product information or samples online, read online magazines, review research and compare design solutions around the world as they relate to their own design problem or exchange information with design students globally. More of the worlds books, journals, and magazines are online with an unsurpassed variety and diversity of data on design problems (such as offices) that is far greater than the contents of any one university library or campus. In addition to specific design problem related experience learners may also access more resources and data related to auxiliary courses which support design problem solving, such as: history, design theory, colour, construction, materials, and the like. The availability of computer programs that are capable of translating from one language to another permit further access to written works in different languages that would otherwise be inaccessible to learners. Many magazines from around the world are now online complete with full text and graphics as well as a variety of online-only publications that are sometimes interactive. Campus libraries are limited to numbers and quantities of magazines and journals they carry and most libraries now have computers with online access so students can use them when searching for data and accessing these online publications. Online journals offer students unprecedented access to research and studies from around the world even in the most obscure of fields. Often the research and data are more current and up-to-date due to immediacy of online publication. Online environments contain dynamic text which allows additional, related content to be sought out by learners immediately on an unlimited number of topics. Dynamic or hypertext allows data to be imbedded or linked to other pertinent information. The learner is able to access this additional information immediately and thus is learner or knower centred and controlled. These interactive factors can promote learning through discovery or exploratory learning and investigation all of which require learners to think.

Jonassen and Wang (in press) assert that:

> "hypertext is among the best examples of constructivist learning environments because acquiring knowledge from hypertext requires the user to engage in constructivistic learning processes. Learning from hypertext is task driven. It depends largely on the purpose for using the hypertext which in turn drives the level of processing" (Jonassen and Wang, in-press).

Hyperlinks that fail to connect or are linked to sites no longer available are common and frequent obstacles to data collection at this level.

Bruner (1965) encouraged learning through discovery, in both his early cognitive theories and later elaborated on the importance of it in constructivist principles. He defines learning through discovery as "a matter of rearranging or transforming evidence in such a way that one is enabled to go beyond the evidence so reassembled to additional new insights" (Bruner, 1965, pp.607-608). Online environments foster discovery and research based learning (Jonassen, Peck, and Wilson, 1999; Jonassen, Mayes, McAleese 1993) through the exploration and focused search of its resources. Research is the essence of the cognitive level of experience and is the first and often considered the most critical phase of the cognitive design process because the rest of the project relies so heavily upon it. Online learning environments are not passive and research conducted online requires the learner to be actively engaged and learners learn more when they are engaged (Arend, 1999; Jonassen, Peck and Wilson, 1999). Online resources may also prove useful to learners in other recommended cognitivist learning endeavours such as "case studies" and guided discovery" (Arend, 1999). Design students in a study by North (1997) believed the online conferencing enhanced their learning and due to extensive web resources also enhanced the Programming stage of design. Students also employed online conferencing to assist one another in information gathering and integrated graphics and illustrations into online discussions. FIDER (Foundation for Interior Design Education Research) standards (2000) require that student work "demonstrate programming skills, including... information gathering research and analysis (functional requirements, code research, etc." (II-7).

These vast global resources continue to grow with input from more diverse populations. Worzel (1999) explains that more and more of the world's knowledge is becoming available online in part because it provides a democratic publishing forum rather than the traditional selection of individual information, ideas, and perspectives. While this can be seen as positive, permitting access to the "best of the world" (Emberley, 1996) it unfortunately permits publication of the 'worst' of the world as well. The greatest concern with online data or information is the often questionable nature of the content. There is no guarantee as to the quality or reliability of the material, information, or source since anyone can post information online. With many sites containing unreliable, incorrect or inaccurate information, such mis-information at the level of experience greatly increases the likelihood for 'MIS-understanding at subsequent levels of cognition. Wilson and Lowry (2001) see the web as a valuable learning resource but equally as "a young and immature technology—frustratingly slow, often unreliable in content and access, chaotic, with content increasingly dominated by commercial interests", the "hype" of which continues to exceed "the reality".

Some critics argue that there is simply too much information online, leading to certain information overload. Learners require direction when dealing with the extraneous amount of online data. They are often unaware of how to evaluate data or content they find and "select what they actually need from the mass of what is available" (Laurillard, 1999, p.184). Searching through numerous sites with content unrelated to the design problem at hand not only wastes time but distracts the learner from the focus of design problem related experience. According to their study on the impact of web-based instruction on learning Lu et al. (2000) found "there is little solid evidence for the effectiveness of WBI [web-based instruction] on learning outcomes". The results of the study show use of "relevant WWW content does improve learning significantly" and that so called "surfing of irrelevant content on the web actually impedes learning". McKibben (1993) also cautions against consumption of excessive information. Postman (1985; 1990)

contends that we are "amusing" and "informing ourselves to death". Critics such as Emberley (1996) decry that the virtual university is leading to the destruction of the scholarly culture and reducing rigorous reading, study and research to "surfing" the net for questionable resources and the like.

In addition to textual and graphic information learners can virtually travel to building sites, explore visual and spatial real world examples through video clips and virtual tours of spaces such as interior environments (ie: offices), museums, retail, cities, monuments, historical sites. While the video is not yet television quality, it far surpasses the effectiveness of the comparatively stale photograph or slide. This virtual travel allows learners to experience places that are inconvenient to visit at best and mostly inaccessible, if not impossible for them to visit in person. Though admittedly, they cannot replace or compare to the actual experience of being there, they are the next best thing, and nonetheless provide still more experience than a book or photos alone. This experience could be combined with the expertise of an onsite guide such as an architectural historian, designer, or architect for example.

Online environments must not be seen as a panacea for learning enhancement, but as a "resource which must be designed to support effective instructional dimensions" (Reeves, 1997, p.3). The web "does not guarantee learning anymore than the presence of a library on campus guarantees learning" (Reeves, 1997, p.3). With so much data at their disposal there is widespread concern that learners may rely too heavily on the information online rather than think and judge for themselves. They may use the technology to think for them, adopting understanding and decisions from cognitive processes other than their own. Although this also occurs with conventional materials like books and other media, the barrage of online resources may increase the frequency of occurrence. If they do not think for themselves then they are not learning; learning requires them to "go beyond the information given" (Bruner, 1965) to gather data, and

think critically by asking the intellectual, rational and responsible questions that must follow merely empirical data. These higher levels of cognition are discussed in latter sections of this chapter.

Experience Through Online Communication with Others

Learners can gain experience for a design problem through individual sources of data and information online or through contact with others who can share their own experience and expertise with the learning. Learners may use email, videoconferencing, threaded discussion or other online means to contact other design learners, practicing designers or architects with specialized experience in areas directly related to their design problem or other persons who may offer information that will contribute to the learner's level of experience or data collection. North's (1998) experimental online introductory interior design course involved textbook and website reading, as well as online discussions and assignments, with evaluation based on student discussion, participation and assignments submitted via email. Critics such as Emberley (1996) admit that if the technology is to play a permanent role in academia, it could and should be used advantageously to introduce learners to the best and brightest individuals in the world, uniting scholars, researchers and learners.

Online environments facilitate communication between individuals and groups despite physical distance or barriers, through email, videoconferencing, white boards, file transfer, synchronous and asynchronous discussion groups. Learners could, for example, contact client groups, professional designers, or design students in other cities, or countries to share project data, information, views and opinions or project examples (i.e. office design types and characteristics or trends in office design in their home countries). Learners might contact or participate in a guest lecture via online threaded discussion or videoconferencing. Instructors might arrange to have office design experts conduct guest critiques or serve on juries via videoconferencing or using

white boards or even email for critiques. Instructors or guest critics could use an online asynchronous question and answer board that the entire class can participate in and view when needed without the traditional constraints of time. Learners might conduct interviews or hold discussions with people in different areas, cities, regions, countries, or continents to gain information and divergent perspectives pertinent to their design problem. They may acquire diverse problem-solving approaches, share insights, and ways of looking at the design problem, the data, and data collection. Online environments can increase the opportunity for learners to seek information from diverse people and allow the experience of experts to inform their own. With these factors unique to online environments, learners are exposed to diverse perspectives, alternative ideas and potential solutions, a broad-based perspective of design problems, global views and cultural diversity, expanding their range of experience beyond what conventional learning environments can offer.

FIDER (Foundation for Interior Design Education Research, 2000) standards insist that "educational philosophies and goals should be applied in the development of a creative professional who can synthesize information, and analyze problems from many different perspectives" (II-2). The results of one study showed students benefited from the diverse, multicultural perspectives and experiences, knowledge and expertise of international faculty, specialized reviewers and featured lecturers, that were previously inaccessible in the conventional learning environment. Students readily recognized and discussed cultural differences with their international counterparts (Vasquez de Velasco and Holland, 1998). These findings are consistent with FIDER (2000) standards that state learning experiences must "develop consciousness of alternative points of view and appreciation of cultural diversity" and "lead to a global perspective" (II-15).

> "The best preparation for the future is an education that will enable graduates to adapt to a changing world. Adaptation to change requires that the graduate

> draw on history and on the experience of many cultures and apply the theories and methods of empirical investigation" (FIDER, 2000, II-2).

Through communication online learning environments support a community of learners or scholars, the traditions of the scholarly culture. They provide learners access to other learners, mentors, academics in various disciplines and practicing professionals in convenient and inexpensive ways that make such exchanges and interactions possible. A case study by Harwood (1997) employed interactive online video conferencing to create a "connected learning community" (Microsoft, Dec.1996) with guest lecturers from various universities in an experimental graduate design research methods course. In addition to lectures, topical outlines and articles were sent and followed by interactive online discussions between students and faculty. The study results indicated that despite some technological glitches, the videoconferencing proved "extremely beneficial" and appealing to students due to its highly interactive nature.

> "Successful designers are integrators, reaching across disciplines to bring in new information; to extract ideas, and to think critically from diverse pints of view" (Owen, 1989, in Price Waterhouse, 1998, p.128).

Although online communication is not the same as face-to-face communication some say it is equally as effective in communicating with learners and as a means for learners to interact with one another. In contrast, critics argue that online communication lacks human sensitivity and that the technology has proved cumbersome in some studies. One benefit of online discussion is that it democratizes the learning environment, making all learners feel equal. Arend (1999) explains that while online discussions may result in some loss of the discussion dynamic, some learners feel more willing to participate without the stress or pressure of group or face-to-face encounters.

Some research indicates that the technology required for online learning environments (hardware such as video/pc camera, mouse, as well as software) interferes with communication by distracting or disrupting one's thought process, critiques, and discussions. Both the technology

and the online resources are said to be unreliable and often unpredictable. Examples include websites that may not be there the next day or software or hardware failures. In many cases frustration has led users to expect the unexpected. These obstacles interfere with the data and information gathering process and thus learner experience. Certain case studies of online courses have revealed barriers to learning including technical difficulties, excessive email, and loss of subtle interpersonal communication cues such as facial expression and body language (Hara and Kling 1999, 2001; Mendels, 1999).

> According to the FIDER 2000 standards "teaching and learning methods must incorporate...the experience of team approaches" and "multidisciplinary experience (for example, projects could include interaction with code specialists, engineers, architects, artists, behaviourists)" (FIDER, 2000, II-7).

Online learning environments facilitate group and collaborative experience through the same communication methods previously described. These communications permit group work by members at a physical distance from one another such as collaborative experience between two or more design learners. Examples include the World Atelier Global Design Studio, the Nepal Interdisciplinary Studio (Sinclair, 1997; 1998) and the Tex-Mex Virtual Design Studio (1997). Online environments support group work by providing convenience, flexibility of time and location. This further fosters the scholarly culture or community of scholars or learners by bringing together learners, instructors-critics, and design practitioners from diverse, distant locations which could be difficult if not impossible in a conventional learning environment. Other examples of experience through collaboration include several virtual design studios. One is an example of effective online collaborative work involving teams of design students and professors at five separate design schools (Wojtowicz, 1995, p.3). Another experimental studio, the World Atelier Global Design Studio (Sinclair, 1997), was an experimental graduate level collaborative architectural design studio developed to encourage international communication. The project employed students from the University of Manitoba in Canada and Tribhuvan University in Nepal along with professors from both institutions and practicing professionals from architecture

and other disciplines. The objective of the online studio and research was international and cultural enrichment rather than an investigation into online learning. However, the obvious advantages to learning lie in the collaboration of divergent students, professors, and practitioners achieved online. In 1998 Sinclair began another real-world case study in Kathmandu, the Nepal Interdisciplinary (Sinclair, 1998), once again integrating online communication and experience. Other examples of group or collaborative experience online include the experimental Tex-Mex Virtual Design Studio which brought together architectural students from Texas and Mexico creating a unique cultural and professional context made possible through the Internet (Vasquez de Velasco and Jimenez 1997c). In one recent case study interior design and architecture students at two separate universities collaborated online to solve a complex design problem. The authors noted the importance of collaborative design yet the lack of collaborative learning approaches in design education. The collaborative, interuniversity studio project enriched learning as a result of sharing of expertise, divergent ideas, design philosophies and processes made possible with the online learning environment (Matthews and Weigand, 2001).

Experience in Light of Learning Styles and Preferences

As Lonergan notes: that which is interesting, gets absorbed. What is interesting to those with different learning styles and preferences?

Online learning environments are learner centred and focus on the learner or "knower" to construct or build their experiences. The learner or knower is in control of the environment which is consistent with constructivist principles and Lonergan's cognitional theory. Following constructivist thought, Jonassen et al (1999) believe "technologies are more effectively used as tools to construct knowledge *with*" (Preface) rather than the widespread misconception that the technology has something to teach us. Many advocates of constructivist learning strongly support online learning environments for their innate ability to "allow students to explore further what

interests them most about the topic [to be learned] through web searches" (Arend, 1999). Online environments allow material to be presented in multiple formats to appeal to many learning styles and preferences so learners may better process and retain new information or data. However those with preferences contrary to visual and auditory senses could be disadvantaged by online environments.

Online environments are highly visual environments to the extent that some critics believe they are biased to the senses of vision and hearing. McKibben (1993, p.22-23) is critical of technologies like online environments because they alter our perception, including obscuring the "subtle and vital information" gained through contact with the "real world" (p.23) and actually "rob us of information" by biasing our senses toward the visual and auditory (p.189). The emphasis of online environments on visual and auditory elements could offer learners with preference for seeing, reading, and hearing an advantage at the level of experience. Audio is not always available in online environments but when it is there may be some possible benefits for those with auditory preferences such as heightened interest, experience, and recall. Online videoconferencing, and lectures would be most beneficial for these learners such as videoconferencing with an office designer for twenty minutes in a question and answer session or discussion about office design. Arend (1999) asserts that from a cognitivist learning perspective, online learning environments can be effective if learners are engaged in some form of real-life problem-solving such as "creating maps and charting weather patterns to see how they affect local agriculture" rather than "listening to an online audio lecture on the same subject". Clouston and Sinclair (1997) state that "multimedia facilitates learning through multi-sensory engagement" and thus can enhance understanding in the highly visual design disciplines. Due to the customized nature of online learning environments, they claim all learning styles and preferences may be accommodated given that the material is developed in an organized and flexible format (Clouston and Sinclair, 1997, p.8). Furthermore, they propose that the technology of online environments

"affords deeper and arguably more profound benefits to pedagogy". Design content is highly visual as are online environments and many design learners naturally think visually and spatially or must learn to do so. Many design learners have begin with backgrounds or degrees in drawing or the fine arts which predisposes them to this kind of thinking. The emphasis on the visual sense in design and online may be an advantage to design learners or may further encourage them to rely on their visual sense and limit their capacity to experience and thus gather information through their other senses.

With its multimedia, interactive format, communication and research capacities, online learning environments support many principles and needs of individual learning styles and preferences. Arend (1999) is enthusiastic about the learning potential of online environments but cautions that while for some learners "the online environment may provide additional use of senses that help them better process and retain new information", others, like those preferring auditory senses, tend "to do well in traditional face-to-face classroom environments". Again, presentation and access to learning material in multiple formats is strongly recommended in order to "appeal to all learning styles" (Arend, 1999). Arend (1999) also notes that "online courses are never conducted entirely online".

> "Type makes a natural and predictable difference in learning styles and in student response to teaching methods. An understanding of type can help to explain why some students catch on to a way of teaching and like it, whereas others do not catch on and do not like it. Two distinct problems are involved here. Catching on is a matter of communication. Liking it is a matter of interest" (Myers, 1995, p.139)

Experience includes memory, imaginations, and mental images that are seen only in the mind of the individual. "Some people may have Technicolor images, and others black and white ones. For some people auditory imagination is much stronger than visual. A musician, for example, may be able to imagine from a score, without even humming, how the music would sound. There are also people who have no visual images, at least in their waking hours, but have rather a kinaesthetic imagination" (Tekippe, 1996, p.82). Content to be learned must be presented to differing types of

learners in ways they can readily absorb the information and reflect on it. Opportunities for application must also vary. If learners are given choices which can be satisfying to divergent types, interest and thus learning is more certain. For example, the cognitive style of extroversion indicates a preference for "learning by talking and physically engaging the environment" while for introversion "quiet reflection" is preferred (Lawrence, 1996, p.43). The research summarized by Lawrence also indicates preferences and suitability of the learning environment including technologies. For example the IS__ type indicates a preference for demonstrations, labs, computer-assisted instruction, films and audio-visuals while EN__ types by contrast, prefer reading, self-instruction, independent coursework, group projects, and interaction with people (Lawrence, 1996, p.41). Online environments require the learner to actively discover knowledge for themselves, working through content in their own individual, preferred way. Learning is self-directed and the learner or knower can follow their own instincts in searching for information and data or seeking experience through the experience of others by contacting and interacting with them via online means. A study by McManus (2000) indicates that certain individuals "learn poorly" in linear online learning environments that restrict learner choices while other individuals learn poorly in online environments that provide too many choices.

At the level of experience in the cognitive process of learning to design, online learning environments can provide unique opportunities to gather extensive information and data through both independent sites and communication with others who share their own wealth of experience with the learner. According to Lonergan's cognitional theory, thoroughness at the level of experience increases the possibility for completeness at subsequent levels, such as understanding and ultimately leading to a "more probable" final decision, design solution or learning outcome because "each step in the generalized empirical method builds on the preceding one" (Creamer, 1996, p.68). In so far as online learning environments facilitate or enhance the cognitive level of

experience, which in turn can lead to more certain knowing or learning, these environments could be said to facilitate and enhance the cognitive process of learning to design.

Understanding

The level of understanding is characterized by inquiry, conceiving (concepts, relationships and meanings discerned) and insight or clarity in understanding the data of experience. This level in the cognitive process of learning to design is facilitated and enhanced by one-on-one communication with the studio critic or 'coach' (Schon, 1987) who, through 'the right kind of telling' or showing, guides the learner in their understanding. The act of understanding, the "aha!", the moment of clarity, of insight, remains within the learner or knower. Although learners must ultimately understand for themselves, it is the instructors, who themselves have already come to 'understand' the design problem, that provide the direction and advice that can assist learners in their understanding. They can offer perspectives and insights unseen by the inexperienced learner. Studio instructors or critics include guests such as practicing designers or architects, and peers who practice in the role of critic. At this level learners will also seek sources of inspiration for concepts and conduct focused, detailed inquiry into specific concepts and preliminary designs, seeking particular product information or specifications, examples of historic design precedents and the like.

> "Students bring to the studio, in greater or lesser degree, generic competencies for communication, experimentation, and imitation on which they can build, in dialogue with the coach, in order to learn to do the cognitive work of learning to design" (Schon, 1987, p.118).

In conventional design learning environments these aims are achieved through two primary means: focused searches for specific resources (documents, persons, other), and studio critiques, mainly individual desk critiques but sometimes in groups as well. At this stage of design learners are developing concepts, ideas and preliminary solutions. This is done through rigorous sketching and drawing with numerous drafts and modifications. As the learner grapples with the data of

experience they generate concept ideas and solutions to small design problems by asking questions for intelligence and inquiring for answers. As these early ideas become more specific, the beginnings of a design solution develop as the learner continues to literally think on paper through drawing and experiment by trial and error. They eventually arrive at some unique insight which clarifies the data and allows a potential design solution to emerge. But the learner does not struggle through this early and critical phase of the cognitive design process alone. The learner receives guidance and direction through the studio instructor or critic. The critic or "coach" (Schon, 1987) meets with the learner, typically in a one-on-one conversation to discuss their design ideas and view their sketches, drawings, models and the like as working expressions of those design ideas. The learner must also attempt to verbally articulate their ideas and concerns though they may lack the necessary or appropriate design vocabulary. The critic provides feedback, raises questions and concerns about the developing design concepts and ideas. The critic offers suggestions, recommendations or demonstrate alternatives, to spur or provoke the learner to think critically and analytically about their understanding and application of the empirical data. Since understanding cannot be conveyed only "constructed by learners" (Jonassen, Peck, Wilson, 1999, Preface) the critic must "coach" or guide the learner through 'the right kind of telling', leading the learner to think for themselves and attempting to elicit understanding or perhaps insight into the design problem and probable solution. Through watching and listening the learner gains an awareness of how to analyze their work, what they should look for, and how the critic, as an expert, would approach the problem or resolve issues. To be successful, the communication must be open at both ends, that is to say both the critic and the learner must be fully engaged and committed to the process, both listening to one another, questioning, expressing and explaining. In the end, the learner must also consider the recommendations and concerns raised by the critic as they continue to modify and develop their design solution, otherwise this communication would be futile. Should the learner decide to disregard the critic's suggestions or concerns, the cognitive level of understanding fails to be

complete and will thus lead to the mis-understanding previously discussed, as all questions for intelligence at this level were not addressed. As such, mis-understanding and any level of the cognitive process of learning to design will undoubtedly lead to a less-certain, improbable design solution. Regardless of learning environment there are no guarantees that learners will take data from the level of experience, ask the questions for intelligence, do the experimentation of drawing and reworking required in the cognitive process of design or consider the advice of the studio "coach". They may have critiques with instructors but may disregard their comments and recommendations. They may decide not to make needed changes. This will ultimately lead to mis-understanding because they are not considering the full range of questions for intelligence or adhering to answers. No one can force them to consider and make design changes or modifications or take advantage of online methods or opportunities (such as discussion with designers) to assist in their intellectual questioning.

By comparison, online learning environments can facilitate communication among learners, studio critics, guest critics and a host of others who for various reasons would be unwilling or unable to participate in conventional design studios due to constraints of time, distant location, finance, and inconvenience. Learners might have critiques by local, regional, national or international guest critics, renowned designers and architects who offer unique insights, experience and expertise in given areas. FIDER (Foundation for Interior Design Education Research) requires that learners interact "with practicing professionals (for examples, as jurors, project critics, guest lecturers, mentors)" (FIDER, 2000, II-7). The flexibility of online communication can facilitate collaborative, cross- and multidisciplinary design teams or critiques. In the online learning environment this communication must occur in different and arguably less effective efficacious formats to include email exchange, synchronous and asynchronous discussion, white boards, file transfer, audio and videoconferencing.

> "New technology can support discussing through a variety of formats, from conferencing (where the software supports a structured, asynchronous messaging environment for a group) to document discourse environments (where successive annotations can be embedded in a document, allowing a group to offer comments and debate)...one of the easiest ways to encourage students to move from a passive to an active mode of learning" (Laurillard, 1999, p.191).

Since online technology is interactive it supports learning by requiring the learner to be cognitively engaged or active (Grabe and Grabe, 1998) which can facilitate understanding. Furthermore, "some students are prepared to take a more active part in debates and tutorials if they can do so by electronic mail rather than face to face (Laurillard, 1993). This does not mean they are in danger of becoming isolated, unsocial individuals; rather, they are building up their confidence so that they are better able to cope with the difficulties of face-to-face interaction" (Laurillard, 1999, p.185).

These online formats have serious limitations when communicating or sharing manually produced design work is necessary. In Schon's (1987) studio examples the critic Quist demonstrates for a student by drawing directly over the student's drawings. White boards and file transfer can be useful but are limited in their quality and capacity to illustrate the whole work especially while simultaneously videoconferencing. Written forms of online communication such as email are also less effective for critiques since this stage of design deals primarily with drawings and "drawing depends on seeing, and words are very poor approximations to visual things..." (Schon, 1987, p.96). Critics of online learning are sceptical as to whether these environments can effectively communicate the in-depth interaction, discussion and demonstration between coach and learner. Studies by Harwood and others indicate that despite complications there are overall benefits. The often complex and sometimes intense critiques can create opportunity for misunderstandings, the risk of which can increase when communication is filtered through the necessary technology. Asynchronous question-and-answer allows learners to "communicate with each other and receive instructor feedback and guidance through posted

online questions and answers" (Laurillard, 1999). But according to Laurillard (1999) online learner discussions that are not moderated by the instructor could lead to mis-understanding, as learners "could reinforce each other's misconceptions" (p.193). Certain case studies of online courses have revealed barriers to learning including mis-understandings, technical difficulties, excessive email, lack of quality feedback, confusion and loss of subtle interpersonal communication cues such as facial expression and body language (Hara and Kling 1999, 2001; Mendels, 1999). Laurillard (1999) claims that the "act of writing is good for clarifying ideas and understanding" (p.185) and that e-mail and online discussion are beneficial because they encourage learners to "express themselves through the written word in order to communicate" (Pea and Kurland, 1987). Feenberg (1999) identifies some limitations of online learning but supports its potential as a medium for learning through written communication and interaction. Online environments also give learners the ability to review information, when and as often as needed which may aid in conceptualization and understanding. Certain learning styles and preferences include the need to constantly review or repeat material in order to better absorb and thus understand it.

Jonassen, Peck and Wilson (1999) demonstrate how higher level learners can utilize online resources to assist in achieving the constructivist ideals of building knowledge through discovery and clarifying individual understanding through social interaction and communication:

> "...learners who articulate a personally meaningful goal or intention can explore the internet in search of ideas that help them to construct their own understanding. Sharing their own understanding by constructing personal and group web sites completes the knowledge construction cycle" (Preface).

Taylor (1997) suggests newsgroups can be used to structure dialogue that fosters critical thinking. Design research reveals varying degrees of success with design critiques and other communication in online learning environments. Advantages include the aforementioned flexibility of online communication formats which permits diverse and previously inaccessible

individuals to participate in learner critiques and unprecedented collaborative design projects. Disadvantages range from distracting technical difficulties and excessive email to the impersonal nature of the communication format.

Some interior design programs have considered and accepted the integration and impact of online environments for basic communication such as that between learners and between learners and faculty (Whitney and McLain-Kark, 2000). An interior design case study examined a design studio taught collaboratively by two universities using, in part, synchronous and asynchronous network features as a means of communication. Student work indicated "improvement" and general learner satisfaction with the online methods (North, Sterling, Ellis, 2000). North (1997) studied online computer conferencing as a supplemental communication forum outside regular design studio hours. The study examined whether the World Wide Web could enhance communication and increase student motivation for online interaction in the senior level interior design studio. The results showed students believed the online conferencing enhanced their learning. Students also employed online conferencing to assist one another in information gathering and integrated graphics and illustrations into online discussions. In a study by Mikovec and Singer (1997) online methods were used in a design studio course to increase opportunities for students to have practicing design professionals critique their design work. Collaborative critiques among design teams and others are essential in design practice and as such are critical learning components of any interior design studio particularly at the cognitive level of understanding. Thus, increased opportunities for such critiques, online or through alternative modes, enhances the learning process and product.

Singer (1997) developed online "cyber internships" allowing students to work collaboratively with design firms. A case study by Harwood (1997) employed interactive online video conferencing to create a "connected learning community" (Microsoft, Dec.1996) with guest

lecturers from various universities in an experimental graduate design research methods course. In addition to lectures, topical outlines and articles were sent and followed by interactive online discussions between students and faculty. The study results indicated that despite some technological glitches, the videoconferencing proved "extremely beneficial" and appealing to students due to its highly interactive nature.

In one recent case study interior design and architecture students at two separate universities collaborated online to solve a complex design problem. The authors noted the importance of collaborative design yet the lack of collaborative learning approaches in design education. Some initial learning barriers were encountered due to the impersonal nature and lack of face-to-face interaction among team members. Traditional communication and design approaches were also used and the authors note the need for some initial face-to-face meeting for the distance portion to be successful. The collaborative, interuniversity studio project enriched learning as a result of sharing of expertise, divergent ideas, design philosophies and processes made possible with the online learning environment (Matthews and Weigand, 2001).

In Wojtowicz's (1995) Virtual Design Studio members of the design team from participating schools communicated asynchronously online and sent video, graphic, drawing and text files as needed. The result was said to be "a new working environment of geographically distributed design practice and education". Another experimental studio, the World Atelier Global Design Studio, was an experimental graduate level collaborative architectural design studio developed to encourage international communication. Students from the University of Manitoba and Tribhuvan University in Nepal worked both independently and in groups to address the plethora of design project issues and submitted design work via the Internet. Email and video conferencing online were used to provide critiques and feedback from professors and practicing architects participating in the project (Sinclair, 1997-1998). The objective of the online studio and research

was international and cultural enrichment rather than an investigation into online learning. However, the obvious advantages to learning lie in the collaboration of divergent students, professors, and practitioners achieved online.

In the Tex-Mex Virtual Design Studio, all stages of the design project could be posted, viewed and evaluated by all individuals regardless of location. Results of the study indicated that "all the conventional instructional targets of a Design Studio were achieved and... non-conventional targets, particular to the Tex-Mex Virtual Design Studio, were largely accomplished" (Vasquez de Velasco and Jimenez, 1997c). The uniqueness of the online experience was noted as likely "reinforcing short term memory and the potential for retroactive introspection" (Vasquez de Velasco and Jimenez, 1997c; Vasquez de Velasco and Holland, 1998). The primary impediment or obstacle encountered was that utilizing the technological components proved distracting for instructors while critiquing student work (Vasquez de Velasco and Jimenez, 1997c). This may further indicate that students too, could be distracted, and thus negatively affect the learning process. Vasquez de Velasco and Holland (1998) describe four pedagogical methods within an innovative model developed in an architectural design program that utilize online communications to link learners and professors from diverse international programs (i.e. Texas and Mexico). Learners have access to an international context and typically achieve above average scores on tests and assignments. The methods include: Synchronized Reciprocal Design Studio, Asynchronous Reciprocal Design/Construction Studio, Direct Reciprocal Exchange of Lectures, and Joint Debate. Students benefited from the diverse, multicultural perspectives and experiences, knowledge and expertise of international faculty, specialized reviewers and featured lecturers, previously inaccessible. Students readily recognized and discussed cultural differences with their international counterparts. Student debates were characterized as "intense" and limited by time, though some students maintained an ongoing debate via email. The study results ranged from "successfully implemented" to "very positive" and "very successful" in terms of the overall

effectiveness of the four methods in bringing about the desired learning outcomes (Vasquez de Velasco and Holland, 1998).

At the level of understanding in the cognitive process of learning to design, online learning environments permit the participation of diverse guest critics and experts and offer unprecedented opportunities for collaborative design teams composed of instructors and learners from around the world. The breadth of this communication with critics and experts has the capacity to make understanding more certain and complete for the learner and thereby increases the potential for completeness at subsequent levels, such as judgement and ultimately leading to a "more probable" final decision, design solution or learning outcome because "each step in the generalized empirical method builds on the preceding one" (Creamer, 1996, p.68). In so far as online learning environments facilitate or enhance the cognitive level of understanding, which in turn can lead to more certain knowing or learning, these environments could be said to facilitate and enhance the cognitive process of learning to design.

Judgement

At the level of judging in the cognitive process of learning to design the learner reflects on their understanding of the design problem. Questions for rationality are posed: Am I certain this is the best solution given my understanding of the data? Is this a possible and probable solution? Does this solution reflect the intended design concept? Were recommendations and concerns cited by studio critics adequately considered and implemented into the design? Did I fully and completely understand and interpret the data correctly? Does this solution meet all design project criteria? And so on. In the conventional design learning environment critiques between learner and critic will likely continue. Since the critical reflection required at this level occurs privately and internally, the critic may act as a sounding board for the learners questions. The critic may provide some verification of the learners line of self-questioning or raise questions for the learner

to consider. Ultimately, only the learner or knower can do the cognitive work of reflection for themselves and commit to a personal judgment about their design solution based on their own reflections. Responses or feedback from critics and other experts may, and often should, weigh into the learners judgment but not determine it.

Online learning environments may facilitate or enhance the cognitive level of judgement in so far as they can provide access to diverse critics and or experts that may broaden the scope and depth of the learners questions for reflection and weigh favourably into the responses. Since the quality, validity, accuracy and reliability of many online sources is questionable, the learner runs the risk of weighing uninformed, erroneous or inappropriate judgments.

Decision

Having judged their design solution to be correct, at the level of deciding in the cognitive process of learning to design the learner deliberates on their judgement, asking questions for responsibility—is the design solution of value? Is it the most appropriate? Is the solution ethical? Who might be positively and negatively affected by this solution and how? Ought I to do it? This level may prove difficult for the learner as ethical and moral considerations are virtually fictional with a merely simulated project context. Questions and answers of ethical responsibility are speculative for the learner because the design context is fictitious. According to FIDER (Foundation for Interior Design Education Research, 2000) the process of learning to design must "address professional ethics and the role of ethics in interior design" (FIDER, 2000, II-15).

In the conventional design learning environment critiques between learner and critic will likely continue. Since deliberation and decision are by nature internal cognitive acts the critic can only serve as a thoughtful guide to the learner or knower who must ultimately complete the cognitive work of deliberating and deciding for themselves. The critic may offer the learner further

questions for thought or hint at a probable decision. Responses or feedback from critics and other experts should inform learners but not determine their final decision. Here, critics can facilitate ethical thinking and behaviour by bringing reality to the learner through suggested implications of their design solutions. Critics are able to draw on their own experience, understanding, insight, judgments and decisions to provide the learner with a realistic approach to their design solution at the level of decision. Through the expertise and experience of these individuals, coupled with readings, research and common sense, learners can estimate the potential consequences, impact and ramifications of their design solutions. They have long since answered the questions of whether or not it *can* be done and ask the more profound questions of whether indeed it *should* be done.

Thus, online learning environments may facilitate or enhance the cognitive level of deliberating and deciding in so far as they can provide access to critics, experts, and simulated stakeholders that may heighten the awareness of the learner to ethical and moral implications of their design solutions. Beyond awareness, the responsibility to act on their decision lies with the learner entirely. Regardless of learning environment, the learner cannot be forced to act on the decision that ought to be carried out. They can even decide to act in opposition to it.

Knowing

Online environments facilitate Lonergan's two ways of knowing by allowing individuals to document and make accessible the collective knowledge of the world, and to continue to contribute to that growing pool of knowledge and make new knowledge accessible to be explored, discovered and analyzed by any knower who so chooses. These same resources can also facilitate 'un-knowing' when their often questionable content is assimilated by the learner into the knowing process.

Since online learning environments can contribute to the levels of experience and understanding and to some minimal extent the levels of judgement and decision, they provide the learner with the opportunity to make knowing at those levels more complete and thereby make knowing in the end more certain or 'more probable'. Thus, in the cognitive process of learning to design the design solution arrived at becomes increasingly 'more probable'.

Despite all the additional information and advice available with online environments the onus to use and apply it is on the knower or learner. The learner must willingly engage in the online activities and research to reap the cognitive benefits. They must make the effort to listen to advice and seek out information and make the connections for understanding as 'no one will do it for them' (Lonergan, 1992, p.13). This, online environments cannot do. They can only facilitate or enhance the knowing, the cognitive process of learning to design.

CHAPTER 5
Summary and Conclusions

Post-secondary institutions face mounting pressure to adopt and implement online learning environments. Their widespread existence and exponential growth seem to signal their impending dominance over conventional learning environments in years soon to come. Unfortunately, online courses are more often than not implemented without seriously considering or comprehending the impact, the advantages and disadvantages to learners and the learning process. Interior Design programs are no exception. Research indicates an emerging trend in experimental online courses, in whole or in part, within the fields of interior design and architecture. Existing studies of online design studio courses are few and generally fail to address the impact of online learning environments on the cognitive process of learning to design. This investigation employed Lonergan's cognitional theory as a theoretical framework from within which to analyze online learning environments, as a means to determine what, if anything, online learning environments may uniquely contribute to the cognitive process of learning to design. The prominent questions addressed by this study and the study findings are summarized below.

What parallels can be drawn between Lonergan's cognitional theory and the cognitive process of learning to design? Lonergan's cognitional theory at once defines the cognitive process of learning, the cognitive process of design and thus the cognitive process of learning to design. The levels of Lonergan's Method: dreaming, experiencing, understanding, insight, judging, and deciding correlate with the cognitive stages designers work through when solving design problems. Since learners learn to design by engaging in the process of design, Lonergan's cognitional theory in turn parallels the cognitive process of learning to design as well.

What, if anything, can online environments uniquely contribute to the cognitive process of

learning to design? What are the advantages and disadvantages of online learning environments relative to the cognitive process of learning to design? What is gained? What is lost?

Factors and unique contributions of online learning environments that facilitate or enhance the cognitive process of learning to design at the levels of experience and understanding include but are not limited to:

- The learner must, by necessity, be actively and cognitively engaged in learning;
- Access to extensive, unprecedented array of resources with many nearly or completely inaccessible otherwise; resources are mostly dynamic with additional content available immediately through links, facilitating and enhancing research and learning through discovery; no longer limited to physical library resources; resources and content online more current and timely without publishing delays; resources are equally accessible to all online learners; provides access to unique resources only available online; democratic publishing format allows material to be published by anyone, permitting access to material that may have otherwise gone unpublished;
- Promotes experience and understanding through the potential for a broad range of collaborative design projects, multicultural, cross and multidisciplinary design team work; potential for rich, unprecedented diversity and array of participants (learners, instructors, critics) from design programs around the world, multiple cites, countries, continents, made possible online; facilitates scholarly culture, community of scholars;
- Increased opportunities for communication, diverse critiques/coaching, perspectives, among learners, studio critics, guest critics and a host of others who for various reasons would be unwilling or unable to participate in conventional design studios due to constraints of time, distant location, finance, and inconvenience; learners have increased opportunities for critiques by local, regional, national or international guest critics, renowned designers and architects who

offer unique insights, experience and expertise in given areas, not possible to this degree through conventional studio environments;

- Fosters learning through discovery and research-based learning critical to the design process;
- Format and structure are learner or knower centred and controlled; accommodates multiple learning styles and preferences and may be advantageous for learners of particular types;
- Combines several media formats (graphics, video, audio, dynamic text, etc.) to produce richer information and heightened experience that may accommodate and appeal to various learning styles and preferences; learners have multiple presentation formats to utilize;
- May increase participation of certain learners in learning discussions;
- Offers access to authentic, real-world contexts through its ability for virtual travel, tour distant geographic locals in real-time, heightens experience and surpasses quality and effectiveness of still photos or slides.

Online environments can, at the very least, improve upon some of the conventional elements that facilitate the cognitive process of learning to design (online journals with up-to-date information, new research, hyper-linked documents, etc.) and at best offer learning opportunities unavailable in the conventional studio learning environment. Online environments have the capacity to expand and deepen learner experience and understanding beyond what the conventional design learning environment can offer.

Factors of online learning environments that hinder the cognitive process of learning to design at the levels of experience and understanding include but are not limited to:

- Excessive and irrelevant information of often questionable content, from questionable, often unreliable sources increases risk of 'mis-understanding' at subsequent levels; learners must be able to evaluate quality and validity of content but often unprepared to do so; excessive

information time consuming to search and may divert learner attention from design content; learner may rely to heavily on the information and barrage of online resources may increase occurrence; publication format permits anyone to publish almost anything;

- Unreliable and unpredictable nature of online environments as they are in a constant state of flux with access and site content changing frequently;
- Technology is cumbersome, distracting and interferes with online communication particularly during critiques between critic and learner, too many devices required; hardware and software often lead to technical difficulties; limitations of the medium, not ideal form for communicating complex design work including manually produced drawings and other design work, lose quality, character and thus vital information when scanning and the like; difficult for demonstrations (critics often draw on trace over student work in conventional studio environment); difficult to video conference and share files simultaneously and impossible with multiple parties;
- Heavy reliance on writing, more time consuming when addressing issues, questions, etc.; lacks qualities of human face-to-face communication and interpersonal communication cues which may lead to misunderstanding; loss of discussion dynamic; increased risk of misunderstanding when communication is filtered through required technology;
- May bias our senses to the visual and auditory; highly visual nature of online environment may create advantages and or disadvantages for particular learning styles and preferences.

Some research on communication between learner and critic or what Schon (1987) calls "coaching" has shown to be difficult online. Learners in the very beginning do not even possess the design vocabulary to express their ideas, concerns, issues, difficulties and online environments lack the verbal and visual cues that of the critic to support the communication process.

Online learning environments hold the most promise in facilitating or enhancing knowing for the learner at the cognitive levels of experience and understanding with marginal success at the higher cognitive levels of judgement and decision due to their reflective nature. Online environments could facilitate improvement in the learner's ability to judge and decide if the online sources accessed, and communication exchanged, elicited deeper reflection or deliberation by the learner. Since each level of Lonergan's Method builds on the preceding level, facilitating or enhancing knowing at the level of experience and understanding can make knowing at subsequent levels of judging and deciding more certain or more 'probable'. In this way, facilitating or enhancing knowing at any level of the cognitive process of learning to design can to some degree enhance learning as it ultimately contributes to the 'most probable' design solution.

Future Research

This study has prompted several significant questions for future research as follows. To what degree can design critiquing or coaching be effective in online learning environments? What is gained and what is lost? As a critical component in the cognitive process of learning to design, the success or failure of online critiques could eliminate online environments as a viable option for design studios. Could Lonergan's cognitional theory be used as a framework for analyzing online learning environments in other educational disciplines such as medicine, law, the humanities and sciences for example? If the method could be applied to these and other disciplines it may inform and enlighten the current approach to online education taken by those administrators and stakeholders.

APPENDIX

Table 1.0

FIDER Accredited Interior Design Programs in Canada and the United States
Programs with Online Courses and or Course Material Online

	University or College	Online Courses? Yes/No	Some course material online	Interest/Plans to develop online courses
1	International Academy of Design Toronto, Ontario	No		
2	Algonquin College Ottawa, Ontario	No		
3	Humber College Etobicoke, Ontario	No		Yes
4	International Academy of Design and Technology Toronto, Ontario	No		
5	Kwantlen University College Richmond, British Columbia	No	Yes	
6	Ryerson University Toronto, Ontario	No		
7	University of Manitoba Winnipeg, Manitoba	No		
8	Northern Alberta Institute of Technology Edmonton, Alberta	No		Yes
9	Mount Royal College Calgary, Alberta	No	Yes	Yes
10	Lakeland College Vermilion, Alberta	No		
11	Southern Illinois University Carbondale Carbondale, Illinois	No		No
12	Mississippi State University Mississippi	No		Yes
13	O'More College of Design Franklin, Tennessee	No		
14	American Intercontinental University Atlanta, Georgia	No		Yes
15	North Dakota State University Fargo, North Dakota	No		Yes. In process of developing a few courses.
16	Brenau University Gainesville, Florida	No		
17	Ohio State University Columbus, Ohio	No		Yes
18	La Roche College Pittsburgh, Pennsylvania	No		
19	Samford University Birmingham, Alabama	No		
20	Drexel University Philadelphia, Pennsylvania	No		
21	Buffalo State College Buffalo, New York	No		
22	Kansas State University Manhattan, Kansas	No		

23	University of Tennessee Knoxville, Tennessee	No		
24	School of Visual Arts New York, New York	No		
25	Rocky Mountain College of Art and Design Denver, Colorado	No		Yes
26	Alexandria Technical College Alexandria, Minnesota	No		
27	Texas Tech University Lubbock, Texas	No		
28	University of North Carolina at Greensboro Greensboro, North Carolina	No		
29	Seminole Community College Sanford, Florida	No		
30	Winthrop University Rock Hill, South Carolina	No		
31	Brigham Young University Idaho	No		
32	El Centro College Dallas, Texas	No		Yes
33	Cornell University Ithaca, New York	No		
34	Western Michigan University Kalamazoo, Michigan	No		
35	Watkins College of Art and Design Nashville, Tennessee	No		
36	Berkeley College/Bergen Campus Waldwick, New Jersey	No		Yes. Some in development for '02
37	University of Nevada Las Vegas, Nevada	No		
38	Washington State University Pullman, Washington	No	Yes	
39	California State University Northridge Northridge, California	No		No
40	Pratt Institute Brooklyn, New York	No		
41	Moore College of Art and Design Philadelphia, Pennsylvania	No		
42	Virginia Commonwealth University Richmond, Virginia	No	Yes	
43	American Intercontinental University Los Angeles, California	No		
44	University of Cincinnati Cincinnati, Ohio	No	Yes	
45	Iowa State University Ames, Iowa	No regular. 1 previous.		
46	Florida State University Tallahassee, Florida	No		
47	Kendall College of Art & Design Ferris State University Grand Rapids, Michigan	No		
48	Rochester Institute of Technology Rochester, New York	No		

49	Arizona State University Tempe, Arizona	No		
50	Ringling School of Art and Design Sarasota, Florida	No		
51	Maryville University of St. Louis St. Louis, Missouri	No		
52	Ohio University Athens, Ohio	No	Yes	
53	University of Arkansas Fayetteville, Arkansas	No		
54	University of Texas at Austin Austin, Texas	No		
55	University of Oklahoma Norman, Oklahoma	No		
56	Philadelphia University Philadelphia, Pennsylvania	No		
57	University of Missouri Columbia, Missouri	No		Yes. One in progress ready within 2001/02
58	International Academy of Design and Technology Chicago, Illinois	No		
59	Purdue University West Lafayette, Indiana	No		
60	Indiana University Bloomington, Indiana	No	Yes	
61	Louisiana State University Baton Rouge, Louisiana	No		
62	Auburn University Auburn, Alabama	No		
63	Western Carolina University Cullowhee, North Carolina	No		
64	Endicott College Beverly, Massachusetts	No		

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