CREATIVITY AND DESIGN: A STUDY OF THE LEARNING EXPERIENCE OF INSTRUCTIONAL DESIGN AND DEVELOPMENT GRADUATE STUDENTS

by

GREGORY NEIL CLINTON

(Under the Direction of Lloyd P. Rieber)

ABSTRACT

Throughout history, creative ideas in every field of endeavor have contributed to human expertise and capability, giving rise to a multitude of individual creative works and, ultimately, creating civilization as we know it. In many fields today, especially design fields, the role of creativity is made explicit. However, the field of instructional design has been an exception to this rule, embracing the design process but seldom acknowledging creativity in its literature.

This dissertation explores the role of creativity in instructional design and development. Specifically, the dissertation presents a literature review and conceptual framework on the role of creativity in instructional design and development, an exploration of the theoretical underpinnings of a graduate curriculum in instructional design, and a research report describing a mixed-methods study of measures of creativity among a group of 17 students in the program, along with five qualitative case studies.

A quantitative analysis used correlational procedures to compare three measures: the Torrance Tests of Creative Thinking: Figural (TTCT:F), the Creative Product Semantic Scale (CPSS), and a questionnaire about personal creative ability. Additionally, five case studies were conducted in which interviews and online design journals were analyzed in the context of other data. The goals of the study were to explore what relationships might be found between the three

measures, to describe the design process of individual students, and to examine student perspectives about creativity and design.

Results of the comparison of measures were inconclusive. However, the quantitative data indicate that the seventeen individuals: a) were highly creative relative to the general population; b) generally viewed themselves as creative persons; and c) created multimedia projects that were rated as fairly homogenous in creativity by two experts. The five case studies describe students who enter the program having more skills with the multimedia development tools, who tend to view themselves as creative, generally thriving in the program. In contrast, students who lack these initial skills may view themselves as less than creative and generally experience frustration in the program, needing additional support. All five case study participants affirmed that creativity is necessary for good design.

INDEX WORDS: behaviorism, constructionism, constructivism, creativity, flow, instructional design, instructional design and development, instructional systems design, ADDIE, multimedia, scaffolding, self-directed learning, situated cognition, situated learning

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DEDICATION

I dedicate this dissertation to my beloved wife, Myung-Sun Clinton, to my stepson, Jin Hwan Oh, and to the memory of my mother and father, Marguerite Elizabeth Clinton and Robert Harold Clinton, Sr.

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Inexpressible thanks to my wife for her love, support, encouragement, and tolerance, without which this dissertation – and many other good things in my life – would never have happened. Many thanks also to my stepson and my extended family for their patience and support. Thanks to Lloyd Rieber and Rob Branch for their friendship and for being the best academic advisors anyone could hope for. Thanks to my committee members, Ikseon Choi, Bonnie Cramond, and Michael Orey for their friendship, inspiration, and valuable input.

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CHAPTER 1

INTRODUCTION

Creativity is a part of everyday life. Not only are the results of innovation constantly surrounding us – and changing rapidly – but also the invitation to be personally creative seems to be a message that reaches all of us to one degree or another in our day-to-day experience. Individuality and autonomy are values that are woven into the fabric of American culture. “It’s your thing,” “Express yourself,” and “An Army of One” are examples of common cultural memes that are repeated in the media. Implicit in these messages is the idea that an individual can do things in a way that nobody else does them. We do have strong cultural norms that push us toward conformity, but they are counterbalanced by the rewards our culture gives to those who, in a socially acceptable manner, find new and clever ways to do and to be.

Among professionals, the pressure to innovate is also a daily reality. The concept of intellectual property is about the great value attached to new ideas, and the potential economic gain associated with them. Corporations have spent great sums of money from year to year in an effort to inspire employees to be more creative (Scott, Leritz, & Mumford, 2004; Sternberg & Lubart, 1999). Many of the same corporations, it appears, also spend great sums of money paying instructional design and development teams to develop training for their employees.

It is ironic, therefore, that the field of instructional design and development, in contrast to other design disciplines, has not formally embraced creativity as an essential element of the design process. This state of affairs is attested to by the fact that in spite of the hundreds of

instructional development models proposed over the years, none of the representative examples described in the survey of models by Gustafson and Branch (2002) make any mention of creativity.

Yet opportunities abound for creativity in the work of instructional designers. Gaining learner attention in novel and effective ways, satisfying challenging demands from clients within project constraints, and designing or selecting materials for delivering content are some of the aspects of every instructional design and development project that can be viewed as opportunities to innovate. As a number of scholars have pointed out (Dick, 1995; Visscher-Voerman & Gustafson, 2004), good instructional designers, in practice, bring their personal creative resources to the table in their day-to-day work. However, the systematic process of designing instruction has been roundly criticized for leading, by default, to uncreative and uninteresting instructional products (Gordon & Zemke, 2000; Rowland, 1995).

The role of creativity in instructional design and development is therefore ripe for study. The dissertation described in the following pages represents an attempt to respond to this need. The present chapter provides an introduction to the major themes of the dissertation (much of this material is drawn from the literature review and conceptual discussions in Chapter 2), along with a description of the remaining chapters, in which these themes are examined in detail.

Research Topic: Creativity and Instructional Design

Creativity

While a common understanding about the nature of creativity is not found in professional and research literature, what one does find is a core definition of creativity that is fairly consistent: creativity is understood to be the generation of ideas that are both novel and useful,

usually in response to a problem that needs to be solved (Csikszentmihalyi, 1996; Feist, 1999; Root-Bernstein & Root-Bernstein, 1999; Sternberg, 1999a; Sternberg & Lubart, 1999). Types of creative thinking that have been identified include divergent thinking (multiple possible responses to the same task or problem), problem identification (often a key event that precedes a creative breakthrough), and evaluative thinking (judging the value of an idea; Plucker & Renzulli, 1999).

If one allows that creativity in the lives and works of individuals is present by degrees, then one is left with the need to measure creative ability and to judge who and what is more or less creative. The solution to this problem in most fields is to assemble a panel of creative experts, chosen by some agreed-upon criteria, and to let this panel collectively rate creative performances and products (Feldman, 1999). However, such a system, though successful in practice, sheds little light on the nature of the creative process.

A large body of work has been done by researchers endeavoring to study the broad range of creative ability (see Albert & Runco, 1999; Paulus & Nijstad, 2003; Sternberg & Lubart, 1999). Approaches include experimental evaluations of immediate influences on creative output, such as variations in instructions for a task (Runco & Sakamoto, 1999); psychometric tests of aptitudes such as divergent thinking, problem identification, and evaluative thinking (Plucker & Renzulli, 1999; Torrance, 1974); and the development of cognitive theories to account for creativity as an aspect of intelligence (Ward, Smith, & Finke, 1999; Weisberg, 1999). While conclusions about the nature and measurability of creativity from these branches of research appear mostly tentative, the research treats as self-evident the existence and importance of a wide range of creative ability in human life.

There are several points of emphasis in the literature relating to creativity that have special importance for a discussion of creativity in instructional design. In brief, these are:

- There is a close connection between creativity and problem solving (Csikszentmihalyi, 1996; Feist, 1999; Paulus & Brown, 2003; Policastro & Gardner, 1999; Root-Bernstein & Root-Bernstein, 1999).
- The creative process has been described as occurring in fairly recognizable stages: Preparation, Incubation, Illumination, and Elaboration/Verification (Csikszentmihalyi, 1996; Penney et al., 2004; Wallas, 1954/1988).
- The motivational construct known as "flow" (Csikszentmihalyi, 1990; 1996) appears to be closely related to creative work.
- Perceptions of self can have an impact on creative performance (Silvia & Phillips 2004; Szymanski & Harkins, 1992).
- Group or social contexts can play a facilitative role in fostering creative performance (Hooker, Nakamura, & Csikszentmihalyi, 2003; Paulus & Nijstad, 2003; Williams & Yang, 1999).
- Support can be found in the literature for both consensual assessment (Amabile, 1983; Baer, Kaufman, & Gentile, 2004) and analytical assessment (Besemer, 1998; Besemer & O'Quin, 1984; 1999; O'Quin & Besemer, 1989) of creative products.
- Assessment of personal creativity via the Torrance Tests of Creative Thinking (TTCT) is widely accepted (Plucker & Renzulli, 1999) and supported by reliability and predictive validity studies (Cramond, 1993).

- The role of creativity in various design fields is well established (Akin, 1994; Blicblau & Steiner, 1998; Court, 1998; deYoung, 1996; Kelley & Hartfield, 1996; Smith & Tabor, 1996).
- All creativity happens within constraints; too much freedom is a hindrance to creative work (Stokes, 2006).

All of the above points of emphasis have implications for the study of the role of creativity in instructional design and development. They are presented in more detail in Chapter 2 (with additional material provided in Appendix A).

Instructional Design

Instructional technologists are generally quite familiar with instructional design, whether termed instructional design, instructional systems design, instructional design and development, or simply instructional development. According to Molenda, Reigeluth, and Nelson (2003), instructional design is "a construct that refers to the principles and procedures by which instructional materials, lessons, and whole systems can be developed in a consistent and reliable fashion" (p. 574). Casual reference to the topic of instructional design generally brings to mind the ADDIE framework – Analysis, Design, Development, Implementation, and Evaluation. As a generic conceptual model, ADDIE represents a common understanding about the broad components or phases of instructional design without prescribing how those phases should be conducted. Widely used process models such as that of Dick, Carey, and Carey (2005) and Smith and Ragan (2005), may be counted among the large "ADDIE family of models" (Gustafson & Branch, 2002) that have been proposed over the last several decades.

Instructional design as practiced by professionals today enjoys wide variability. In a recent study, Visscher-Voerman and Gustafson (2004) found no consistent patterns of design behavior among 24 professional instructional designers. However, guidelines exist in regard to instructional designer competencies (Richey, Fields, & Foxon, 2001) as well as how beginning instructional designers should be trained (Tripp, 1994).

Research Rationale: Conceptualizing the Role of Creativity

A natural affinity exists between creativity and design. According to Nelson and Stolterman's book *The Design Way* (2003), design is simply the creation of new things. "To come up with an idea, and to give form, structure and function to that idea, is at the core of design as a human activity" (p. 1).

Instructional technology literature includes no research reports specifically on the role of creativity in instructional design, and none of the models reviewed by Gustafson and Branch (2002) appear to include any mention of creativity. However, the idea that creativity is important in the work of instructional designers is not new. It has been the topic of a number of conference presentations over the years. In published literature, discussions of the scientific approach versus the "craft" or "artistic" approach to instructional design have appeared from time to time (Clark & Estes, 1998; Heinich, 1984; Reigeluth, Bunderson, & Merrill, 1978). The instructional design profession has also come under criticism periodically from educators who claim that the process by its nature tends to produce unimaginative training products, resulting in boredom for learners. "Used as directed, it produces bad solutions" (Gordon & Zemke, 2000, p. 42). Dick (1995a, 1995b) defended instructional design by arguing that common practice among professionals who use the models is not rigid and was never intended to be. However, other writers have contended

that instructional design models ignore creativity (Caropreso & Couch, 1996; Rowland, 1995), or that creativity needs to be fostered among instructional designers apart from the instructional design models themselves (Caropreso & Couch, 1996). More recently, Allessi and Trollip (2001), Gustafson and Branch (2002), and Luppicini (2003) have been among those calling for instructional design work to be done creatively.

Creativity has not been formally acknowledged in models of instructional design. However, the above sources suggest that many instructional technologists sense a need to keep creativity from being overlooked in instructional designers' day-to-day work. What remains is to find a formal conceptualization of this need that is specific to the instructional technology field. Chapter 2 of the dissertation is an attempt to accomplish this in the light of relevant literature. The chapter offers a conceptual framework for understanding the operations of creativity in the context of instructional design and development.

Chapter 2 also outlines several areas of needed research relating to creativity in instructional design and development. These are highlighted in the following section.

Research Directions: Present and Future

Several areas of possible research have emerged from the survey of literature and development of the conceptual framework in Chapter 2. It is from among these research areas, given here in abbreviated form, that two pilot studies and the dissertation study presented in Chapter 4 were conceived.

Further Study of Professional Instructional Design Practice

Studies of what professional instructional designers do are relatively uncommon, and more such studies need to be conducted in the light of creativity's role. Qualitative studies of professional instructional designers, with issues of creativity specifically in mind, might illuminate the role of creativity in the work of a broad range of designers.

Creative Self-Awareness

Ethnographic studies of professional designers could include an examination of the degree to which designers are self-conscious or self-confident about the creative aspect of their work. Self-efficacy theory (Bandura, 1986) could provide a helpful frame of reference for studying this phenomenon.

Flow Theory

As noted earlier, the flow experience and the creative process appear to be closely related. Eminently creative persons often report experiences of flow in their work (Csikszentmihalyi, 1996). Additionally, in two pilot studies involving 12 instructional design and development students, all students strongly associated flow with their design work (Clinton & Rieber, 2005; Clinton, 2005). Ethnographic or phenomenological studies of the work experience of professional instructional designers can explore the extent to which these professionals describe their work as characterized by flow, and whether work sessions accompanied by a sense of flow are also regarded as creative or productive.

Situated (Group) Creativity

Just as communities of practice foster social growth and skill acquisition, communities of practice can also foster creative work (Hooker, Nakamura, and Csikszentmihalyi, 2003). In the final chapter of their edited book *Group Creativity*, Paulus and Nijstad (2003) suggest five questions to be addressed by future research. Because instructional design and development often involves a group process, all of these are relevant to instructional design and development teams as well as communities of training in the practice of IDD:

1. What are the relevant inputs group members bring to their task?
2. Under what conditions are individual inputs contributed in an optimal way?
3. How do the contributions of other group members affect individual-level cognition, motivation, and emotion?
4. How are individual contributions combined to yield a creative group response?
5. Under what conditions does group creativity affect the environment of the group? (p. 333-338)

Creativity as a Curricular Component in Instructional Design Training

I argue that instructional design students can benefit from engagement with conceptual representations of creativity and instructional design while these students are in the formative stages of their professional careers. Studies need to be designed to evaluate whether students actually would benefit from such an inclusion in the curriculum. While controlled comparison studies would likely be difficult, perceived benefit among students could be studied via pre- and post-interviews for a semester in which this component has been added to the curriculum.

Research Setting: Graduate-Level Training in Instructional Design and Development:

The setting for the research projects described in this dissertation is the "IT@UGA Studio" program in the University of Georgia's College of Education. Not only is this a graduate program where students learn instructional design and development, it is also an innovative example of an adult education curriculum designed to create a learning community, one that engages students in immersive, real-world experiences while working within the constraints of the education structure of a major university. The program came about through the leadership of faculty in the Instructional Technology program who sought to give expression to their constructivist views on teaching and learning. The effort toward a new curriculum was driven not only by an overarching philosophical orientation – constructivism – but also by various theoretical perspectives that have influenced the thinking of faculty members.

Prominent among these perspectives were constructionism, legitimate peripheral participation, and self-directed learning. Additional significant theoretical constructs included situated cognition, scaffolding, and flow theory. Finally, the behaviorist roots of instructional design were also an important historical underpinning of the program's design. A thorough exploration of these perspectives, along with a description of the Studio program, is the subject matter of Chapter 3 of this dissertation. The chapter serves to effectively ground the dissertation research project (Chapter 4) in an in-depth understanding of the research setting.

Research Project: The Dissertation Study

As an initial effort to implement some of the research ideas outlined in Chapter 2, the study conducted for this dissertation examined the role of creativity in the experience of students enrolled in the IT@UGA Studio program. This mixed-methods study, presented in Chapter 4 and

Appendices B-I, used correlational procedures to compare three measures of creativity: the Torrance Tests of Creative Thinking: Figural (TTCT:F), ratings of student multimedia projects using the Creative Product Semantic Scale (CPSS), and a questionnaire about personal creative ability. Additionally, five case studies were conducted in which interview data and online design journal content were analyzed in the context of individual creativity data and course artifacts. The goals of the study were to explore what relationships might be found between the three measures, to describe individual students' design process, and to examine student perspectives about creativity and design.

Two pilot studies preceded the Chapter 4 study. In the first of these (Clinton & Rieber, 2005), students' design journals, questionnaires, debrief session notes, and course evaluations were examined. In the second study (Clinton, 2005), three interviews with students were analyzed. While participants' assessment of their personal creativity varied considerably among the twelve students in the two studies, students stressed the importance of creativity in their design work, and all students reported episodes of flow. (Please see the summary of research in Chapter 5 for a description of these two studies.)

Results of the comparison of measures in the Chapter 4 study were inconclusive. However, the quantitative data indicate that the seventeen individuals: a) were highly creative relative to the general population (as measured by the TTCT:F); b) generally viewed themselves as creative persons (as indicated by questionnaire responses); and c) created multimedia projects that were rated as fairly homogenous in creativity by two experts (using the CPSS). The five case studies describe certain students who enter the program having more skills with the multimedia development tools, who tend to view themselves as creative, generally thriving in the program. In contrast, other students who lack these initial skills may view themselves as less than creative

and generally experience frustration in the program, needing additional support. All five case study participants affirmed that creativity is necessary for good design, though each emphasized, from the perspective of his or her own skill level, that a basic level of technical ability is a prerequisite for creativity. All reported experiences of flow (Csikszentmihalyi, 1990) of two hours or more in their project work. The importance of peer feedback was also strongly highlighted among the experiences of the case study participants.

Conclusion: Dissertation Scope and Structure

A collection of journal-style articles serves as the structure of this dissertation. This alternative dissertation format, used in an education context, is an adaptation of a similar approach to dissertations used in the natural sciences (Boote & Beile, 2005). In keeping with University of Georgia guidelines (University of Georgia, 2003), the overall structure of the dissertation is given below (note that the university's guidelines provide for a certain amount of redundancy to occur between the major manuscripts and the opening and closing chapters):

Chapter 1. This *Introduction* chapter;

Chapter 2. The literature review/theoretical framework paper *A Literature Review and Proposed Perspective for Instructional Design and Development: The Role of Creativity in the Training and Practice Of Instructional Designers*;

Chapter 3. The article manuscript *The Studio Experience at the University of Georgia: An Example of Constructionist Learning for Adults* (Clinton/Rieber);

Chapter 4. A research manuscript documenting findings from the dissertation study: *An Investigation of the Role of Creativity in a Graduate Level Instructional Design and Development Training Program;*

Chapter 5. A closing *Epilogue* chapter that ties together the major results and themes; and Appendices.

CHAPTER 2

A LITERATURE REVIEW AND PROPOSED PERSPECTIVE FOR INSTRUCTIONAL DESIGN AND DEVELOPMENT: THE ROLE OF CREATIVITY IN THE TRAINING AND PRACTICE OF INSTRUCTIONAL DESIGNERS[1]

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[1]Clinton, G. A version of this paper has been accepted provisionally by *Educational Technology Research and Development*. Printed here with permission of publisher, 11/10/06.

Abstract

This paper presents a review of research and theoretical perspectives on creativity and instructional design, offering a conceptual framework for understanding the connection between these two constructs. Other fields of design embrace creativity in their literature, providing an example for instructional design to follow. Design problems that confront instructional designers are described as opportunities for creative work, and these opportunities permeate virtually the entire design and development process. Creativity exercised by members of instructional design teams must be subordinated to the goals of design projects. This paper also explores ways that the design and development process can benefit from creativity, and suggests directions for future research.

A Literature Review and Proposed Perspective for Instructional Design and Development:

The Role of Creativity in the Training and Practice of Instructional Designers

> "Creativity is not a tangible asset like mineral deposits that can be hoarded or fought over or even bought and sold. We must begin to think of creativity as a common good, like liberty or security. It is something essential that belongs to all of us, and that must always be fed, renewed, and maintained—or else it will slip away."
>
> – Richard Florida, *The Rise of the Creative Class* (2002, p. xxvi).

Background

Among the various branches of educational practice, instructional design holds a unique position in that it is counted among the design disciplines (Nelson & Stolterman, 2003). Because the element of design is included in the concept of instructional design, so also is the creative aspect that is recognized in other design disciplines. However, the field of instructional technology has been slow to formally acknowledge the importance of creativity in instructional design. In this paper I propose a way of thinking about instructional design that adds a conceptual layer rarely included in representations of instructional design practice. Following relevant background information from the creativity literature and about instructional design as a professional practice, I attempt to describe the natural connection that exists between design and creativity as illustrated by various fields in which design plays an acknowledged role. By extension, I follow this with an exploration of the connection between creativity and instructional design, suggesting that this connection has always been present, but has tended to be conceptualized in, a very informal and tentative fashion. I argue that creativity is important to the

success of any instructional design project; the connection between the two should be formally conceptualized, included routinely in the discourse of our field, and incorporated into the training of new instructional designers.

I wish to note at the outset that my intent is to conceptualize the role of creativity in the work of professional instructional designers and, correspondingly, to advocate introducing this conceptualization into the training of new instructional designers so as to encourage them to embrace creativity as an essential part of their design work. What I am not attempting to address is enhancement of the creativity of instructional designers' target learners. While helping all learners reach their creative potential is the duty of every educator, creativity of instructional designers' target learners is beyond the scope of this paper. I discuss promoting creativity in learners only in terms of historical perspectives about creativity and in reference to students of instructional design.

Creativity

Creative work is the engine that drives civilization forward. "Most of the things that are interesting, important, and *human* are the results of creativity" (Csikszentmihalyi, 1996, p. 1). Economist Richard Florida states, "Human creativity is the ultimate economic resource. The ability to come up with new ideas and better ways of doing things is ultimately what raises productivity and thus living standards" (Florida, 2002, p. xiii). The existence of many centers, foundations, and associations devoted to the study of creativity (e.g., the American Creativity Association; the Center for Creative Leadership, Greensboro, NC; Center for Creative Studies, Buffalo, NY) is one indicator of the value placed on creativity by American society.

While a common understanding about the nature of creativity is not found in professional and research literature, what one does find is a core definition of creativity that is fairly consistent: creativity is understood to be the generation of ideas that are both novel and useful, usually in response to a problem that needs to be solved (Csikszentmihalyi, 1996; Feist, 1999; Root-Bernstein & Root-Bernstein, 1999; Sternberg, 1999a; Sternberg & Lubart, 1999). Types of creative thinking that have been identified include divergent thinking (multiple possible responses to the same task or problem), problem identification (often a key event that precedes a creative breakthrough), and evaluative thinking (judging the value of an idea; Plucker & Renzulli, 1999).

A wide array of theoretical perspectives and research methods has been brought to bear on the study of creativity. These range from mystical approaches to cognitive theories to social frameworks, and, it would seem, everything in between (see Albert & Runco, 1999; Sternberg & Lubart, 1999). Part of the reason for this variety is that creativity is not an easy phenomenon to study. Theoretical perspectives abound, but data shedding clear light on the subject are hard to come by. Such issues as the nature of creativity, how it happens, factors that influence the process, who is really creative, and what is considered creative work – all of these remain unresolved.

If one allows that creativity in the lives and works of individuals is present by degrees, then one is left with the need to measure creative ability and to judge who and what is more or less creative. The solution to this problem in most fields is to assemble a panel of creative experts, chosen by some agreed-upon criteria, and to let this panel collectively rate creative performances and products (Feldman, 1999). Such a system, however successful in practice, sheds little light on the nature of the creative process.

Many researchers have therefore limited their study samples to the lives and works of eminently recognized creators (e.g., Einstein, Mozart, Picasso) in order to eliminate any doubt about the fact that creativity is present (e.g., Csikszentmihalyi, 1996; Policastro & Gardner, 1999; Simonton, 1999). When there is already an international consensus that an individual is a creative genius, one can plunge in, so to speak, and learn as much as possible about creativity through such a person. However, many others find this limiting of scope (and of generalizability) unsatisfying, and even "Big C Creativity" researchers acknowledge that more homespun levels of creative work exist.

Instructional designers, as educators, tend to be interested in the creative potential of all learners. This view in the field of education can be traced in part to the writings John Dewey, whose influential book *Art as Experience* (1934) presented a broadly inclusive view of creativity. Dewey argued eloquently for a continuum of creative experience from the most mundane of human activities to the highest expressions of artistic genius. He did not deny the existence of great works of art; however, to Dewey the isolation of works of art in museums, along with the elevation of individual artists to an elite status, was an artificial development arising out of the tendency of our industrialized society to sap the vitality out of day-to-day experience. Through monotonous tasks and impersonal social structures, daily existence had become unnaturally void of creative vitality, causing the emotional impact of works of art, when viewed, to seem separate from the rest of life. But to Dewey the potential for what we might now call "little c creativity" was everywhere and in need of being re-awakened.

The increasing acceptance of the idea of the creative potential of all individuals (and, especially, all learners) since Dewey's time is attested to by the inclusion of the "Create" category within the cognitive processes dimension in the recent revision by Anderson,

Krathwohl, and colleagues of Bloom's taxonomy of learning outcomes (Anderson & Krathwohl, 2001). A learning objective in the Create category might require a learner to generate a hypothesis, plan or devise a procedure, or produce or construct a product. The authors emphasized that synthesis of existing ideas into a new whole is included in the concept. "Create, as used here … although it includes objectives that call for unique production, also refers to objectives calling for production that all students can and will do" (p. 85). And thus all learners may be encouraged to create without the expectation that all would generate conspicuously novel solutions to given problems. As instructional designers increasingly draw upon this revised taxonomy when identifying learning outcomes, it is to be hoped that the option of having learners explore their own creative powers - to generate, plan, or produce new responses - will be an option clearly on the table. However, in this paper my emphasis is on the creative potential of the instructional designers themselves rather than their learners per se.

A large body of work has been done by researchers endeavoring to study this broad range of creative ability (see Albert & Runco, 1999; Paulus & Nijstad, 2003; Sternberg & Lubart, 1999). Approaches include experimental evaluations of immediate influences on creative output, such as variations in instructions for a task (Runco & Sakamoto, 1999); psychometric tests of aptitudes such as divergent thinking, problem identification, and evaluative thinking (Plucker & Renzulli, 1999; Torrance, 1974); and the development of cognitive theories to account for creativity as an aspect of intelligence (Ward, Smith, & Finke, 1999; Weisberg, 1999). While conclusions about the nature and measurability of creativity from these branches of research appear mostly tentative, the research treats as self-evident the existence and importance of a wide range of creative ability in human life.

Creativity and problem solving. There are several points of emphasis in creativity literature that have special importance for our discussion of instructional design. First, there is a close connection between creativity and problem solving. Many creativity theorists include problem solving (or problem identification) in their definitions, descriptions or discussions of creativity (Csikszentmihalyi, 1996; Feist, 1999; Paulus & Brown, 2003; Policastro & Gardner, 1999; Root-Bernstein & Root-Bernstein, 1999). Many experimental studies of creativity are essentially studies of performance in problem solving tasks (Runco & Sakamoto, 1999). Theories of problem solving emphasize one's arriving at viable solutions by means of formal, step-by-step processes of reasoning (Bruning et al., 2004) or by heuristics (Polya, 1945). However, the emphasis of creativity is on the possibility of finding truly novel solutions that expand the knowledge base of an individual, a community, or a domain. While not identical, the two constructs overlap. A given exercise in problem solving may be more formulaic than creative; but problems in need of solving may be regarded as opportunities for creative work.

Stages of creativity. The second point of emphasis is that the creative process has been described as occurring in fairly recognizable stages. These stages, originally proposed by Wallas (1954/1988), have never been completely verified by empirical means (but see Csikszentmihalyi, 1996; Penney et al., 2004). However, they have been widely adopted by theorists, sometimes with minor variations. The stages are commonly described as Preparation (including lifelong study in a discipline as well as immediate preparation), Incubation (during which the creative task is set aside and allowed to "simmer"), Illumination (the "eureka" moment), and Elaboration/Verification (working out the details and developing the results). Everyday occurrences of creative thinking may not necessarily manifest these stages; however, eminent creators such as those studied by Csikszentmihalyi (1996) often reported such stages, particularly

incubation, in their work on difficult problems. It may be that less difficult problems simply engage an automated version of this cycle, particularly for expert designers (Slavin, 2003).

Creativity and self-perception. The third point of emphasis about creativity is that there appears to be an important relationship between perceptions of self and creativity. Heightened self-awareness hinders creativity in some contexts (Szymanski & Harkins, 1992). However, this effect can apparently be moderated or even eliminated by setting up favorable self-performance expectations through the manner in which a creative task is introduced (Silvia and Phillips, 2004). Like the experimental studies reviewed by Runco and Sakamoto (1999) and Scott, Leritz, and Mumford (2004), these findings suggest that how problems are presented and how performance expectations are discussed make a difference in creative output. Perceptions of self in relation to creativity may also be regarded as an important individual difference to consider among learners of professional skills such as instructional design.

Flow theory. The fourth point of emphasis regarding creativity is that the motivational construct known as “flow” (Csikszentmihalyi, 1990; 1996) appears to be closely related to creative work. Flow is described as an “optimal experience,” a state of intense mental focus on a task or activity in which the challenges of the activity are appropriately matched to the skills of the participant. It is defined as "...the state in which people are so involved in an activity that nothing else seems to matter; the experience is so enjoyable that people will do it even at great cost, for the sheer sake of doing it" (Csikszentmihalyi, 1990, p. 4). All of the eminently creative individuals studied by Csikszentmihalyi (1996) not only experienced flow but depended on it as an essential component of what drove their creative work. Had there not been any flow, their devotion to the work would have been unlikely. Flow theory therefore highlights the important role of intrinsic motivation in creativity (Collins & Amabile, 1999).

The relationship between flow and creativity is not completely understood. Not all of the work of eminently creative persons is accompanied by flow; also, flow is described as being available to all people, not just to those who are famously creative (Csikszentmihalyi, 1990). Work done "in the flow channel" or "in the zone" tends to be generative in nature and is associated with accomplishment. "The best moments usually occur when a person's body or mind is stretched to its limits in a voluntary effort to accomplish something difficult and worthwhile" (Csikszentmihalyi, 1990, p. 3). It is easy to imagine how this is the case with a wide variety of creative or productive activities, including design work. However, whether a mundane task accompanied by a sense of flow can be considered creative, in any meaningful sense (for example, weeding the garden), is debatable. Also, even in overtly creative work, an intense session accompanied by flow is not guaranteed to produce work judged as satisfactory by the creator. Therefore the flow experience appears to be conducive to creativity but does not equal creativity.

Enhancing creativity. The fifth point of emphasis about creativity, in the context of its relation to instructional design, is that efforts to enhance creativity are of great interest but have been difficult to prove successful. Corporations have for years considered ways to promote higher levels of creativity among employees (Scott, Leritz, & Mumford, 2004), especially in the context of project teams. Thus creativity-enhancing workshops have been quite popular in business circles, but these have been criticized as not being grounded in psychological theory or research (Sternberg & Lubart, 1999). While clear evidence of enhancing personal creativity has historically been difficult to produce, a recent review of 70 creativity training studies by Scott, Leritz, & Mumford (2004) presents a more positive view. The authors found that "well-designed creativity training programs typically induce gains in performance with these effects generalizing

across criteria, settings, and target populations" (p. 361). Meantime, many theorists believe that individuals' creative capacity can at least be optimized if not increased (Collins & Amabile, 1999; Nickerson, 1999; Paulus & Brown, 2003; Runco & Sakamoto, 1999). Part of optimizing creative performance is avoidance of factors that are known to hinder creativity, such as excessive stress (Collins & Amabile, 1999).

Creativity and social context. Another point of emphasis regarding creativity is that the role played in creative work by group or social contexts, and even cultural and historical contexts, is increasingly being recognized (Csikszentmihalyi, 1996; Paulus & Nijstad, 2003; Simonton, 1999; 2003; Williams & Yang, 1999). Sometimes this view is referred to as an ecological approach (Harrington, 1999). The relevance of the social element in individual creativity is highlighted by a statement from Feldman (2001): "It is common to find that the unique form of a creator's work is forged within a small group of peers … The group is catalytic to the transformation of style and content" (Feldman, 2001, p. 176). Creativity therefore occurs within a social system, not just within the individual. "Creativity does not happen inside people's heads, but in the interaction between a person's thoughts and a sociocultural context. It is a systemic rather than an individual phenomenon" (Csikszentmihalyi, 1996, p. 23). For example, Hooker, Nakamura, and Csikszentmihalyi (2003) studied creativity in the context of a community of scientists strongly associated with creative achievement, in which the community itself provided a diffuse form of mentoring to less-senior members. "Perhaps the most striking trend in our data was the overwhelming importance of peers, post-docs, and lab culture in the apprenticeship experience" (p. 238). The group as a whole clearly made a difference in the creative work of individuals.

Group creativity is thus related to situated learning. Lave and Wenger (1991) described the dynamics of informal apprenticeship-style learning that takes place outside of schools in various communities of practice. This situated learning is "an increasing participation in communities of practice" (p. 49), in which the social context (the "situatedness") exerts an incalculable influence on learning and performance. The same dynamics of learning that occur generally in communities of practice also occur in communities of creative practice (Hooker, Nakamura, & Csikszentmihalyi, 2003). This dynamic may be regarded as situated creativity, in which the whole collective performance is greater than the sum of its parts (Dennis & Williams, 2003; Nemeth & Nemeth-Brown, 2003). To the extent that corporate design cultures or instructional design training programs may take the form of communities of practice that foster creative work and attract creative talent, they have the potential to allow situated creativity to occur.

Creativity within constraints. The final point to consider about creativity is that all creativity happens within constraints (Stokes, 2006). Nelson and Stolterman (2003) have described the necessary "framing judgment" that must be made about a design, discerning the scope of a project based on situational realities and designerly perception. This framing judgment "is used for defining and embracing the space of potential design outcomes. It is also used for forming the limits that define the conceptual container – a *virtual* crucible – that is required for containment of the intense *heat* of creative activity. Finally, it is used for determining what is to be included in the design process, and what lies beyond consideration" (p. 199, italics in original). Just as physical boundaries are necessary for billiard balls to find the available paths to a chosen pocket, ideas must bounce off of conceptual boundaries in order to have definition and achieve direction. Knowing what lies beyond consideration, that is, the limits of scope, provides

these boundaries, forming the container within which design and innovation must occur. It is clear that too much pressure or restriction can hinder the flow of creative ideas (Collins & Amabile, 1999); however, a casting-off of all systematic constraints does not promote creativity either. Complete freedom is a hindrance to creativity (Stokes, 2006), but a reasonable amount of limitation and constraint can spur creative work forward.

An additional topic that is relevant to creativity and instructional design is the assessment of creativity, both in terms of personal aptitude and in regard to judging creative products. A separate literature review of this topic is given in Appendix A.

Instructional Design

Instructional technologists are generally quite familiar with instructional design, whether termed instructional design, instructional systems design, instructional design and development, or simply instructional development. According to Molenda, Reigeluth, and Nelson (2003), instructional design is "a construct that refers to the principles and procedures by which instructional materials, lessons, and whole systems can be developed in a consistent and reliable fashion" (p. 574). Casual reference to the topic of instructional design generally brings to mind the ADDIE framework – Analysis, Design, Development, Implementation, and Evaluation. As a generic conceptual model, ADDIE represents a common understanding about the broad components or phases of instructional design without prescribing how those phases should be conducted. Widely used process models such as that of Dick, Carey, and Carey (2005) and Smith and Ragan (2005), may be counted among the large "ADDIE family of models" (Gustafson & Branch, 2002) that have been proposed over the last several decades. For purposes of this paper, the ADDIE framework will be used to represent processes of instructional design and

development generically – the operations of creativity will be described in the context of design processes assumed to be at work in most, if not all, of these models. A representation of the ADDIE framework, one that emphasizes the overlap of the various components over time, is given in Figure 2.1.

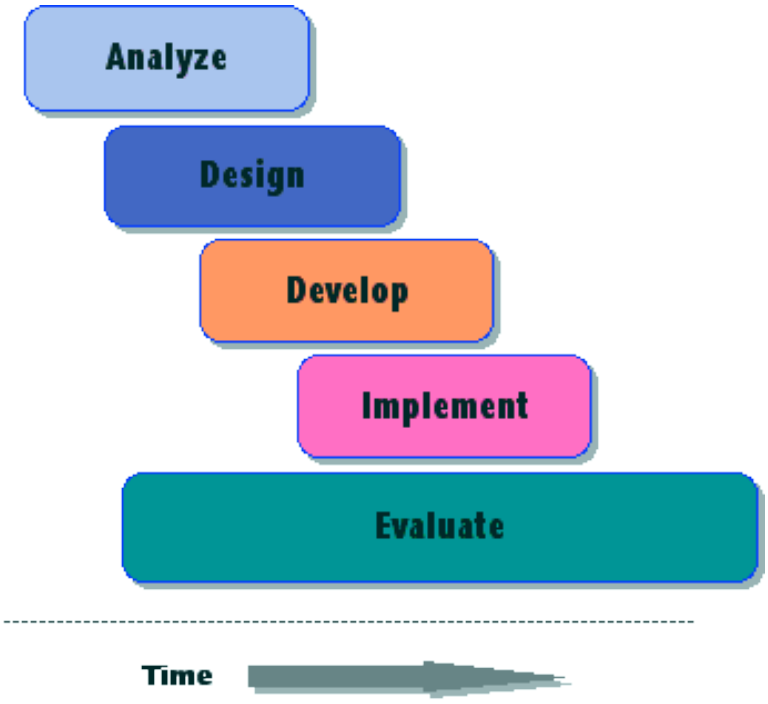

Figure 2.1. ADDIE framework. Note: adapted from Hill (1998).

The idea of systematizing the development of instruction has its roots in an era dominated by behaviorism. While the origins of the ADDIE framework itself are unclear, "the historical roots of much of what today is referred to as instructional design was Skinnerian psychology, especially as it was manifested in programmed instruction (PI)" (Dick, 1995a, p. 5). The publication dates of two of the early prominent instructional design models, the Silvern model in

1965 and the Hamreus model in 1968 (Gustafson & Branch, 2002) reflect this historical connection.

Early behaviorists showed little interest in the study of creativity. "Generally speaking, creativity has been of little concern to researchers and practitioners working in the behavioral tradition. Skinner himself wrote about it rarely and never conducted research on creativity per se. … the concept of creativity suggests that people initiate action, whereas Skinner and other early behaviorists believed that all behavior is determined by a person's genetic endowment and environmental history with no real initiative taking place" (Epstein & Laptosky, 1999, p. 175-176). Creativity was acknowledged to exist, but was generally avoided as being too problematic for study. It should come as no surprise therefore that creativity is largely omitted in ADDIE-based models.

Instructional design as practiced by professionals today enjoys the same variability, if not more so, that is reflected in the large number of published models. In a recent study, Visscher-Voerman and Gustafson (2004) found no consistent patterns of design behavior among 24 professional instructional designers. However, guidelines exist in regard to instructional designer competencies (Richey, Fields, & Foxon, 2001) as well as how beginning instructional designers should be trained (Tripp, 1994).

The Persistent Thread: Instructional Design and Creativity

Creativity and Design

A natural affinity exists between creativity and design. According to Nelson and Stolterman's book *The Design Way* (2003), design is simply the creation of new things. "To come up with an idea, and to give form, structure and function to that idea, is at the core of

design as a human activity" (p. 1). The authors develop this understanding of design in a way that bears some resemblance to Wallas' (1954/1988) stages of creativity, including the emergence, out of the subconscious, of one or more germ ideas ("parti") and the working out of those ideas until they become a finished innovation.

At first glance, design would seem to be the same as creativity. Certainly Nelson and Stolterman's general description of the design process fairly matches many descriptions of the creative process (see Sternberg & Lubart, 1999). However, there are several differences to note. First, the authors treat creativity itself as a sub-component of the process of design, referring primarily to the *parti* or seed idea. The authors conceive of design itself as the holistic or inclusive term that encompasses multiple processes. This allows them to distinguish, for example, between creativity and innovation, since creativity is viewed as happening early in the process and innovation comes in the form of the particular artifact that is the end product of a design. Second, Nelson and Stolterman' primary frame of reference is that of commercial design. Thus design is described as a relationship of service and is quintessentially done for, and with, a client. Design is described as involving an iterative process of dialog and prototyping with the client in order to both meet and exceed the client's vision of the end product. Even if a design is created for oneself or for mankind, the recipient of the design is still characterized as being in the role of a client.

Considerations such as these distinguish such a conception of design as having a broader scope than most views of creativity. However, Nelson and Stolterman's view of design supports the importance of creativity in instructional design in two ways: first, their conceptual model of the design process includes creativity explicitly. The authors leave no doubt that all design, specifically including instructional design, is dependent on creative ideas. Second, design, with

its dependence on creative ideas, is viewed broadly. Just as with Dewey's (1934) view of art, Nelson and Stolterman's view of design encompasses all designs large and small, and no distinction is made between "eminent" designers and the rest of the world. Any designer can be creative at some level, whether splendid or mundane, whether good or evil.

In addition to the global, trans-disciplinary conceptions of design proposed by Nelson and Stolterman (2003), the treatment of creativity in other specific design disciplines can be instructive concerning the role of creativity in instructional design. Fields in which this role is made explicit, in addition to the fine arts, include such disciplines as engineering, architecture, and software design. First, professional engineering literature includes an emphasis on the importance of creativity in the training experience of student engineers (Blicblau & Steiner, 1998; Court, 1998). For example, according to Court, "The need for engineering design students to understand that creativity is an important part of their educational development and also for a sound basis for their future role in industry has been well established" (p.141). Court reviewed the foundations of engineering design within the context of such an established role of creativity and proposed an instructional method for including creativity as an integral part of training. He then documented an instructional unit that implemented this approach and graphically displayed the results. Court concluded that "… creativity needs to be present at all stages of the design process, including detailed design" (p. 151). He also observed, "Throughout the design process the engineering designer is cycling through a process of expanding creative thinking, generating ideas, analyzing them and making a selection, thus narrowing alternatives before expanding again at a more detailed level, often termed divergent/convergent thinking" (Court, 1998, p. 145).

The field of architecture has also explicitly addressed creativity and design. As an example, Akin (1994) provided an in-depth discussion of the nature of creativity, its relation to problem solving, and a comparison between architectural design and engineering design. Akin seems to have equated creativity with problem restructuring. He also used the term "design problem," which has been used by Jonassen (2000) in his proposed typology of problem solving (see the section on Creativity and Instructional Design below).

Finally, creativity has been conceptualized in the field of software design, as exemplified by several of the chapters in Winograd's edited book *Bringing Design to Software* (1996). First, chapters by both Kelley and Hartfield (1996) and de Young (1996) advocated the view that design is art as much as science. According to these authors, there are times when it is appropriate for designers to take uncomfortable risks or "creative leaps" based on intuition, and organizations that develop software need to be open to this possibility. Going a step further, the chapter by Smith and Tabor (1996) described the concept of the artist-designer and suggested that the work of software design should be viewed as *interaction design*. These authors argued for the "indivisibility of function and aesthetics," a principle applicable to all fields of design.

Creativity and Instructional Design

Instructional technology literature presents no research reports specifically on the role of creativity in instructional design, and none of the models reviewed by Gustafson and Branch (2002) appear to include any mention of creativity. However, the idea that creativity is important in the work of instructional designers is not new. It has been the topic of a number of conference presentations over the years. In published literature, discussions of the scientific approach versus the "craft" or "artistic" approach to instructional design have appeared from time to time (Clark

& Estes, 1998; Heinich, 1984; Reigeluth, Bunderson, & Merrill, 1978). The instructional design profession has also come under criticism periodically from educators who claim that the process by its nature tends to produce unimaginative training products, resulting in boredom for learners. "Used as directed, it produces bad solutions" (Gordon & Zemke, 2000, p. 42). Dick (1995a, 1995b) defended instructional design by arguing that common practice among professionals who use the models is not rigid and was never intended to be. However, other writers have contended that instructional design models ignore creativity (Caropreso & Couch, 1996; Rowland, 1995), or that creativity needs to be fostered among instructional designers apart from the instructional design models themselves (Caropreso & Couch, 1996). More recently, Allessi and Trollip (2001), Gustafson and Branch (2002), and Luppicini (2003) have been among those calling for instructional design work to be done creatively.

In addition to the practice of instructional design, the preparation of new instructional designers inevitably involves learning and practicing one or more of the models, and thus coverage of creativity in their training is left up to the instructors rather than being represented in the model. However, some acknowledgement that creativity should also be addressed in training of designers may be found in such sources as Tripp (1994) and Richey, Fields, and Foxon (2001). In proposing how instructional designers should be trained, Tripp argued for a studio-like learning environment. He suggested that one of the kinds of knowledge students would gain from such an environment is that of "creative approaches" to problem identification and problem solving. Also, in a set of competencies for instructional designers, Richey, Fields, and Foxon listed #12, "Reflect upon the elements of a situation before finalizing design decisions and strategies," along with the subskills (a) "Generate multiple solutions to a given problem situation," and (b) "Remain open to alternative solutions until sufficient data is collected and

verified" (p. 50). The expressions "generate multiple solutions" and "remain open to alternative solutions" are statements of two of the recognized components of creative thinking, fluency and flexibility (Davis, 2004). While these sources do not constitute a robust treatment of the topic of creativity, they reflect an awareness in the field that creativity has a role to play in instructional design, and that this role should be highlighted in the training of new designers.

Regarding professional practice, a recent literature review by Larson and Lockee (2004), examining current factors impacting both practice and preparation of instructional design and technology professionals, did not address creativity explicitly. However, Visscher-Voerman and Gustafson (2004), in their qualitative study of the work of professional instructional designers, included a philosophical exploration that attempted to describe the "artistic" element in the work of some designers. The study consisted of an extensive qualitative examination of 24 expert instructional designers in six different settings, seeking an authentic description of what instructional designers actually do. The authors found the activities of designers to be so widely varied that generalizations were impossible to make. A decision was then made to explore philosophical literature and develop a conceptual framework that might describe, not the design activities themselves, but the kinds of rationales underlying the choices designers make in taking this or that action. The proposed framework consists of four paradigms: instrumental, communicative, pragmatic, and artistic. Of special interest is the idea that some professional instructional designers operate out of an essentially artistic paradigm, a possibility that has been acknowledged in some of the early instructional design literature (Reigeluth, Bunderson, & Merrill, 1978). However, none of the 24 designers included in the Visscher-Voerman and Gustafson (2004) study were described as having this perspective. The authors emphasize that the paradigms are not mutually exclusive. Moreover, they address the issue of creativity by

stating, "… one hopes it is present in any project and is not the exclusive domain of the artistic designer" (p. 84).

Creativity has not been formally acknowledged in models of instructional design. However, the above sources suggest that many instructional technologists sense a need to keep creativity from being overlooked in instructional designers' day-to-day work. What remains is to find a way to formally conceptualize this need in a way that is specific to our field. Once again, other professional design fields have formally acknowledged the role of creativity. Instructional design can do the same and be in good company.

Acknowledging the Connection:

Conceptualizing the Role of Creativity in Instructional Design

The point made by Visscher-Voerman and Gustafson (2004) - that creativity has a place in any instructional design project - is in agreement with other authors such as Allessi and Trollip (2001) and Rowland (1995). Given that our field has attempted to conceptualize instructional design in a multitude of models, and given that none of these models to date have overtly attempted to describe the role of creativity, we might ask ourselves what an instructional design model that includes creativity might look like.

First, it may be helpful to highlight the purpose of models. Norman (1983) distinguished between conceptual models of systems and user's mental models of those systems. His concluding remarks about mental models contain the following statement: "As teachers, it is our duty to develop conceptual models that will aid the learner to develop adequate and appropriate mental models" (p. 14). Thus one of the purposes of conceptual models is to influence the mental models of those who study or use them. This is in one sense a summing up of all that we do in

education – we present a seemingly endless stream of conceptual models to learners in order to make a lasting impression on their internal mental models of the world around them. And to the extent that we see learners putting what they've learned into practice, we conclude that we have succeeded in this effort, imperfect though the results may be. Putting a conceptual model before the minds of designers is therefore no idle exercise - the conceptual models designers use affect their mental models of the design process.

Also, it is important to distinguish between conceptual models, such as the generic ADDIE, and process models that offer not only a conceptualization but also a prescription and/or tools for applying particular elements of a model. According to Gustafson and Branch (2002), it was the addition of the "how to practice" detail that "has led to the creation of the many different models that appear in the literature" (p. 3-4). The model offered in this paper is a conceptual model for thinking about the role of creativity; however, illustrations of concepts in the model are drawn from various processes that may occur during instructional design and development.

The first way we can try to conceive of a creativity-friendly instructional design model is to think of the designer's creative mindset as an "envelope" or contextual wrap that should surround the entire process. Instructional designers who approach their work with an openness to novel but useful ideas, as called for in the instructional design competencies outlined by Richey, Fields, and Foxon (2001), may find such ideas being generated during any part of the process. It is not difficult to imagine creative ideas occurring in association with the design of, for example, elements that gain learner attention or materials that actually deliver the instructional content. It is also quite conceivable that the nature of the target work environment, as another example, could preclude more conventional methods of analysis (such as in a hazardous materials

environment), requiring creative solutions in order for a task analysis to be accomplished. Figure 2.2 illustrates this concept.

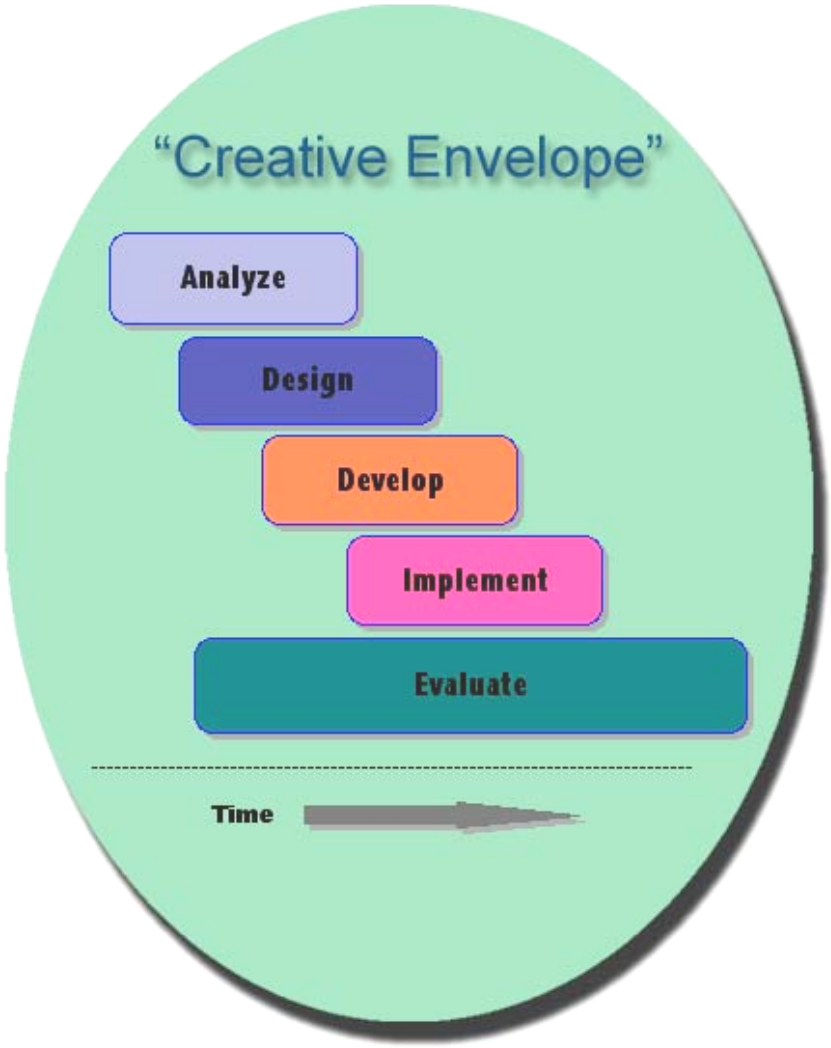

Figure 2.2. ADDIE framework surrounded by a "creative envelope." Note: ADDIE framework adapted from Hill (1998).

Second, although design is more than problem solving, there are problems that must be solved within the design process (Nelson & Stolterman, 2003). Jonassen (2000) proposed a typology of problem solving that identified design problems as one of the problem types. He

described design problems as "usually among the most complex and ill-structured kinds of problems that are encountered in practice" (p. 80). Jonassen did not discuss creativity explicitly, but the language he used to describe design problems is very similar to the language of theories of creativity. The solving of design problems may therefore be regarded as an overlap point between problem solving and creativity, or, put another way, a type of task in which theorists' association of creativity and problem solving (Feist, 1999; Root-Bernstein & Root-Bernstein, 1999) is substantiated. Further, the difference between a design task and a design problem may be regarded as one of degree, since each involves the generating of ideas at some level. These design problems/tasks, then, present opportunities for creative thinking to occur. This is in agreement generally with Nelson and Stolterman (2003), who view both problem solving and creativity as ingredients in the overall design process. Specifically, the creative idea or *parti* that leads to the going-forward of the design process may in many cases be a creative solution to a thorny design problem, or may present new problems. Moreover, Nelson and Stolterman acknowledge that the design process may involve a "drizzle" of multiple, smaller creative ideas that can add up to the larger design conception.

We can visualize this as a cycle that involves the stages of creative thinking (Penney et al., 2004; Wallas, 1954/1988). A designer's processing of design problems may be viewed as opportunistic excursions (Tripp, 1996), or "little loops," that permeate almost the entire instructional design process. I prefer to call these design problem/creativity loops. Since the creative process is made possible not only by personal creative ability but also by professional skills and expertise that have been built up over time, many of these excursions may occur in an automated fashion, such that the individual stages of the process may not be apparent. However, for major design dilemmas that may resist quick solutions, such as a serious mismatch between a

client's specifications and the available resources, the entire set of stages of creativity - preparation, incubation, illumination, elaboration/verification (Penney et al., 2004; Wallas, 1954/1988) - may be clearly evident. Figure 2.3 illustrates this cycle.

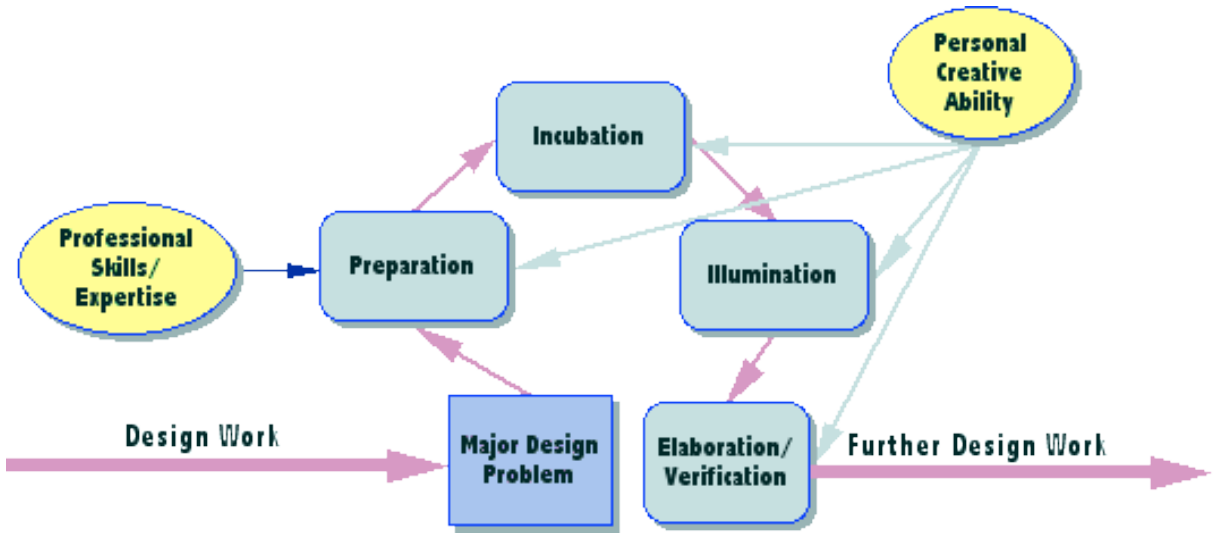

Figure 2.3. Design Problem/Creativity Loop.

Building on these two ideas, the creative envelope and the design problem/creativity loop, we can then conceive of the full instructional design framework in a way that acknowledges the importance of creativity. On the macro level, one sees that the creative envelope ideally surrounds the entire process; and a "magnifying glass view" into the micro level illustrates a view of the whole process as a fabric of various design problem/creativity loops. Figure 2.4 shows the ADDIE framework with the creative envelope and "magnifying glass view" incorporated.

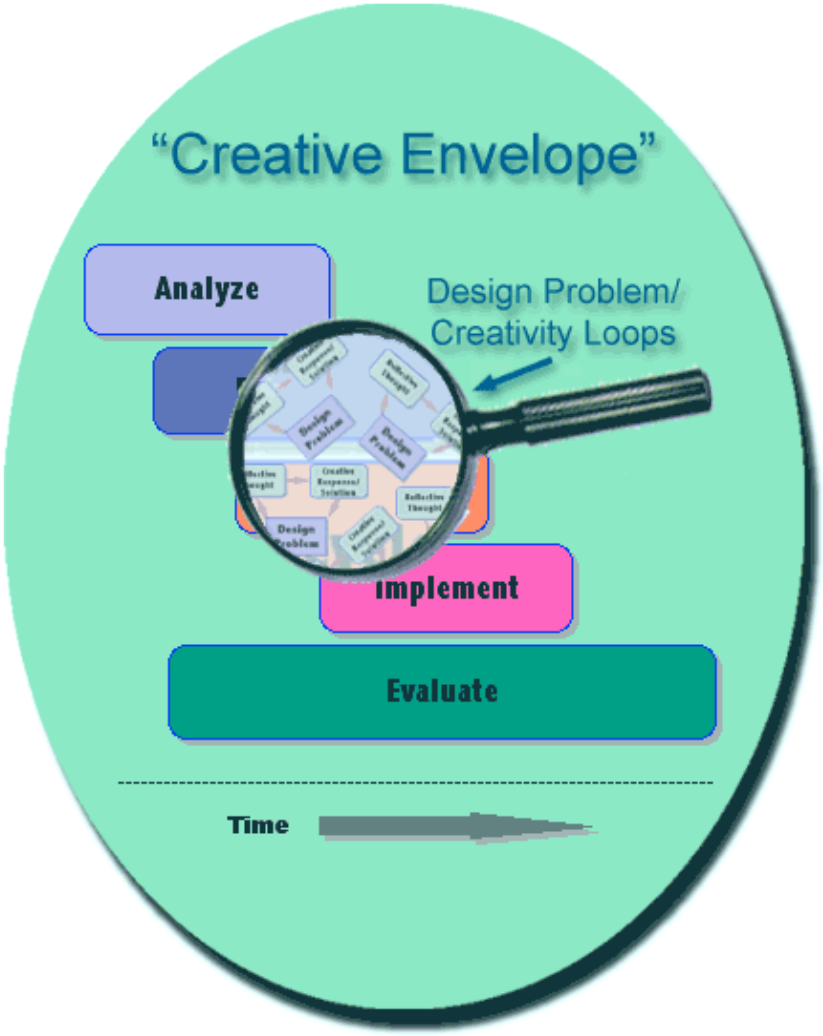

Figure 2.4. ADDIE with creative envelope and "magnifying glass" view. Note: ADDIE framework adapted from Hill (1998).

Every instructional design model, no matter how complex, is an oversimplification of real-life instructional design work conducted by complex human participants in complex contexts. The simple conceptual model offered here is no exception. However, the point of the model is that, to the extent that an instructional designer may be confronted with the next task or design problem in a project (Jonassen, 2000), these tasks or problems may be regarded as opportunities for creative work.

How An Emphasis on Creativity Can Benefit Instructional Design

A good working environment is highly valued among professionals. A supportive working environment for creative ideas is especially desirable for those whose type of work places them in the "creative class" (Florida, 2002), including those who do design work. Harrington (1999) has noted that while such supportive environments do not guarantee creative output, "establishing supportive environments may be analogous to eating well, exercising, and not smoking: while these practices do not guarantee desired outcomes, they generally improve the odds" (p. 325). Part of the "ecology" of a supportive instructional design environment is the common language, symbols, and values shared among the members of that environment. These include the conceptual models of instructional design and development that have been brought into the environment by individuals and that are adopted and used by leaders as they communicate about projects. The symbolic power of these conceptual models, as discussed above, lies in their ability to influence the mental models of those who use them (Norman, 1983).

Therefore, the presence or absence of an emphasis on creativity in the models presented to instructional designers, whether in training or in the workplace, is non-trivial. Inclusion of some conceptualization of creative work among designers helps to send a message that creative ideas are taken seriously in a particular work environment. A formal approach to acknowledging the importance of creativity, via a conceptual model, suggests that creativity is "built-in" to the work of instructional design, rather than being an "add-on." This is, in fact, precisely what has been accomplished by Nelson & Stolterman (2003) in their conceptual representation of the design process viewed across disciplines.

Studies of creativity have indeed suggested that the manner in which creative tasks are presented influences individuals' conception of their personal creative potential and, thereby, their creative output (Silvia & Phillips 2004; Szymanski & Harkins, 1992). Motivational research has also suggested that, although intrinsic motivators are most powerful for creativity, the right kind of extrinsic motivators can also help to maximize creative output (Collins & Amabile, 1999; Runco & Sakamoto, 1999). Even the simple instruction to "be creative" may have a facilitative effect toward creative responses (Chen et al., 2005).

Given that creative output can be influenced by the above factors, it is reasonable to conclude that engaging designers in an internal and external dialogue about creativity can help promote creative outcomes. Supportive environments, either in the workplace or in training, can be created in which the role of creativity is conceptualized and this dialogue is fostered. Simply put: thinking about being creative appears to increase the chances that creative ideas will occur. If one's mental model of instructional design and development work has been influenced by conceptual models that emphasize creative possibilities, then this greater anticipation of creative possibilities in the mind of the designer can reasonably be expected to result in an increased occurrence of innovative ideas.

It is not difficult to imagine how just a little bit more divergent thinking, or insightful problem identification, or evaluative thinking can benefit the various phases of instructional design and development as represented by the ADDIE framework. At every stage, designs are being created – designs that involve decisions and ideas to be brought to fruition, some of which are appropriately called design problems (Nelson & Stolterman, 2003). First, in the analysis phase, context analysis, goal analysis, task analysis, learner analysis, and other processes must be designed. The analysis phase may be seen as one big example of problem identification. What is

the problem or opportunity that needs to be addressed? What are its dynamics? What would be an appropriate instructional goal to address this situation? We know from the creativity literature that some intractable scientific problems have resisted solution until a special insight occurred about the nature of the problem itself. If an emphasis on creative thinking can lead to a more insightful way of viewing the data about the problem situation, the course of an entire project could be influenced for the better. For example, a performance gap among factory workers in electronics may appear to be an instructional problem, but upon closer inspection may turn out to be a performance support problem, in which case the crucial right decision would be to develop performance support systems rather than instruction.

In the design phase, many decisions are made about what materials to select or develop and how to deliver the instruction using those materials. This phase has perhaps the closest affinity to what has been called the artistic or "craft approach," since designers can actually devise specific instructional materials and make style decisions. Here we have a golden opportunity for divergent thinking, with many possible ways to conceive of the presentation of content. And here, likewise, we face many design problems. For example, how should the first event of instruction – gaining learner attention – be accomplished? Novelty is the quintessential device for gaining attention, and is part and parcel with creativity. Perhaps there is a metaphor that ties in with the theme of the instruction that can be used in some new and unexpected way.

Likewise, content delivery is full of possibilities. How can content be enriched so as to maintain learner interest? As one example, a team of undergraduate instructional design students I taught had gathered the necessary content for a career awareness instructional module in the form of text and graphics. The project could have been completed in a satisfactory manner using this content; however, a student had the idea of videotaping a welcome message from the state

commissioner of labor in our state, to include in the introductory section of the module. To our surprise, the state official agreed to participate, and could schedule it within our time constraints. Thus a merely adequate module became extraordinary, in a way that was fully in line with the goals of the project.

In the development phase, problem identification and divergent thinking can facilitate bringing the instructional materials to life. Many problems are typically encountered during development. As another specific example, in a recent project our university's Instructional Multimedia Design and Development team was planning to leave an undefined skip-ahead button in an entire instructional DVD product, simply because individual video clips were accessed separately through menus and were too brief to need scene markers. If there is no next scene, there is nothing to skip ahead to; team members viewed this as "coming with the territory" of working with DVD technology. The situation was left as-is for a time, and seemed on its way to becoming a "feature" of the final product, until one team member thought of a simple way to trick the DVD system into doing what the user would want: we placed a "phantom" scene marker ten frames in advance of the end of each video clip. The result: the user clicks to skip ahead (if desired), the last frames of the same clip play unnoticed, and the end of the clip activates the function that calls up the menu. A problem specific to the development phase met its solution via an idea that was new to our team, to the benefit of end users.

Regarding the implementation phase, one might think that all decisions have been made at this point, so no room for creativity is left. However, implementation of instruction is never without human input, whether in management of, for example, a stand-alone Web-based instructional system or in actual delivery of stand-up instruction. Decisions and designs must be made about how instruction is offered, how learners are recruited, whether or not the instruction

should be bundled with other courseware, and how to manage the logistics of instruction. All of these designs have the potential to be enhanced by creative thinking.

Finally, in the evaluation phase, creative designs may be devised for assessing the overall effectiveness of instruction, tracking learner performance, and managing the assessment over an extended period of time (if called for). There is a sense in which evaluation faces fewer restrictions, because accomplishing instructional goals is the business of the rest of the project, whereas an evaluator is not immediately responsible for making the instructional delivery successful, but rather for making the evaluation of that delivery successful. The evaluator may accomplish the evaluation in whatever innovative way presents itself.

In considering the benefits of creative thinking to the design process, we should note that work that both fulfills learning needs and does so in creative ways is the ideal of creative work for a designer. Put another way, a design that is attractive or clever but fails to meet the goals of a project must be regarded as less creative than a design that is attractive or clever and also meets project goals.

This point bears some elaboration. The difficulty of striking a balance between the "craft" element of instructional design and the more scientific or systematic element is an issue that has been discussed over the years among practitioners and scholars (e.g., Heinich, 1984; Clark & Estes, 1998). Instructional design and development is conceived as a systematic process that reliably homes in on particular instructional solutions. Also, projects typically come with budget constraints, logistical constraints, environmental constraints, learner need constraints, and other limitations – all of which can be carefully analyzed and codified to form a prescribed "box" into which the instruction must fit. Finding room for innovative ideas or for artistic finesse within these systematically identified parameters can be very challenging. However, a hopeful note can

be found in the somewhat counterintuitive point discussed earlier - that major constraints are actually necessary for creative thinking to occur (Nelson & Stolterman, 2003; Stokes, 2006). Designers who are inclined to look for more creative possibilities in their work, who may chafe at times under the constraints of a given project, may find it helpful to view the boundaries of the systematic process as the crucible, the place of pressure that can cause ideas to interact with each other in new ways. Such a perspective may help to ensure that designers continue to seek creative ideas while respecting the systematic design process and remaining faithful to project goals.

Exploring the Relationship: Suggested Research

Further Study of Professional Instructional Design Practice

Studies of what professional instructional designers do are relatively uncommon, and more such studies need to be conducted in the light of creativity's role. One aspect of the work of professionals that stands out clearly in the recent Visscher-Voerman and Gustafson (2004) study is that different designers work differently. Also, as mentioned above (see the section on Creativity and Instructional Design), the Visscher-Voerman and Gustafson study is significant in that the authors suggest an "artistic" paradigm or world-view that lies behind the work of some professional designers.

Some issues remain to be examined, however: first, none of the 24 designers studied by Visscher-Voerman and Gustafson (2004) had adopted the artistic paradigm as described by the researchers, and the authors' version of an "artistic" paradigm may not accurately represent a typical artist's mindset. Further qualitative studies (e.g., ethnographic) might be conducted that seek out such "artistic" designers and describe their work. What can students of instructional

design learn from professional instructional designers who view themselves as artists? Current students of instructional design need to be made aware that such professionals, as potential role models, exist.

Second, the extreme individuality of the 24 professionals studied suggests that the creative energies of all of these designers may be substantially engaged. Designers are doing what seems to work best for them, and they are doing this successfully as professionals. They are not relying on the thoroughly systematic nature of the design models so much as on their own expertise and intuition. Further qualitative studies of professional instructional designers such as these, with issues of creativity specifically in mind, might illuminate the role of creativity in the work of a broad range of designers. Once again, Visscher-Voerman and Gustafson (2004) expressed the hope that creativity is present in all of these professional design projects, while Nelson and Stolterman (2003) include creativity in their conception of all meaningful design activity. What is the view of the designers on this proposition? How does their self-knowledge, as it relates to the creative element in their work, operate? Do they regard themselves as highly creative?

Creative Self-Awareness

Ethnographic studies of professional designers could also include an examination of the degree to which designers are self-conscious or self-confident about the creative aspect of their work. Self-efficacy theory (Bandura, 1986) could provide a helpful frame of reference for studying this phenomenon. Research is also needed regarding the same issues for students of instructional design, and about how these perceptions interact with their learning and performance on their projects. Further literature review and research should be conducted to

establish a theory of self-efficacy that is specific to creativity, to apply this theory to professional instructional design practice, and to evaluate ways that students with low creative self-efficacy can be best served in instructional design and development training programs.

Flow Theory

As noted earlier, the flow experience and the creative process appear to be closely related. Eminently creative persons often report experiences of flow in their work (Csikszentmihalyi, 1996). Additionally, in two pilot studies involving 12 instructional design and development students, all students strongly associated flow with their design work (Clinton & Rieber, 2005; Clinton, 2005) Ethnographic or phenomenological studies of the work experience of professional instructional designers can explore the extent to which these professionals describe their work as characterized by flow, and whether work sessions accompanied by a sense of flow are also regarded as creative or productive. Such information could not only help clarify the workings of creativity in professional instructional design; it could also help guide instructional design trainers as to whether, or how much, to include an awareness of flow theory in the instructional design training curriculum.

Situated (Group) Creativity

Just as communities of practice foster social growth and skill acquisition, communities of practice can also foster creative work (Hooker, Nakamura, and Csikszentmihalyi, 2003). The same is true of small circles of friends or professional associates (Lewis, 1960). Because all creative work is a product of the social context as much as the individual (Csikszentmihalyi, 1996), the same “creative envelope” proposed above for individual designers – the mindset open

to creativity – should surround not only training programs but also professional design teams. This openness paves the way not just for individual creativity within the group but also for the synergy of "situated creativity" in which the flow of ideas of the whole team is enhanced beyond the sum of the individuals.

In the final chapter of their edited book *Group Creativity*, Paulus and Nijstad (2003) suggest five questions to be addressed by future research. Because instructional design and development often involves a group process, all of these are relevant to instructional design and development teams as well as communities of training in the practice of IDD:

1. What are the relevant inputs group members bring to their task?
2. Under what conditions are individual inputs contributed in an optimal way?
3. How do the contributions of other group members affect individual-level cognition, motivation, and emotion?
4. How are individual contributions combined to yield a creative group response?
5. Under what conditions does group creativity affect the environment of the group? (p. 333-338)

Studies that address questions such as these in the context of instructional design and development work can contribute insight about creativity and instructional design as well as about group creativity generally. The specific work of instructional design teams may raise other questions that would be helpful to address, such as how teams should divide up roles among team members with creative ability in mind. Qualitative studies of instructional design group process and group design outcomes could shed light on these questions.

Creativity as a Curricular Component in Instructional Design Training

I have argued that instructional design students can benefit from engagement with conceptual representations of creativity and instructional design while these students are in the formative stages of their professional careers. Studies need to be conducted to evaluate whether students actually would benefit from such an inclusion in the curriculum. Comparison studies could be employed; however, setting up a control group and assessing the results could involve some difficulty. One straightforward measure would be to assess, via interviews or questionnaires, whether students find such content meaningful.

Conclusion

As the field of instructional technology continues to grow and develop, it benefits from the advance of knowledge in all related fields. At the present day, studies of creativity appear to have finally moved into the mainstream of psychological study as well as educational theory and practice. Gifted education, in particular, has long since had a strong interest in creativity as part of its interest in identifying children with special abilities. Meanwhile, other design disciplines, unencumbered by the slow evolution of psychological learning theories, have embraced creativity for quite some time, and new conceptions of design as a creative process are emerging from these fields.

It is time for the field of instructional technology, and the profession of instructional design specifically, to catch up with the rest of the world in regard to creativity. Creative work in instructional design and development projects is a positive force that can enhance the lives of learners and contribute to the success of instructional products and applications in the

educational and corporate marketplace. It is to be hoped that this force will be embraced, explored conceptually, and harnessed to the full in the new century.

CHAPTER 3

THE STUDIO EXPERIENCE AT THE UNIVERSITY OF GEORGIA: AN EXAMPLE OF CONSTRUCTIONIST LEARNING FOR ADULTS[1]

[1]Clinton, G. and L.P. Rieber. Submitted to *Educational Technology Research and Development*, 12/3/06.

Abstract

The studio curriculum in the Instructional Technology program at the University of Georgia (IT@UGA) represents a deliberate application of contemporary theory of how adults learn complex information in ill-structured domains. The IT@UGA studio curriculum has been used since 1998 to prepare professionals to design, develop, evaluate, and manage educational multimedia. Theoretical considerations played a major role in shaping the design of the IT@UGA studio curriculum. Prominent among these were constructionism, legitimate peripheral participation, and self-directed learning. Additional significant theoretical constructs included situated cognition, scaffolding, and flow theory. The behaviorist roots of instructional design were an important historical underpinning of the program's design. This paper presents these concepts and discusses their relevance to training adults in instructional design and development (IDD).

The Studio Experience at the University of Georgia: An Example of Constructionist Learning for Adults

In graduate programs at universities around the United States, the one-course/one-instructor model has long been the norm. This model has many strengths, but it places limitations on the authenticity of instruction for many disciplines, in which the real-life professional world for which students are preparing can be characterized by different structures such as consultant-client relationships or communities of practice.

The purpose of this article is to discuss a new form of graduate education in instructional technology at the University of Georgia (IT@UGA) called the Studio. For this new approach, based on the epistemological beliefs and principles of constructivism, our preferred metaphor is the crafting of a new form of government based on democratic principles, embodied specifically the Constitution of the United States that was ratified in 1787. Both of these denote ways of "governing" and consequently include rules and relationships of power, authority, and responsibility that are intended to be fair and equitable. Both are also imperfect embodiments of underlying ideals. Like the U.S. Constitution, the Studio Handbook — the written expression of the Studio curriculum — is a dynamic document that has been amended often since it was first "ratified" by the instructional technology faculty at the University of Georgia in the fall of 1998. It has continued to work as a guide and model for helping faculty and students alike experience and reflect on what constructivism in education really means. This is not to suggest that students do not have difficulty adjusting to the studio curriculum. There have been difficulties, but by the time the program has been completed, resulting in a Masters degree in Instructional Technology,

students generally report[1] that it is an effective and appropriate approach and one that is superior to the alternative — a curriculum in which virtually all of the decisions about what to learn and how are made by an instructor.

We believe our constructivism-based insistence on a high level of learner control is consistent with Dewey's educational philosophy as set forth in *Democracy and Education*: "A society which is mobile, which is full of channels for the distribution of a change occurring anywhere, must see to it that its members are educated to personal initiative and adaptability" (Dewey, 1916, p. 84). This "personal initiative and adaptability" is, in a real sense, what the Studio experience is all about.

The purposes of this paper are to describe the theoretical and philosophical principles upon which the Studio curriculum is based and to explain, briefly, how the Studio curriculum works.

An Overview of the IT@UGA Studio Curriculum

The structure of the Studio curriculum is summarized and illustrated in Figure 3.1. For a complete description of the curriculum, refer to the Studio Handbook (Rieber, Orey, & King, 2006), revised and published each semester on the IT@UGA Studio Web site. The originators of the studio curriculum — Lloyd Rieber, Michael Orey, and James King — envisioned and likened the learning of educational multimedia design to that of an art or architectural studio (Tripp, 1994) in which a group of people learn skills and develop expertise while working on authentic projects in a public space comprised of tools and work areas.

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[1] All students are required to complete a final examination of their graduate studies by the Graduate School at the University of Georgia. This is done using a portfolio approach. During the presentation and defense of the portfolio, students are typically asked to critique their program in general, and the studio curriculum in particular.

EDIT 6190 Design & Development Tools
First Course

- Individual project selected and designed based on constructionist principles
- Scope: negotiated with instructor

EDIT 6200 Learning Environments Design I
Second Course

- Individual project selected and designed based on instructional design principles
- External client
- Scope: Lesson
- "Consultants" for EDIT 6210 Teams
- Mentors to 6190 participants

EDIT 6210 Learning Environments Design II
Final Course

- Team project selected and based on instructional design principles
- External client
- Scope: Unit
- Mentors to 6200 and 6190 participants

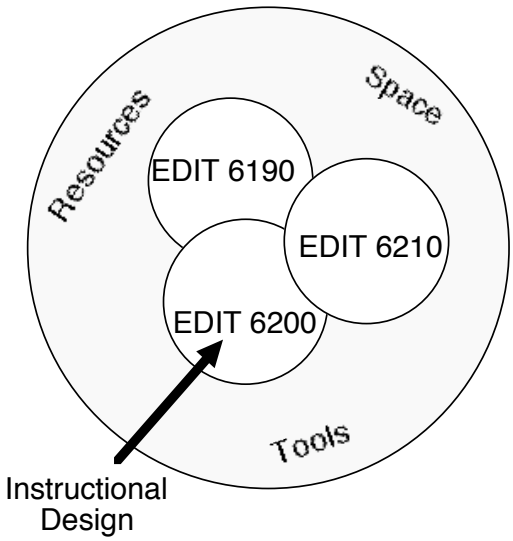


Figure 3.1. Structure of the IT@UGA Studio curriculum.

The studio curriculum comprises a sequence of three courses that we will refer to as the first course, second course, and final course, respectively. While such a structure and progression is common to most universities that have instructional technology programs, what is unique here is that participants in all three courses meet and work together throughout the semester. A typical studio class begins with all participants meeting in one room to review the evening's activities, discuss a design theme or issue, or to review the progress of the final course's design teams. As students go to various activities and events scheduled for the class, many of them organized by the participants themselves, they meet, help, and interact with a variety of their classmates. It is expected that the more experienced and skilled Studio participants will mentor those with less experience and skill. Of course, each participant has unique responsibilities

associated with their respective course, but all have opportunities to call on any of the instructors and other participants for help, advice, and critiques as project development proceeds during the semester. This all-in-one structure helps to demonstrate and explain the requirements and dynamics of the more advanced courses for all participants from the very beginning of the studio experience. The culture of the studio is evidenced by the fact that when participants are asked about their graduate load in a semester, they typically respond first by stating they are "in the Studio," and second by listing the particular studio course.

Imposed structure on participants diminishes progressively while they complete the three courses in the studio curriculum. In the first course, the instructor prepares a weekly agenda, readings, discussions, and workshops for the most typical tools chosen by participants. In the second course, the instructor organizes weekly design discussions and organizes a schedule of project design documents and other project deliverables. In the final course, the participants are expected to organize themselves into teams and each team is then responsible to organize their weekly meetings and semester schedule for developing their team project. In all three courses, even the first course, the second half of the semester is characterized less by any explicit course structure and more by work on the respective studio projects. At the end of the semester, all of the participants show their projects in a public forum called the Showcase at which the public and professional community are invited to attend. Similar to an athlete or musician who willingly spends countless hours practicing basic skills in order to be able to complete in the "big game" or perform "in concert" (Anderson, Reder, & Simon, 1996), the showcase provides an authentic and motivating context and rationale for devoting the necessary time it actually takes to design and develop a multimedia project.

The goal of the first course is to learn broadly about the nature of design while acquiring proficiency with multimedia tools. Participants can choose any project topic they wish and there is no expectation that the project will be instructional in nature. Indeed, participants are encouraged to choose a topic that they are passionate about and committed to completing, one that will more likely be characterized by a degree of the "flow" experience (Csikszentmihalyi, 1990). Although workshops are provided on key introductory aspects of the prominent multimedia tools, and assistance from instructors and more skilled participants is provided throughout the semester, participants are largely responsible to set and maintain an independent learning plan for learning the tools sufficiently. They keep a design journal in which they reflect on the design of their project in light of the design literature they read during the semester. They finish the course having designed a personally relevant project and having acquired technical proficiency in a range of multimedia tools.

The goal of the second course is to design a multimedia lesson for an external client. Successfully completing both the first course and the department's introductory instructional design course are prerequisite to the second course. Hence, participants begin the second course with a firm understanding of instructional design and also multimedia design and development skills. In addition, participants perform 20 hours of consultation on one of the final course's team projects by performing well-defined tasks and activities as defined by the final course's team members. Through this consultation, they also learn about the elements and dynamics of a larger team project. They are counseled to pay close attention to how teams organize themselves in order to use those strategies that work well when they are team members the next semester, as well as to avoid problems encountered by teams.

The goal of the final course is to design, in a team setting, a multimedia unit consisting of approximately 3-5 lessons for an external client. By the time participants reach the final course they have developed a wide array of skills and experiences from their prior experience in the Studio and from other courses in the master's curriculum (e.g., project management). Participants are also expected to come to the final course knowing more about their own strengths, weaknesses, and ambitions. For example, an important decision for each team is choosing one project manager. Teams also need to identify who will take the lead on the project's design, development, and evaluation. All teams have to work well with the consultants, that is, students enrolled in the second course. The 20 hours of consultation that each second course participant brings must be carefully and strategically managed and used. Each final course team is expected to provide mentorship and leadership to all studio participants. Consequently, their team projects are held up as models for all participants throughout the semester. They are expected to share the progress of their project throughout the semester to the entire studio community.

What is the theoretical justification for such a curriculum structure? The design of this structure was explicitly based on fundamental principles of learning and design found in the professional literature. Admittedly, the studio curriculum was initially influenced and based largely on the combined experience of the founding studio instructors when it was first implemented in August, 1998. However, this experience was influenced by the professional literature related to learning and design. Among the most important and influential theoretical constructs are those based on constructivist principles, such as constructionism and situated cognition. However, the studio curriculum, much like the instructional technology field, reflects

a pragmatic aggregation of theories and philosophical positions. The remainder of this article presents and explains these guiding principles.

Background and Principles of Instructional Design and Development: Influence of Behaviorism

Given that the studio curriculum resides in a larger curriculum devoted to preparing people to design, develop, evaluate, and manage instructional systems, it is fitting and important to consider the theoretical and philosophical underpinnings of instructional design. First of all, many streams of thought have influenced learning theory over the past century. Based on an examination of three best-selling college textbooks on educational psychology, one may surmise that developmental theories of learning continue to be dominated by Piaget and Vygotsky, while more general learning theory has been dominated not so much by specific individuals as by the philosophical and theoretical orientations of behaviorism, cognitivism, and, more recently, constructivism (Ormrod, 2003; Slavin, 2003; Woolfolk, 1998). Some basic themes of behaviorism, cognitivism, and constructivism – all of which have influenced the Studio program - are presented in Table 3.1.

It is interesting, and ironic, that principles of constructivism are today being applied to training in instructional design, since the whole enterprise of systematically designing instruction finds its roots primarily in the work of archetypical behaviorist B.F. Skinner (1968) and the neo-behaviorist Robert Gagne (1965; Gagne & Briggs, 1973). The idea that instruction can be analyzed and developed systematically is entirely dependent on behaviorism's emphasis on measurable external behaviors and measurable outcomes, while constructivism (like cognitivism)

Table 3.1. *Themes associated with behaviorism, cognitivism, and constructivism. Based on Slavin (2003) and Bruning et al. (2004).*

Behaviorist Themes	Cognitive Themes	Instructional Themes Associated with Constructivist Epistemology
Classical and operant conditioning Contingencies of Reinforcement Internal phenomena addressed as long as expressed in terms of definable behaviors (e.g., "self-talk") Modeling and observational learning Self-regulation Epistemology: Objectivism (knowledge based on independent external realities)	Computer as model for thinking Information processing theory Mental frameworks Extended practice of cognitive skills Self-awareness and self-regulation Motivational theories Social interaction Contextual knowledge Compatible with objectivism or constructivism	Socially Situated Learning Zone of proximal development Cognitive apprenticeship Mediated learning (scaffolding) Papert's constructionism Self-direction Constructivist epistemology: knowledge is uniquely constructed by each individual through interaction with people and objects

emphasizes the inner processes of each learner. The theoretical roots of the activity denoted by the term "instructional design" – associated with the ADDIE framework (Analysis, Design, Development, Implementation, Evaluation) – are entirely behaviorist.

One must be careful when discussing broad philosophical orientations to ensure that meanings of terms are not muddled. Behaviorism is a philosophical and theoretical perspective that emphasizes the study of human psychology via observable behaviors. While behaviorism has epistemological implications (e.g., what can't be observed can't be known), it is not normally construed to be an epistemology. Constructivism, on the other hand, is primarily an epistemology (Crotty, 1998), that is, a philosophical orientation about the nature of knowledge.

In the 1950s and 1960s, Skinner challenged the educational world to respond to recent research in behavior and learning. Several of his important writings from this period were gathered together in the book *The Technology of Teaching* (Skinner, 1968). One of the biggest problems in classroom instruction, according to Skinner, is that the number of specific, timely reinforcements needed to shape student behavior is extremely large and beyond the reach of the classroom teacher. For the first four years of learning mathematics, Skinner estimated this number to be between 25,000 and 50,000 per student (Skinner, 1968, p. 17). His solution was the creation of mechanical teaching machines that would not only take the burden of repetitive teaching tasks off the teacher, but would also deliver far more instances of reinforcement to each learner than a classroom teacher could ever provide. Teaching machines were thus seen both as much-needed labor-saving devices for teachers and as a way to overcome the limitations of human teaching. Skinner (1968) presented the technology of teaching machines as *the* inevitable solution to the deficiencies of education:

> There is a simple job to be done. The task can be stated in concrete terms. The necessary techniques are known. The equipment needed can easily be provided. Nothing stands in the way but cultural inertia. … We are on the threshold of an exciting and revolutionary period, in which the scientific study of man will be put to work in man's best interests. Education must play its part. It must accept the fact that a sweeping revision of educational practices is possible and inevitable. When it has done this, we can look forward with confidence to a school system which is aware of the nature of its tasks, secure in its methods, and generously supported by the informed and effective citizens whom education itself will create. (p. 28)

Borrowing from Huxley (1932), this was truly a vision of a "brave new world" in which human behavior would be managed by benevolent educators through and with technology. However, by the time Skinner's book was published, forces were already at work that would largely sweep his vision aside within a few years. With the rise of computer science, a theoretical preoccupation with the *inner* processes of thinking and learning had been rapidly growing. Cognitive psychology, with its focus on computer information processing as a model for human thinking, was on its way to becoming the dominant perspective in education (Bruning, Schraw, Norby, & Ronning, 2004; Slavin, 2003). Also, the influence of Jean Piaget and Lev Vygotsky (1978), along with others, would soon lead to the ascendance of constructivism as an influential epistemological paradigm (Duffy & Cunningham, 1996; Jonassen, 1991). Skinner publicly lamented before his death in 1990 that the world had failed to learn from him (Boeree, 2000).

While the revolutionary change envisaged by Skinner did not happen, the systematic design of instruction nonetheless became a significant force in education. With the publication of Robert Gagne's *Conditions of Learning* in 1965, in which he outlined the widely-adopted nine events of instruction, the groundwork was laid for a field of instructional design to come in to being (Reiser, 2001), and for early ADDIE-type models to begin to emerge, such as those of Silverman and Hamerus (Gustafson & Branch, 2002). Skinner's machines were never widely implemented in public education, but the textbook-based variant known as "programmed instruction" was more accessible and did receive extensive use for a few years.

Another interesting irony of this history is the fact that the very development that was largely responsible for cognitive psychology eclipsing behaviorism – the rise of computers – is what provided the ideal delivery mechanism for the teaching machine concept. In the late 1970s,

while Gagne was publishing a largely rewritten third edition of *The Conditions of Learning* (1977) – one that now incorporated concepts of cognitive science and marked his own transition from behaviorist to neo-behaviorist – the advent of personal computers was creating an obvious context for the advocacy of behaviorist-based instructional design. Personal computers rapidly became the new teaching machines (Reiser, 2001), and Gagne's events of instruction (later called events of learning) remained a foundational piece in the new arena of computer-based instructional design and development. Taken together, the work of Skinner, Gagne, and others in relation to teaching machines, the events of instruction, and programmed instruction might appropriately be referred to as the "behavioral theory of the systematic design of instruction." Whether a single theory or not, this way of viewing instructional development has probably influenced the field that we now call instructional technology more profoundly than any other theoretical or philosophical construct.

Dominant Theoretical Constructs Behind the IT@UGA Studio Curriculum

The Studio curriculum in the University of Georgia was strongly influenced by the following theoretical perspectives: Constructionism; situated cognition/situated learning; and self-directed learning (Rieber, 2000a, 2000b; Rieber, Orey, & King, 2006). While these three perspectives may represent the theoretical core of the curriculum, the set of skills being taught – instructional design and development – is thoroughly rooted in behaviorism, as discussed above. One additional concept found in the Studio curriculum, scaffolding, is closely related to situated cognition/situated learning and figures prominently in Studio materials. Flow theory also figures prominently in the studio, especially in the first course. The following sections will discuss each of the above perspectives.

Constructionism

A discussion of constructionism highlights yet another irony regarding the theoretical underpinnings of the Studio program. The idea of "constructing learning" was actually present in the seminal writings of Skinner promoting teaching machines, which were the precursors to computer-based instruction. In the introductory section of *The Technology of Teaching* (1968), Skinner reviewed "three great metaphors" in use in the field of education: growth or development, acquisition, and construction. However, in Skinner's view, it was the *teacher* who constructs learning in the student via the arrangement of contingencies of reinforcement. "… the *behavior* of the student can in a very real sense be constructed" (p. 4, italics in original). This is a radically different concept from the learner-centered constructivism and constructionism envisaged for the Studio program.

Two clarifications are needed regarding the term *constructionism*. First, constructionism, in the sense discussed here, should not be confused with the philosophical orientation known as social constructionism. Social constructionism is an epistemological position (a belief about the nature of knowing) that espouses the socio-cultural nature of all knowledge (Crotty, 1998). While it is true that constructionism, as discussed here, has a strong epistemological dimension (Papert, 1991), it is not an epistemology per se but "a theory of learning and a strategy for education" (Kafai & Resnick, 1996, p. 1). Second, *constructionism*, as used in this paper, is regarded as an application of principles of *constructivism* (with a "v"), a variant of social constructionism that emphasizes the construction of knowledge through interaction with the environment. All of these perspectives are to be contrasted with objectivism, the belief that reality is external to the knower and that meaning corresponds to objects and categories in the

real world. (See Jonassen, 1991, for a comparison of the assumptions of constructivism and objectivism).

The absence of the word "social" with constructivism does not mean that constructivism lacks an emphasis on social interaction. According to Slavin (2003), constructivism draws heavily on the work of Piaget and Vygotsky and includes the key concepts of social learning, the zone of proximal development, cognitive apprenticeship, and mediated learning (scaffolding). In practice, instruction carried out from a constructivist perspective may emphasize approaches such as cooperative learning, discovery learning, self-regulated learning, and the teaching of problem-solving strategies and critical thinking skills.

Constructionism, as used here, is a theory of instruction introduced by Seymour Papert and first articulated formally in Harel and Papert (1991), though the roots of these ideas were contained in Papert's seminal work *Mindstorms* (1980). These ideas grew out of his work with psychologist and epistemologist Jean Piaget. As Papert points out, constructionism has a strong epistemological dimension:

> Constructionism – the N word as opposed the V word – shares constructivism's connotation of learning as "building knowledge structures" irrespective of the circumstances of the learning. It then adds the idea that this happens especially felicitously in a context where the learner is consciously engaged in constructing a public entity, whether it's a sand castle on the beach or a theory of the universe. (Papert, 1991, p. 1)

Thus constructionism seeks to promote the internal activity of constructing knowledge through the external activity of constructing a representation or manipulation of that knowledge.

Constructionist learning environments are therefore those environments that facilitate such activities specifically with the construction of new knowledge in mind. Though Papert himself has hesitated to describe constructionism in any sort of formulaic manner (Papert, 1991, p.1), at least four basic tenets of constructionism have been offered by Bers, Ponte, Juelich, Viera, & Schenker (2002): "(a) learning by designing meaningful projects to share in the community, (b) using concrete objects to build and explore the world, (c) the identification of powerful ideas that are both personally and epistemologically significant, and (d) the importance of self-reflection as part of the learning process" (p. 123).

Students in constructionist learning environments are engaged in the designing of many kinds of things in a social setting, as explained by Kafai & Resnick (1996):

> Constructionism suggests that learners are particularly likely to make new ideas when they are actively engaged in making some type of external artifact — be it a robot, a poem, a sand castle, or a computer program — which they can reflect upon and share with others. (p. 1)

Student-generated projects are important aspects to implementing constructionism. Projects can be defined as "relatively long-term, problem-focused, and meaningful units of instruction that integrate concepts from a number of disciplines or fields of study" (Blumenfeld et al., 1991, p. 370). Projects have two fundamental elements: 1) a driving question or problem; and 2) activities that result in one or more *artifacts*. Artifacts are "sharable and critiquable externalizations of students' cognitive work in classrooms" and "proceed through intermediate phases and are continuously subject to revision and improvement" (p. 370-371). More detailed

descriptions of applications of constructionism may be found in Harel and Papert (1991), Kafai and Resnick (1996), and Rieber (2003).

Constructionism is relevant to the training of adults in instructional design and development, in which a public artifact is normally produced. Given the nature of IDD as a design activity (Nelson & Stolterman, 2003; Tripp, 1994), constructionism, the essence of which is learning-by-designing, provides a framework for maximizing learning.

In the first studio course, participants create a project that is continually open to review and critique by other members of the studio community. Additionally, they complete a web-based design journal during the design and development phases of the project, which is also a public document. Finally, studio participants in all three courses show and discuss their respective studio projects at the "Studio showcase," the final and culminating event that is open to the general professional community.

It is crucial that participants choose a project topic in the first course for which they are passionate. They are explicitly advised to reflect on their values and interests and to choose a topic for which they are highly enthusiastic and devoted. This is posed as a unique opportunity for the students, that is, to receive graduate credit for pursuing one of their passions. Consequently, topics range from the very personal (e.g. documenting the birth of a child or an important anniversary of parents) to avocations (e.g. gardening, quilting, traveling). Work-related project topics are not off limits, but participants are counseled not to choose a project that will seem like "work."

It is explicitly hoped that students who follow this advice will experience the kind of optimal life experience that Csikszentmihalyi (1990) identified as "flow" during the completion of their projects. Csikszentmihalyi originally defined flow as "...the state in which people are so

involved in an activity that nothing else seems to matter; the experience is so enjoyable that people will do it even at great cost, for the sheer sake of doing it" (p. 4). Flow is associated with losing track of time, a sense of momentum, and often a sense of creative productivity (Csikszentmihalyi, 1996). It may seem overly ambitious to expect graduate students to regard a component of their for-credit work in this fashion; however, Studio participants who have been interviewed as part of several research projects have in fact reported, without exception, episodes of flow in their project work, in many cases losing track of time repeatedly for several hours at a stretch (Clinton, 2005; Clinton, 2006; Clinton & Rieber, 2005).

Situated Cognition and Situated Learning

After constructivism, the next most important theoretical construct influencing the studio curriculum has been situated cognition. A seminal article advocating for situated cognition was Brown, Collins, and Duguid (1989). Major concepts in this article included situated cognition, cognitive apprenticeship, scaffolding, communities of practice, legitimate peripheral participation (situated learning), and enculturation. Brown, Collins, and Duguid heavily cited the work of Jean Lave (see the discussion of situated learning below).[2]

Situated cognition posits that all thinking, learning, and knowledge arise from socially mediated activities embedded in authentic and meaningful contexts. Even the closely associated concept of scaffolding (Wood, Bruner, & Ross, 1976), which might at first glance be regarded as merely an instructional technique, is a social concept. Scaffolding is heavily associated with Vygotsky's (1978) concepts of the zone of proximal development (ZPD) and the more

[2] Interestingly, the book *Situated Learning: Legitimate Peripheral Participation* (Lave & Wenger, 1991) was cited in Brown, Collins, & Duguid (1989) as "Lave and Wenger, in preparation."

knowledgeable other (MKO), as well as with apprenticeship and with the enculturation that apprenticeship entails.

Situated cognition specifically refers to the embeddedness of learning activity within a context, which may be more or less authentic to the context from which the learning content is derived. For example, Brown, Collins, & Duguid (1989) discussed successful models of cognitive apprenticeship in which classroom instruction was presented by teachers modeling the reasoning processes of mathematics professionals rather than those of typical math teachers. Like scaffolding, cognitive apprenticeship is derived from the concept of the zone of proximal development (Vygotsky, 1978).

Legitimate peripheral participation (situated learning) is a descriptive theory that offers a comprehensive view of the way that learning is socially situated in communities of practice. Lave and Wenger (1991) formulated a theory that broadens apprenticeship into an "analytical perspective" (p. 39) on learning as "an integral part of generative social practice in the lived-in world" (p. 35). In this view, life, or at least social life, does not proceed without learning (see also Dewey's exposition of the educative nature of social interaction, Dewey, 1916). The central focus of this theory is social practice itself, of which learning is a natural outgrowth. The social context is primary. Put another way, learning is first and foremost a process of social participation, and secondarily a process of learning. Learning is "an increasing participation in communities of practice" (p.49). From this perspective, even individual learning, as pointed out by Salomon and Perkins (1998), may be regarded as covertly social and may be part of learners' peripheral participation in a practicing community.

Following are some key points about legitimate peripheral participation (LPP) within situated learning:

- In five apprenticeship contexts examined by Lave and Wenger (1991), in the successful cases, there was little observable teaching but a great deal of learning.
- "Peripheral" is directional; the learner is assumed to be moving gradually toward "full participation."
- LPP is a process of gradual enculturation into a community of practice, of moving from newcomer status to old-timer status.
- Lave and Wenger (1991) insisted that the dualities of legitimate/illegitimate, peripheral/central, and participation/non-participation have no useful meaning for this view of learning. The "center" of practice is not defined.
- Lave and Wenger (1991) avoided issues of inequity and social justice for the purposes of the book. Their concern seemed to be with typical social systems rather than all variations of social contexts. However, the relation between newcomer and old-timer was acknowledged to involve relations of power.

A key example of legitimate peripheral participation in the IT@UGA studio is the role of consultants played by participants enrolled in the second course on the team projects of the final course. As consultants, they contribute to the team projects in a serious and direct way, providing up to 20 hours of "billable" time. The duties of each consultant are (or should be) clearly defined by the respective design team. They also attend many of the design team meetings in order to understand the context of the project. They are expected to perform this consulting role in a timely, professional fashion, but the responsibility of the team project's ultimate success or failure is not theirs. Still, they experience the emotion — high and low — that accompanies the team's progress. Along the way, they are expressly told to note examples of

good and bad team practices in order to be prepared for their own role as team members in the final course in a subsequent semester.

Scaffolding

The concept of scaffolding is generally credited to Jerome Bruner and colleagues in the 1970s (Wood, Bruner, & Ross, 1976). Scaffolding is based on Vygotsky's (1978) concepts of the zone of proximal development (ZPD) and the more knowledgeable other (MKO). According to these concepts, the best learning happens in the area just beyond what the learner is capable of on his or her own; a person with more knowledge can provide the necessary assistance for this learning. The ZPD is defined as "the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance, or in collaboration with more capable peers" (Vygotsky, 1978, p. 86).

Bruner's variation on this theme focused on the issue of support. As the metaphor from building construction suggests, scaffolding describes support for learning that is gradually removed, or faded, over time. Fading is an integral component in scaffolding (Pea, 2004), which is commonly applied in individual teacher-learner interactions but may also logically be built into the overall design of an academic program.

In the IT@UGA studio, scaffolding fades slowly over the three-course sequence. It is strongest in the first course, with much of the agenda determined by the instructor. However, even in the first course, students are expected to make decisions about their learning path, with help and advice from the instructor. In comparison to a traditional graduate course, participants

in the first course have much latitude, but not nearly as much as they have in the second course, nor, especially, in the final course.

Self-Directed Learning

The fourth major theoretical construct associated with the Studio is that of self-directed learning. In keeping with our mindfulness of the behaviorist roots of instructional technology, it may be appropriate to begin here by noting the distinction between self-regulated learning, a concept of specific learning activities rooted in behaviorism, and self-directed learning, a broader constructivist perspective relating to learner autonomy. Simply put, self-regulated learning normally refers to well-defined behavioral strategies for reaching short-term learning goals, while self-directed learning refers to a learner deciding what to learn and how to learn it, what end-product will suffice as evidence of the learning, and when this goal has been reached (Moran, 2005). Self-directed learning, with its longer-term focus, has also been called a way of life (Brockett & Hiemstra, 1991). It is often illustrated with examples of adults who become interested in a particular topic or activity outside of formal education and who take the initiative to make learning happen about that topic.

The concept of self-directed learning has been enormously influential in adult education. By the early 1980s, Brookfield (1984) had concluded: "By almost any conceivable measure, research into self-directed adult learning must constitute the chief growth area in the field of adult education research in the last decade" (p. 59). Philip Candy, whose book *Self-Direction for Lifelong Learning* (1991) was declared in the foreword by Brookfield to be the definitive comprehensive volume on the subject, attributed the modern origins of self-directed learning research to the work of Cyril Houle and Allen Tough in the 1960s. However, the processes and

conditions of self-directed learning have been a major force in human life since ancient times (Brockett and Hiemstra, 1991).

Brockett and Hiemstra (1991) presented a model for self-directed learning called the Personal Responsibility Orientation (PRO) model. Their model distinguished between two major facets of the concept, one describing the "characteristics of the teaching-learning transaction" (self-directed learning) and the other describing the mindset of the learner (learner self-direction).

Candy (1991) took the concept of self-directed learning a step further by subdividing each of the main facets into two additional subcategories. The learner's activity or method of self-directed learning may either be true autodidaxy (self-education, with no reference to an instructor) or assisted autodidaxy, also called independent study, in which an instructor still maintains some degree of control. Likewise, the goal of learner self-direction may refer to the learner's capacity for self-management (similar to self-regulated learning) or the learner's personal autonomy in the sense of choosing one's direction in learning (Candy, 1991).

As an approach to instruction, SDL presents an apparent paradox: self-direction implies learning alone, without the aid of an instructor or facilitator. However, those who work with adult learners can do many things to help promote SDL in their learners, including assisting with planning, providing feedback, and locating or coordinating available resources (Brockett & Heimstra, 1991).

In the first studio course, seminars and discussions are held specifically to address the nature of self-directed learning. These become very personal in the sense that participants are asked to tell stories of self-directed learning in everyday life. A main point of these discussions is that, as adults, everyone has had countless self-directed learning experiences because that is

how most of the important lessons of life are learned. Something seems to happen, however, when one crosses the threshold of school — one becomes or takes on the persona of a student, a persona learned over a period of at least 16 years of formal schooling (a typical period for most graduate students). This persona is usually accompanied by feelings of needing or wanting complete direction and control by the instructor. If direction is not provided, discomfort and frustration often follow, usually because the concept of self-directed-ness is interpreted as "I need to learn this all by myself without help". Indeed, in the Studio there tends to be an expectation that the instructors will be able show step-by-step and in a fixed sequence how to use a multitude of multimedia tools and apply design principles in such a way that all participants will be able to create exemplary projects (Fiedler, 1999; Song & Hill, 2004). There is an assumption that there is one "best way" to learn these skills suitable for all learners. But, like many important life skills, these multimedia skills are multi-faceted, complex, ill-structured, and determined in large part by the nature and context of the design problem or project. The seminars and discussions about self-directed learning help to reveal the incompatibility and incongruence of the desire for a simple directed learning experience within a complex learning and working environment, such as that of designing a multimedia project.

As the first course unfolds, participants begin to see that self-directed learning is not about "going it alone", but instead is about making choices and decisions, followed by taking action. Some actions include going to organized workshops that present a subset of skills in a structured way. Other actions include making appointments with instructors or more capable peers for individual tutoring or help. Slowly participants realize, sometimes only over the duration of the three courses, that the diversity of the people and needs dictated by the projects results in a similar diversity of learning paths and that no instructor could possibly organize any

"best route" that would meet all the competing needs and expectations. Most students leave the graduate program comfortable with a learning approach that will serve them well as a practicing professional. Even for those for whom the studio approach does not work well, at least they have experienced a different model for how "school" might be conducted.

Conclusions

Creating effective educational multimedia requires many people with many skills, talents, and experiences. The abilities needed to complete a successful project are necessarily distributed across the development team. Examples include knowledge of the subject matter, project management, instructional design, evaluation, graphic design, and a wide array of computer tools (authoring/programming, graphics, animation, etc.). The increase in Web-based forms of instructional materials further complicates this design process, requiring not only another layer of technical sophistication, but often complete rethinking of how instructional materials ought to be designed. At the core of all of this is a creative and collaborative problem-solving process in which members of the team must somehow learn how to work with and rely upon each other.

Unfortunately, graduate programs that prepare people to join these development teams rarely teach this way. Even the most innovative of instructors have difficulty providing their students with authentic and collaborative design experiences under the constraints of the one-course/one-instructor model. All faculty who are serious about their teaching struggle with these problems, but are usually stymied in how to initiate change in their departments or colleges. After all, universities are not known as champions of change when it comes to teaching.

The Studio curriculum at the University of Georgia has been operating since 1998. Its design was strongly influenced by contemporary learning theory. We feel it is one of the best

examples of how to model a constructivist epistemology in an adult learning environment. A great mistake that is often made when interpreting and analyzing applications of constructivism to education is that it is synonymous with discovery learning and that instruction is the antithesis of such a philosophy (see Kirschner, Sweller, & Clark, 2006, and Mayer, 2004, for examples of this misconception). In contrast, a mature constructivist view looks to understand when instruction is not the most appropriate route to learning, or conversely, when instruction is most needed for learning to occur. Understanding the difference is probably the most challenging aspect for any teacher in a constructivist learning environment. A constructivist teacher is not interested in the quickest learning if this means that learning will remain shallow and decontextualized. Finally, even if a constructivist approach to learning, as embodied in the IT@UGA Studio, is not the best approach for every single learner, it is significant that it provides at least one contrasting model of education for the adults who experience it.

Public education, promoting the free exchange of ideas and the "initiative and adaptability" of individuals that Dewey articulated, has been a key ingredient in the success of the new American democracy (imperfections notwithstanding) that was formally signed into existence 1787. It is our hope and anticipation that the IT@UGA Studio program, as a new instructional endeavor at an academic institution, will also continue to grow, adapt, and flourish in a way that fosters these qualities and is responsive to its citizens as they pass through the program.

CHAPTER 4

AN INVESTIGATION OF THE ROLE OF CREATIVITY IN A GRADUATE LEVEL INSTRUCTIONAL DESIGN AND DEVELOPMENT TRAINING PROGRAM[1]

[1]Clinton, G. To be submitted to *Educational Technology Research and Development*.

Abstract

Creative ideas breathe life into any field of human endeavor. However, the role of creativity in instructional design and development has received little attention in instructional technology literature. Specifically, the role of student creativity in instructional design graduate programs has not been studied sufficiently. This mixed-methods study used correlational procedures to compare three measures of creativity: the Torrance Tests of Creative Thinking: Figural (TTCT:F), the Creative Product Semantic Scale (CPSS), and a questionnaire about personal creative ability. Additionally, five case studies were conducted in which interviews and online design journals were analyzed in the context of other data. The goals of the study were to explore what relationships might be found between the three measures, to describe individual students' design process, and to examine student perspectives about creativity and design.

Results of the comparison of measures were inconclusive. However, the quantitative data indicated that the seventeen individuals: a) were highly creative relative to the general population (as measured by the TTCT:F); b) generally viewed themselves as creative persons (as indicated by questionnaire responses); and c) created multimedia projects that were rated as fairly homogenous in creativity by two experts (using the CPSS). Results of the five case studies suggest that students who enter the program having more skills with the multimedia development tools, who view themselves as creative, generally thrive in the program, in contrast with students who lack this background, who view themselves as less than creative, who generally experience frustration in the program and need additional support.

An Investigation of the Role of Creativity in a Graduate Level Instructional Design and Development Training Program

In America, we revere those whose innovations or artistic expressions have left their mark on our culture. More than that, we depend on creative innovation as a driving force in our economy. Economist Richard Florida, in his book *The Rise of the Creative Class*, calls creativity "the fundamental source of economic growth" (Florida, 2002, p. xxix).

Creativity is usually defined as the generation of ideas that are both novel and useful, often in response to a problem that needs to be solved (e.g., Sternberg & Lubart, 1999). While our economy at large depends on creativity, specific sectors of the workforce are more associated with creative output by definition. These sectors make up what Florida calls the Creative Class: "If you are a scientist or engineer, an architect or designer, a writer, artist, or musician or if you use your creativity as a key factor in your work or business, you are a member" (p. xxvii). For the field of instructional technology, the fact that the term "designer" is included in the above statement is significant: instructional designers are counted among the creative. Yet no research reports have been published specifically addressing the role of creativity in instructional design and development.

Relevant Literature

Given the absence of research on creativity and instructional design, the context for this study had to be drawn from a wide range of related literature, given here in brief. First, one informal paper from an instructional technology source bears mentioning. Luppicini (2003) described a protocol for reflection and discussion among instructional designers. The protocol is

called Reflective Action Instructional Design (RAID). The author's observations about the instructional technology literature were similar to my own: "How exactly creative decision making takes place is not addressed in the ID literature. Nor are procedures offered for guiding creative decisions" (p. 76). Luppicini's evidence, informally collected from students in a design course, suggested that reflective thinking in the instructional design and development process may contribute to creativity.

Beyond Luppicini's work, other research relevant to this topic is drawn mainly from three bodies of literature: creativity studies, creativity-related studies in other design fields, and studies in instructional design and development. General conclusions from this literature search may be summarized as follows:

1. Perceptions of self can have an impact on creative performance (Silvia & Phillips 2004; Szymanski & Harkins, 1992);
2. Group or social contexts can play a facilitative role in fostering creative performance (Hooker, Nakamura, & Csikszentmihalyi, 2003; Paulus & Nijstad, 2003; Williams & Yang, 1999);
3. Support can be found in the literature for both consensual assessment (Amabile, 1983; Baer, Kaufman, & Gentile, 2004) and analytical assessment (Besemer, 1998; Besemer & O'Quin, 1984; 1999; O'Quin & Besemer, 1989) of creative products;
4. Assessment of personal creativity via the Torrance Tests of Creative Thinking (TTCT) is widely accepted (Plucker & Renzulli, 1999) and supported by reliability and predictive validity studies (Cramond, 1993);

5. The role of creativity in various design fields is well established (Akin, 1994; Blicblau & Steiner, 1998; Court, 1998; deYoung, 1996; Kelley & Hartfield, 1996; Smith & Tabor, 1996);
6. Characteristics of professional practice and preparation in the field of instructional design indicate an important role for creativity (Larson & Lockee, 2004; Visscher-Voerman & Gustafson, 2004); and
7. Characteristics of the instructional design training setting under study (the Studio) indicate an environment in which students are given considerable freedom to be creative (Fiedler, 1999; Song & Hill, 2004).

While each of the above insights provides contextual information for the present study, there remains no research, and very little theoretical treatment, on the role of creativity in professional practice and training in instructional design and development. Therefore, a serious gap exists in the literature regarding this issue.

Purpose And Research Questions

This study was a mixed-methods investigation designed to explore the role of creativity in the design experience of students in a masters level instructional design and development program at a research-extensive university in the southeastern United States. My intent was to find out whether students' self-reporting of creative ability is consistent with their performance on a creativity test and/or the ratings and rankings of their multimedia projects by a panel of experts. The intent was primarily descriptive rather than having a directional hypothesis. The

study also examined how five students conceptualized the role of creativity in their design experience. The research questions addressed by this research are as follows:

1) What relationships can be found between: a) self-rating of personal creative ability by program participants; b) participants' composite scores on the Torrance Tests of Creative Thinking – Figural (TTCT:F); and c) ratings of participant projects by a panel of experts?

2) What does the design process of individual students look like?

3) What are participants' perceptions of creativity as it relates to their project work?

Research Method

(Note: A detailed plan for the research methodology was developed for the dissertation prospectus. This original methodology chapter is provided, for reference, in Appendix B.)

The use of mixed methods in research may be regarded as the pragmatic use of available tools for solving problems within a socio-historical context (Schutz, Chambliss, & DeCuir, 2004). Mixed method research extends the idea of triangulation beyond multiple data sources to multiple methodologies. The intent behind the triangulation of methodologies is not merely to demonstrate consistency of results, but rather to test for such consistency and to afford an opportunity to look for deeper understanding if such consistency does not emerge (Patton, 2002). While this study was weighted toward the qualitative side, it was designed to employ both methodologies extensively.

Pilot Studies

Two pilot studies preceded this study. In the first of these (Clinton & Rieber, 2005), students' design journals, questionnaires, debrief session notes, and course evaluations were examined. In the second study (Clinton, 2005), three interviews with students were analyzed. While participants' assessment of their personal creativity varied considerably among the twelve students in the two studies, students stressed the importance of creativity in their design work, and all students reported episodes of flow. (Please see the summary of research in Chapter 5 for a description of these two studies.)

Context

The context for this study was the "Studio" program in the university's Instructional Design and Development master's curriculum. In this program, three different course levels meet together in a learning community designed with constructivist principles in mind. The primary deliverable for all students is an individual or team multimedia project, displayed publicly in an advertised showcase event. For the first level course (Design and Development Tools), this project and the skills needed to complete it are entirely dictated by the student's personal interests. For the second level (Learning Environments Design I), an individual project is completed according to the needs of an external client. Finally, the third level (Learning Environments Design II) is devoted to team projects for external clients. Online documentation of projects is required of all students. Also, all students are required to use their technology skills to perform ten hours of voluntary community service, apart from their project work.

The Design and Development Tools course was especially designed by the instructors to put principles of constructionism (Papert, 1991) into practice. For this first-level course, students

spend the first half of the semester doing self-study of multimedia development tools from how-to books (typically Dreamweaver, Flash, Fireworks, and/or Photoshop), with help from workshop sessions given by the instructor. The second half of the semester begins with a one-on-one conference with the instructor and is devoted to project design and development. These first-level students must maintain a design journal containing at least eight reflections and including responses to readings about principles of design.

Students are required to take the first level course twice during the master's program, and therefore, unlike the other two levels, there are typically some first timers and some second timers in this course in a given semester. Students are also required to give and receive a certain number of desktop critiques, or "desk crits," of their projects during development. At the end of each semester, students from the third level course receive nominations for a peer-based recognition of excellent projects called the Blue Sock awards. The third level students evaluate and vote on the nominees, any number of whom may receive the award. Results are submitted to one of the instructors and announced to the class via email.

Participants

For the group measures, participants consisted of seventeen students enrolled in the first two course levels of the Studio program. Among these there were eleven taking the Design and Development Tools for the first time, two for the second time, and four enrolled in the second level course. Additionally, these seventeen were comprised of eight Instructional Design and Development majors and nine of various other majors; 12 female and five male; three East Asian, one South Asian, one Arab, one mixed, and ten white; ages ranging from 24 to 46. Table

4.1 displays the demographics for the seventeen participants, along with their prior experience with the TTCT:F and their status relative to the Blue Sock Award for the semester under study.

The participants for the case studies were five graduate students enrolled in the first-level Studio course (Design and Development Tools). Of these five, four were taking the course for the first time and one was repeating the course (allowed by the university). In addition, these five were comprised of four Instructional Design and Development majors and one School Library Media major, four female and one male, four white and one South Asian, ages ranging from 24 to 39.

Table 4.1. *Demographic information for the seventeen participants.*

PARTICIPANT	COURSE	AGE	GENDER	ETHNICITY	PROGRAM	TTCT:F BEFORE?	BLUE SOCK AWARD
1 (Case Study)	6190-2nd	39	F	White	IDD - Masters	Unsure (not recently)	yes
2	6190	27	F	White	Landscape Architecture - Masters	No	no
3	6200	34	F	Asian	IDD - Masters	No	yes
4	6190	30	F	Asian	Elementary/Social Studies Ed.	No	yes
5	6190	29	M	White	PE/Sports Studies	No	no
6	6190	32	M	White	EdPsych - Applied Cognition/Dev.	No	no
7	6190-2nd	43	F	White	IDD - Masters	No	no
8 (Case Study)	6190	25	F	White	IDD - Masters	No	no
9 (Case Study)	6190	24	F	White	School Lib. Media	Unsure (not recently)	nominated
10	6200	24	M	Arab	IDD - Masters	No	yes
11	6200	46	F	Mixed	IDD - Masters	No	nominated
12	6190	26	F	W	EdS - TIP	Yes - 2yrs prior, not scored	no
13	6190	26	F	White	EdS - TIP	No	no
14 (Case Study)	6190	33	F	Asian (Ind)	IDD - Masters	No	no
15 (Case Study)	6190	24	M	White	IDD - Masters	No	yes
16	6190	32	F	White	PhD - Romance Languages	No	no
17	6200	35	M	Asian	PhD - Adult Education	No	yes

A combination of purposive and pragmatic sampling was employed in selecting the five case study participants. Desirable characteristics included first time Design and Development Tools students and Instructional Design and Development majors. These characteristics were sought because the focus of the research was the initial experience in the first level Studio course, emphasizing the concepts of creativity and creative ability that students bring with them into the program. Another reason for these criteria is that I was interested in students (at least four) who were ultimately there for the purpose of studying *instructional* design and development (rather than simply multimedia design).

However, my options were limited. There were only eight IDD majors among the seventeen students who were available to participate in the study, and three of these were enrolled in the second level course (EDIT 6200). One other was taking the first level course for the second time while simultaneously taking the third level course, and an additional student was taking the first level course for the second time (but had no other experience in the program). This left three individuals who met the criteria (Delinda, Jensen, and Chitra), and so a compromise was needed in selecting the fourth case study participant. The second-time student in the first level course was of interest because of the unusual circumstance that her project focused on creativity; however, she was hospitalized temporarily at the end of the semester and her availability was uncertain. A fourth case study participant with a different major was therefore recruited and interviewed, one who was new to the Studio (Marla). Subsequently, the other student (Renee) recovered sufficiently and contacted me expressing a strong interest in participating (note that the names given above are not students' real names).

Experts employed in the ratings of student projects were two university employees, one female, one male, ages 45 and 56, both of whom had studied in the College of Education's

Instructional Technology doctoral program, one with a completed PhD. Both raters had completed coursework in theories of creativity in addition to their IT coursework. Both served in multimedia development roles in their respective employments.

Assessment Instruments

There were three assessment instruments used in this study: The Torrance Tests of Creative Thinking – Figural (TTCT:F; Torance, 1974), the Creative Product Semantic Scale (CPSS; Besemer & O'Quin, 1999), and a brief questionnaire created by the researcher.

The TTCT:F is a psychometric instrument designed to elicit expression of various kinds of creative thinking from test takers through drawing pictures in response to three kinds of visual stimuli. Focusing primarily on divergent thinking patterns, the TTCT:F is the most widely used battery of creativity tests world-wide (Sternberg & Lubart, 1999). While the limitations of psychometric testing of creativity have been highlighted in the literature (Sternberg & Lubart, 1999), the TTCT:F is noted for fairly respectable measures of reliability (Plucker & Renzulli, 1999) and predictive validity (Cramond, 1993; 1994). The TTCT:F uses non-verbal stimuli and was therefore the desirable form of the test for the mixed group of American and international students that typically make up the Studio community. There are two alternate versions of the test booklet, Form A and Form B. The TTCT:F can be administered in approximately 30 minutes and yields scores of Fluency, Originality Elaboration, Abstractness of titles, and Resistance to premature closure, as well as a composite creative thinking score.

The CPSS is a rating scale for assessing creative products based on a theoretical model originally proposed by Besemer and Treffinger (1981) called the Creative Product Analysis Matrix (CPAM). Research on this model has been "aimed at developing a measuring instrument

which might be used by diverse groups, such as engineers, new product designers, artists, and students to consider and describe their creative products" (O'Quin & Besemer, 1989, p. 268). As such, the CPAM framework represents an effort to make explicit those qualities in a product that, taken together, result in the product being considered creative. The CPAM is visualized as a cube having three dimensions: 1) Novelty; 2) Resolution (functionality); and 3) Elaboration and Synthesis (style). Nine sub-facets are also identified. Novelty is composed of originality and surprise; Resolution is composed of logical, useful, valuable, and understandable; Elaboration and Synthesis is composed of organic, well-crafted, and elegant (Besemer & O'Quin, 1999).

The rating scale is composed of pairs of opposing adjectives (e.g., organized-disorganized, graceful-awkward, meticulous-sloppy). For each of these pairs, raters must respond on a seven-point likert-type scale in reference to a product. Various adjective pairs contribute to each subscale of the CPAM; for example, a participant's score for "elegant" is computed by taking the mean score from the five pairs graceful-awkward, refined-busy, coarse-elegant, repelling-charming, and attractive-unattractive. Originally there were 110 item pairs in the CPSS; this has since been refined to 71 and then to 55 item pairs (Besemer & O'Quin, 1989), then to 43 item pairs (Besemer, 1998; Besemer & O'Quin, 1999).

The third assessment instrument used in this study was a brief questionnaire created by the researcher based on a similar questionnaire used in a pilot study (Clinton & Rieber, 2005). The aim of the questionnaire was straightforward: to ask participants to rate their personal creative ability. Two questions were used in an attempt to achieve this aim. The first personal creativity question was identical to a multiple choice question used in the above pilot study (that elicited an evenly distributed set of responses). For dissertation purposes, a second version of the creativity question was added, one that asked participants to rate their creativity on a scale of 1-8.

An even number was used to help steer participants away from the natural tendency to choose the middle response. Other items on the questionnaire elicited demographic information. The two creativity questions from the questionnaire are presented in Figure 4.1.

Procedures

The Studio courses were co-taught in the fall semester 2005 by one faculty instructor for each of the three courses plus a graduate teaching intern who assisted with the first level course. Study participants were recruited with the cooperation of class instructors during the last week of the semester. Participants were offered a bookstore gift certificate as an incentive. Emphasis was placed on participation being entirely voluntary, with no connection between participation and course grade. The data collection period for student participants lasted approximately six weeks during December 2005 and January 2006. Data collection from experts (project ratings) extended into March 2006 as methodological issues with the expert protocol were being resolved.

Large Group Procedures (N = 17). Class sessions were observed informally for several sessions during the first half of the semester. At no time prior to the final week of the semester was the research topic revealed. At the end of the semester, participating students were given: a) the questionnaire about perceptions of personal creativity; and b) the Torrance Tests of Creative Thinking – Figural (TTCT:F). The 17 students also agreed to have their course projects rated by a panel of experts after the end of the semester.

The researcher, a certified administrator and scorer of the TTCT:F, conducted the test sessions and scored the booklets. All participants were given Form B booklets. The researcher's scoring skills on the TTCT:F were checked by means of four practice tests submitted to a certified trainer within the two week period immediately prior to the scoring of the 17 test

booklets. A later check was conducted by another certified scorer using two randomly chosen test booklets from the group of 17. The difference in scores for both test booklets was within the standard error of measurement of 5.13 for Form B for this age group.

An initial trial run of expert ratings, using an adaptation of consensus-based assessment (Amabile, 1983), failed to produce sufficient interrater reliability. An online version of the Creative Product Semantic Scale (CPSS, Besemer & O'Quin, 1999) was then developed. Expert raters were instructed to think of the relative creativity of the projects in reference to each other rather than to judge their creativity compared to the general population (this was viewed by the experts as a helpful clarification, since most of the general population do not create multimedia products). Resulting scores for each subscale are averaged into an overall composite score.

PLEASE TRY TO CHOOSE THE MOST HONEST ANSWER, WITHOUT THINKING TOO MUCH ABOUT IT!

1. Do you consider yourself a creative person? (Please circle the letter for the answer that comes closest to your personal point of view.)

A. Yes, definitely, and others seem to regard me this way.
B. Yes, but I don't know if I'm perceived that way by others.
C. I sometimes have moments that I regard as creative but my strengths are in other areas besides creativity.
D. Not really – I don't think of myself that way.

2. On a scale of one to eight, please rate your personal creative ability as compared to other people in the general population. Circle the number of your choice.

1 2 3 4 5 6 7 8

Least Creative ---------- Most Creative

Figure 4.1. Questions 1 and 2 of the questionnaire.

A new trial run using the online CPSS produced adequate interrater agreement. Subsequently the two experts were given the project information for the seventeen study participants. The two experts' ratings of the seventeen projects yielded an average difference between raters across subscales of less than one (Novelty .8765, Resolution .7537, Elab./Synth. .8706) on a scale of one to seven.

Case Study Procedures (N = 5). Five selected students out of the larger group were interviewed toward the end of the data collection period. These semi-structured interviews ranged in length from 50 minutes to 150 minutes. A brief follow-up interview of about ten minutes in length was conducted with two of the participants. Audio recording for interviews was accomplished using a Macintosh PowerBook G4 computer and Garage Band software. The semi-structured interview protocol used for this study is given in Appendix C.

Online design journals of these five students were also included in the case study data. Selected instructional artifacts from the Studio program were also included for reference, along with the informal classroom observation data. Large group quantitative data were considered to be contextual information for the case studies.

Analysis

Qualitative Analysis. The grounded theory method, along with an "inductive/deductive interaction" similar to that suggested by Strauss and Corbin (1990), was used for the qualitative portion of the study. Design journals and other documents, observation data, and interview transcripts were analyzed for meaningful patterns, themes, and categories.

The analysis process consisted of the following elements over the course of the research:

- repeated listening to the interview recordings;
- initial open coding and memo writing by hand on printouts of the interview transcripts, design journals, and other documents (Patton, 2002; Strauss & Corbin, 1990);
- further coding and memo writing in all source documents using NVivo software (version 7);
- word searches in source documents (e.g., creative, idea, etc.);
- review of the Studio Handbook and Studio program website;
- grouping together of non-narrative data (e.g., TTCT:F scores, CPSS ratings, questionnaire responses) in table form for each case;
- clarification of emerging categories using concept maps (using Inspiration software);
- creation of a table of commonalities across cases;
- holistic perusal of all data (Strauss & Corbin, 1990);
- review of resulting categories with reference to Patton's (2002) guidelines for testing categories; and
- final grouping of categories into four broad super-categories.

The final version of the entire hierarchical structure of super-categories and categories for the five cases is given in Appendix D.

Quantitative Analysis. Possible relationships between the following three pairs of data sets were examined: 1) composite TTCT:F scores and subscale scores/overall CPSS ratings and

subscale ratings of projects, 2) composite TTCT:F scores/participant self-rating of personal creativity in response to questionnaires, and 3) overall CPSS ratings of projects/ participant self-rating of personal creativity in response to questionnaires.

Cross-Method Analysis. In addition to the above analyses, the results of the qualitative analysis for each case study served as contextual information for interpreting the results of the quantitative analysis, and vice versa.

Researcher Biases. All researchers view their work through the lens of their own life experience. In my case, the primary biases I brought to this study were no doubt shaped by my experiences as a musician. First, I view creativity as a highly desirable quality for any work. In music, like other fine arts, any work that is overly formulaic tends to be viewed as uninspired and unsatisfying. I am not fond of cut-and-dried approaches to much of anything, especially instruction.

Second, I tend to agree with those who view creativity as an aptitude that is partly, if not mostly, innate. That is to say that I expected different students to exhibit different degrees of creativity in their work, according to what they have brought to the table with them coming into the Design and Development tools course.

A third assumption was that more creative students might tend to do well in the course, while less creative students may not fare as well. I wanted to use document analysis and self-reporting to provide a rich description of the creative aspect of students' learning experience, and I sought insights as to how such a learning environment can better serve all students. However, I did not expect the Studio learning environment to be able to "make students creative," regardless of improvements that might be recommended after this study. Rather, I expected that insights from this study might lead to improvements as to how to better serve less-creative students.

I needed to be prepared for the possibility that these assumptions were incorrect, that creativity is not as highly valued by others as it is by me, that creativity is not essentially innate and is not a factor contributing to success in the Design and Development Tools course. Historically, after all, the field of instructional design has invested great energy in an effort to establish a scientific approach to instruction, a process for which a step-by-step procedure can be followed. I needed to be open to the possibility that the data I would gather would support rather than call into question this systematic, formulaic approach. It was incumbent upon me as a researcher to be willing to have my assumptions called into question by the data.

Another bias that I brought to this study was my admiration for the faculty who created the Studio program. This bias could have made it difficult to come to any conclusions about student experiences that would constitute criticisms of these faculty members or their work. I needed to be willing to let the data speak in this regard.

Findings From Quantitative Data

The mean of the 17 overall CPSS scores on student projects was 4.25, standard deviation .57, with 1 as the lowest possible score and 7 the highest. The mean of the 17 TTCT:F scores (standardized with a normative mean of 100) was 135.35, standard deviation 13.65. Questionnaire responses, along with composite and subscale scores for the TTCT:F and the CPSS, are presented in Table 4.2. Initial comparison of composite TTCT:F Scores and overall CPSS scores, using a scatterplot and Pearson correlation generated by SPSS, showed no relationships between these measures ($r = -0.17$, $p = .949$).

Table 4.2. *Questionnaire responses with CPSS and TTCT:F composite and subscale scores for the seventeen participants. TTCT:F scores are standardized with a mean of 100. CPSS scores are averaged from rater responses on a scale of 1 to 7.*

Participant	Questionnaire Q1	Questionnaire Q2	CPSS Avg	Novelty Avg	Resolution Avg	Elab/Synth Avg
1	A	6	5.0472	5.0125	5.4625	4.6667
2	C	5	5.1549	4.5625	5.1688	5.7334
3	C	4	4.7556	3.6750	5.2250	5.3667
4	B	6	3.7354	2.6500	4.3563	4.2000
5	A	6	4.2257	2.4875	5.2563	4.9333
6	C	5	3.5062	2.5500	4.8688	3.7000
7	B	6	4.6452	4.1250	5.2438	4.5667
8	C	6	3.7854	2.8500	4.9063	3.6000
9	B	5	3.9910	3.4625	4.3438	4.1667
10	C	4	4.7972	3.4500	5.5750	5.3667
11	C	6	4.7875	3.2125	5.8500	5.3000
12	C	3	4.0903	2.9000	5.0375	4.3333
13	A	6	3.3942	4.1375	3.4125	2.6333
14	C	6	4.4035	3.1875	5.1563	4.8667
15	A	6	3.3473	3.9375	3.4375	2.5667
16	A	6	4.5104	4.9000	5.0313	3.6000
17	C	5	4.0639	2.9500	4.9750	4.2667

Participant	TTCT:F Composite With Creative Strengths	TTCT:F Percentile	TTCT:F Fluency	Fluency Percentile	TTCT:F Originality	Originality Percentile
1	145.0	99	110.0	69	145.0	98
2	136.0	94	125.0	89	137.0	96
3	122.0	74	87.0	26	115.0	77
4	136.0	94	114.0	76	127.0	90
5	130.0	87	70.0	8	97.0	45
6	137.0	94	100.0	49	127.0	90
7	162.0	99	119.0	82	137.0	96
8	140.0	96	105.0	60	132.0	94
9	145.0	99	105.0	60	121.0	85
10	120.0	69	83.0	21	97.0	45
11	142.0	97	116.0	79	112.0	72
12	154.0	99	105.0	60	132.0	94
13	145.0	99	97.0	44	141.0	97
14	124.0	78	133.0	95	147.0	99
15	129.0	86	70.0	8	112.0	72
16	129.0	86	100.0	49	121.0	85
17	105.0	39	100.0	49	105.0	59

Participant	TTCT:F Elaboration	Elaboration Percentile	TTCT:F Abstr. Of Titles	Abstr. Of Titles Percentile	TTCT:F Res. Prem. Closure	Res. Prem. Closure Percentile	TTCT:F Cr. Strengths
1	146.0	98	119.0	82	143.0	96	13
2	139.0	96	89.0	30	135.0	92	11
3	152.0	99	84.0	23	118.0	80	11
4	152.0	99	89.0	30	135.0	92	13
5	152.0	99	111.0	70	99.0	48	14
6	116.0	75	123.0	87	151.0	98	14
7	160.0	99	148.0	98	151.0	98	19
8	156.0	99	107.0	63	127.0	87	15
9	146.0	98	123.0	87	143.0	96	17
10	132.0	92	102.0	55	143.0	96	9
11	152.0	99	128.0	91	127.0	87	15
12	158.0	99	158.0	99	118.0	80	20
13	160.0	99	111.0	70	118.0	80	20
14	139.0	96	40.0	1	107.0	64	11
15	152.0	99	107.0	63	85.0	25	14
16	139.0	96	84.0	23	135.0	92	13
17	106.0	60	84.0	23	99.0	48	6

Subscale scores for the TTCT:F (fluency; originality; elaboration; abstractness of titles; and resistance to premature closure) and the CPSS (novelty; resolution; elaboration & synthesis) were compared, along with composite scores, using a correlation matrix, as shown in Figure 4.2 and Table 4.3. As can be seen in the matrix, few of the eight different subscales correlated well with each other, even within the same testing instrument. However, there are exceptions. For example, correlation between the CPSS subscales *Resolution* and *Elaboration & Synthesis* was extremely strong (.831, p = .000). Another high within-instrument correlation was that between the TTCT:F subscales *Fluency* and *Originality*. (719, p = .001).

Moderate levels of correlation occurred between several other measures. The next highest correlation, after the two mentioned above, was also within-instrument: TTCT:F *Fluency* and *Resistance to Premature Closure* (.429, p = .043). The highest correlation across instruments came in next, for the CPSS subscale *Novelty* and the TTCT:F subscale *Originality* (.366, p = .074). The coefficient for the TTCT:F subscales *Elaboration* and *Abstractness of Titles* was next (.361; p = .077). Finally, once again across instruments, the CPSS subscale *Resolution* correlated somewhat with the TTCT:F subscale *Resistance to Premature Closure* (.340, p =.091). All other correlation coefficients were at .33 or below and generally non-significant.

For purposes of analysis, the four response options of question 1 (Q1) of the questionnaire ("Do you consider yourself a creative person?") were reversed (A=D, B=C, C=B, and D=A) and converted to numbers that correspond to the 8-point Likert scale of question 2 (Q2, A=2, B=4, C=6, D=8). A moderate correlation (.550) was shown between responses to Q1 and Q2, both intended to provide a self-rating of creative ability; this correlation was statistically significant (p = .015).

Correlation Matrix

		CPSS Composite Score – Average across raters	CPSS Novelty Average across raters	CPSS Resolution Average across raters	CPSS ElabSynth Average across raters	TTCT:F Composite CI Standard Score	TTCT:F Fluency Standard Score	TTCT:F Originality Standard Score	TTCT:F Elaboration Standard Score	TTCT:F Abstractness of Titles Standard Score	TTCT:F Resistance to Premature Closure Standard Score
Correlation	CPSS Composite Score – Average across raters	1.000	.459	.805	.846	-.017	.341	.022	-.018	-.095	.334
	CPSS Novelty Average across raters	.459	1.000	-.042	-.038	.182	.147	.366	.164	-.045	.234
	CPSS Resolution Average across raters	.805	-.042	1.000	.831	-.067	.293	-.148	-.203	.021	.340
	CPSS ElabSynth Average across raters	.846	-.038	.831	1.000	-.134	.306	-.158	-.112	-.130	.242
	TTCT:F Composite CI Standard Score	-.017	.182	-.067	-.134	1.000	.336	.553	.661	.742	.485
	TTCT:F Fluency Standard Score	.341	.147	.293	.306	.336	1.000	.719	-.008	-.138	.429
	TTCT:F Originality Standard Score	.022	.366	-.148	-.158	.553	.719	1.000	.282	-.012	.313
	TTCT:F Elaboration Standard Score	-.018	.164	-.203	-.112	.661	-.008	.282	1.000	.361	-.033
	TTCT:F Abstractness of Titles Standard Score	-.095	-.045	.021	-.130	.742	-.138	-.012	.361	1.000	.330
	TTCT:F Resistance to Premature Closure Standard Score	.334	.234	.340	.242	.485	.429	.313	-.033	.330	1.000
Sig. (1-tailed)	CPSS Composite Score – Average across raters		.032	.000	.000	.474	.090	.467	.472	.358	.095
	CPSS Novelty Average across raters	.032		.437	.443	.242	.287	.074	.264	.432	.183
	CPSS Resolution Average across raters	.000	.437		.000	.399	.127	.285	.218	.469	.091
	CPSS ElabSynth Average across raters	.000	.443	.000		.304	.116	.272	.335	.310	.175
	TTCT:F Composite CI Standard Score	.474	.242	.399	.304		.094	.011	.002	.000	.024
	TTCT:F Fluency Standard Score	.090	.287	.127	.116	.094		.001	.487	.299	.043
	TTCT:F Originality Standard Score	.467	.074	.285	.272	.011	.001		.136	.482	.111
	TTCT:F Elaboration Standard Score	.472	.264	.218	.335	.002	.487	.136		.077	.449
	TTCT:F Abstractness of Titles Standard Score	.358	.432	.469	.310	.000	.299	.482	.077		.098
	TTCT:F Resistance to Premature Closure Standard Score	.095	.183	.091	.175	.024	.043	.111	.449	.098	

Figure 4.2. Correlation matrix of TTCT:F composite scores/subscales and CPSS overall scores/subscales. Shaded areas indicate comparisons across instruments. The six highest correlation coefficients are enclosed in shapes, with the p value for each coefficient enclosed in the corresponding shape.

Table 4.3. *Descriptive statistics for the correlation matrix given in Figure 4.2.*

	N	Range	Sum	Mean	Std. Deviation	Variance
CPSS Composite Score – Average Across Raters	17	1.8076	72.2405	4.249438	.5730809	.328
CPSS Novelty Average Across Raters	17	2.5250	60.0500	3.532353	.8022315	.644
CPSS Resolution Average Across Raters	17	2.4375	83.3062	4.900368	.6690729	.448
CPSS ElabSynth Average Across Raters	17	3.1667	73.8665	4.345091	.9143165	.836
TTCT:F Composite CI Standard Score	17	57.0000	2301.0000	135.352941	13.6470747	186.243
TTCT:F Fluency Standard Score	17	63.0000	1739.0000	102.294118	17.4634071	304.971
TTCT:F Originality Standard Score	17	50.0000	2105.0000	123.823529	15.7092142	226.390
TTCT:F Elaboration Standard Score	17	54.0000	2457.0000	144.529412	15.0462522	226.390
TTCT:F Abstractness of Titles Standard Score	17	118.0000	1807.0000	106.294118	27.5584939	759.471
TTCT:F Resistance to Premature Closure Standard Score	17	66.0000	2134.0000	125.529412	19.4458146	378.140
Valid N (listwise)	17					

After Q1 had been converted, in an effort to explore possibilities for meaningful comparison, responses to Q1 and Q2 were "averaged" together for each participant (not real numeric averages, since responses from Q1 were ordinal-level). Participants were then ranked, with ties, according to these "averaged" responses about their personal creative ability. Participants were also ranked, again with ties, according to their composite TTCT:F scores. Finally, participants were ranked, with no ties, according to the overall CPSS scores on their projects. Kendall's tau correlations were then computed for the three possible pairs of rankings. Results were as follows: rankings for Q1 and Q 2 combined/rankings for overall CPSS scores – tau = -.205, p = .137; rankings for TTCT:F composite scores/rankings for overall CPSS scores – tau = .185, p = .165; rankings for Q1 and Q 2 combined/ rankings for TTCT:F composite scores – tau = -.052, p = .386. No relationship could be discerned between the three sets of rankings.

Quantitative Findings: Discussion

It is clear that inferences about population parameters cannot be made from the data as they stand, given the small sample size and the low variance in TTCT:F and CPSS scores. However, to the extent that each data point is valid, the above collection of data does describe this particular group of 17 students. Descriptive statistics can be used as the name implies - to describe those in the sample.

At the same time, there appear to be some issues in knowing how to interpret parts of the data. For example, participants' interpretation of the relation between the two items in the questionnaire was puzzling at first. These two questions were intended to ask participants for the same information in two different ways; but among the small set of multiple choice options in Q1 and the eight points on the Likert scale in Q2, there was ample variation in what students perceived as belonging together. Figure 4.3 presents the different combinations of answers chosen, along with numbers of responses, among the 17 participants.

While the responses to Q1, chosen from among four carefully worded descriptions of personal creativity, might be viewed as standing on their own, it appeared difficult to assign any meaningful weight to the Likert-scale responses of Q2, given the pattern shown in figure 4.3. However, a possible reason for the inconsistency may lie in the frame of reference in the minds of participants while responding, specifically, in the *change* of frame of reference that may be prompted by the wording of the questionnaire as one moves from Q1 to Q2. In an attempt to help respondents think about their personal creative ability, the perception of what others think had been included in the wording of the response options for Q1. This may have led respondents to think mostly about their immediate peers in the Studio program or, perhaps, their wider circle of social contacts. Q2, on the other hand, specifically asks respondents to consider their creativity in

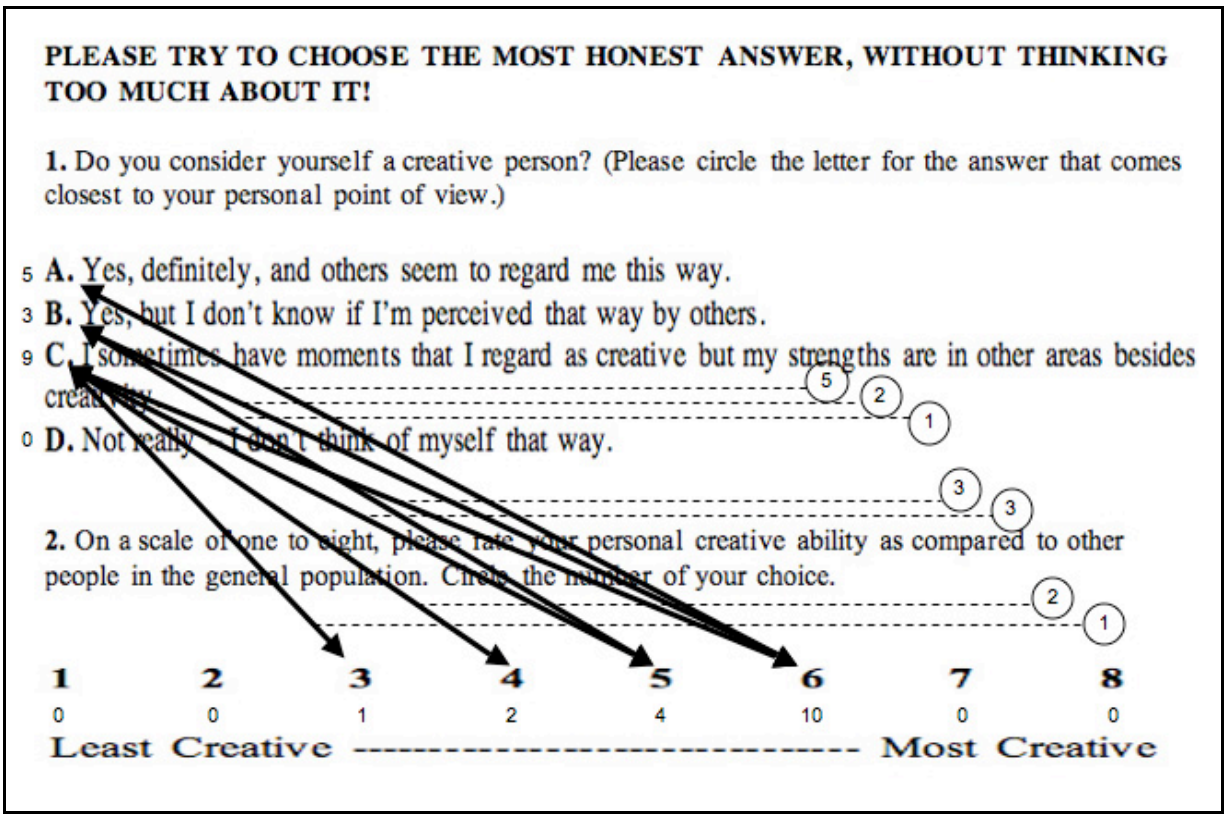


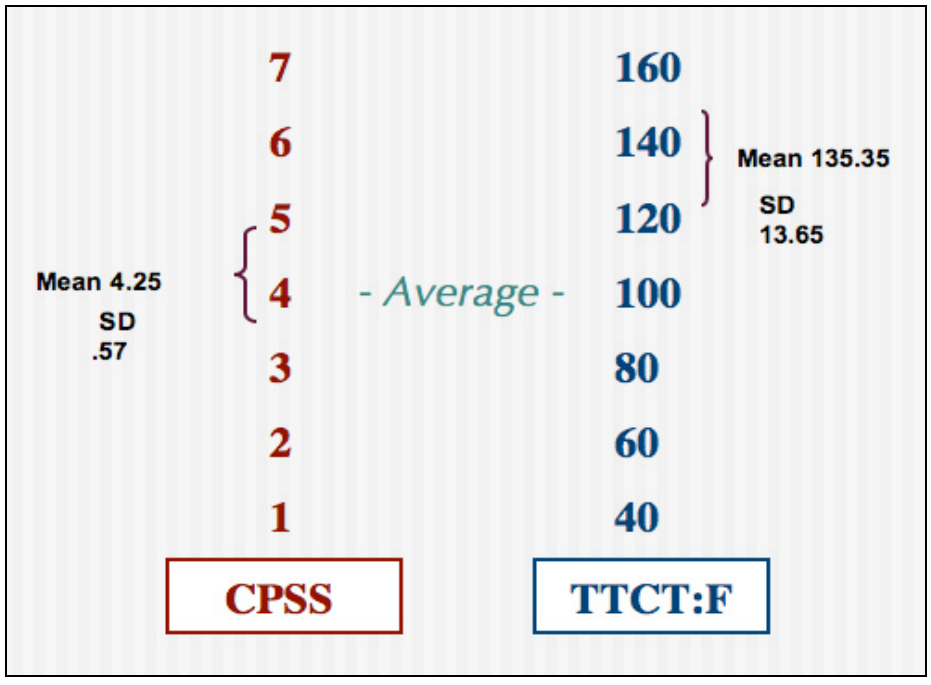
Figure 4.3. Numbers of responses to Q1 and Q2 of the questionnaire. Numbers of responses are shown at each item. Two-arrowed lines and circled numbers indicate pairs of responses by the same participant. Note: Some skewing of the format was employed in this figure in order to provide more space to display the response pairs.

comparison to the general population. This could account for the general skewing of Q2 responses toward the high end of the scale as compared to Q1 responses.

Frame of reference appears to have also played a role in the overall relationship between TTCT:F scores and CPSS ratings. The TTCT:F is normed to the general population and, similar to Q2 of the questionnaire, TTCT:F scores for this sample are skewed toward the high end of the standard scale (the mean of the sample, 135.35, is more than two standard deviations above the

normal mean of 100). However, in an attempt to make sure the expert raters' task was sufficiently clearly defined, the researcher instructed the experts to think of the group of 17 projects as their frame of reference (this seemed important at the time in light of the fact that members of the general population do not commonly produce multimedia products). While the lack of variance is similar in both cases, the mean of the CPSS ratings is very close to the scale average of 4, in contrast to the high mean (135.35) of the standardized TTCT:F scores. This difference in frame of reference suggests that the generally average CPSS ratings for projects are not necessarily inconsistent with the high creativity scores of the group as measured by the TTCT:F. Figure 4.4 illustrates the means and standard deviations of the CPSS and TTCT:F scores relative to their respective scales.

Figure 4.4. Means and standard deviations of CPSS and TTCT:F scores relative to their respective scales.



While the frame of reference issue is helpful in explaining the overall distribution of the data for the TTCT:F, CPSS, and questionnaire, the general lack of correlation between overall scores and subscale scores on the TTCT:F and the CPSS remains an unexpected outcome. For future studies, an increase in sample size should be considered the most straightforward way to evaluate whether there is any tendency, on average, for scores generated by these instruments to correlate. Meanwhile, there are several points to consider about the low correlation figures for this sample. First, a number of scholars have claimed that the TTCT:F measures a "slice" of creativity rather than the entire picture of a person's creative ability (Plucker & Renzulli, 1999). Further, that which is measured by the TTCT:F is known to be dynamic – it can change over time in a person. Therefore, for each participant the TTCT:F may be regarded as offering one view of that individual's creativity at a particular time, but not the only possible view.

Moreover, the CPSS is a measure of specific raters' responses to a specific product. Even in the fine arts, the creativity of an artist and the creativity of a particular work are two different things. The CPSS therefore offers a snapshot of creativity, as fixed in a product, rather than an overall view of a person's ability.

Finally, all measures are subject to some degree of error, and the amount of error cannot be determined in a specific participant. It is worth noting that there was one participant who had taken the TTCT:F two years prior, and two others who were unsure as to whether they had ever taken the test before. It could be that some amount of test-retest effect influenced their scores. Also, for the CPSS, limiting the number of expert raters to two was considered a practical necessity. While this decision was supported by an acceptable level of interrater reliability, it was not considered ideal. A larger number of raters might increase confidence in the individual CPSS ratings.

On the whole, it appears that these seventeen individuals: a) were highly creative relative to the general population (as measured by the TTCT:F); b) generally viewed themselves as creative persons, especially when thinking of their own creativity relative to the general population (as indicated by questionnaire responses); and c) created multimedia projects that were rated as fairly homogenous in creativity by two experts (using the CPSS). There was one individual in the group whose quantitative measures were most consistent: she chose A for Q1, 6 for Q2, and scored near the top of the group in both the CPSS (overall 5.0472) and the TTCT:F (composite score in the 99th percentile). This individual was one of the case study participants, Renee; so more information about her will be presented in the qualitative findings section.

Findings From Qualitative Data

The qualitative portion of the study centers on five case studies of individual students enrolled in the first-level Studio course, Design and Development Tools. While the analysis of the data included exploration of emergent themes, much of this report will focus on those themes that correspond to the research questions: participants' views of creativity and design, participants' creativity ability, and participants' project design process.

There are a number of insights to be gained from the five participants' accounts of their learning experience. In this section, I give an overview of each of the five cases. I then give a brief summary of the kinds of data that shed light on the major themes. Finally, I explore commonalities across the five cases. Details for each case, including views of design, views of creativity, creative ability, project description, and design process, are given in Appendices E-I.

The Five Cases

Delinda. Delinda was a 25 year-old high school business teacher enrolled in the masters IDD program. The primary subject she teaches is fashion merchandising. She had recently changed majors from the teacher-oriented Technology Integration Program into the more business-oriented IDD program, and was taking Design and Development Tools for the first time. Demographic and Blue Sock Award data for Delinda are presented in Table 4.4.

Table 4.4. *Demographic data for Delinda. The number at left correspond to Delinda's placement within the group of seventeen, as given in Table 4.1.*

PARTICIPANT	COURSE	AGE	GENDER	ETHNICITY	PROGRAM	TTCT:F BEFORE?	BLUE SOCK AWARD
8 Delinda	6190	25	F	White	IDD - Masters	No	No

Delinda described herself as very people-oriented. Meeting other people, being in social situations, and helping others are the things that get her excited. She hates to work by herself. She also said she learns best by doing and therefore she wanted her design to offer something more than passive for her learners. Data structure and non-narrative data for Delinda's personal creative ability are presented in Table 4.5. Her views about creativity and her creative ability are discussed in the *Conceptions and Measures of Creativity* section below and in Appendix E.

Delinda said she came into the Studio program with "zero" experience with the multimedia tools; however, later in the interview she mentioned one exception, a previous professional development course in basic Photoshop skills. She had considered taking the university's recommended prerequisite course, in basic web and multimedia tools, before entering the Studio, but she thought it would "throw her off course."

She described herself as transitioning from secondary education to industry. Beyond her interest in business as a teacher, she seems to feel drawn toward the business world personally. "I always wanted to be in the business world." But she also expressed a desire to have more real world experience to offer to her students in the future.

The tone of Delinda's design journal and that of her interview differed noticeably. The cooperative and generally enthusiastic tone of the design journal seems to reflect a motivation to please the instructor during the course, whereas the interview, which was conducted after the

Table 4.5. *Data structure and non-narrative data for Delinda's personal creative ability.*

Personal Creative Ability – Delinda		
As Viewed by Self	From Interview	Self View (see text)
		Perception of How Viewed by Others (see text)
	Additional data from Design Journal	(see text)
	Assessment of Personal Creativity From Questionnaire	Q1. **C. "Sometimes I have moments that I regard as creative but my strengths are in other areas besides creativity."**
		Q2. **6** (on a scale of 1-8)
As Viewed by Others	CPSS Average – **3.7854** (on a scale of 1-7)	Novelty - **2.8500**
		Resolution - **4.9063**
		Elab. & Synthesis - **3.6000**
	Blue Sock Award Status	**Not Nominated**
As Measured by the TTCT:F	Composite Percentile - **96**	Fluency percentile – **60**
		Originality percentile - **94**
		Elaboration percentile - **99**
		Abstractness of Titles percentile – **63**
		Resistance to Premature Closure percentile – **87**
		Creative Strengths - **15** (out of a possible 26)

Studio showcase, was perhaps unfettered by such constraints – her interview responses presented a more cynical and pragmatic attitude toward the Studio experience. She also expressed strong views about what suits her purposes and what does not. For example, she had no use for the self-directed study of multimedia tools via textbooks. "Those books are still on my shelf at home, unopened." Her distaste for working alone was reflected in her journal statement, "I would not consider myself a self-organized learner. ... I have always worked better in a group or with a teacher."

Thus the first half of the semester was not very productive for Delinda, in spite of having brought a prioritized list of 8-10 project ideas with her into the course. For the individual mid-semester conference with the instructor, she described a rather panicky preparation in which she managed to put a web page together using the instructor's Dreamweaver guide and had a rollover behavior working on a graphic. In this one-on-one meeting, not with Dr. R. but with the graduate student who was assisting him, she presented this webpage material plus the Photoshop exercises she had done in the prior staff development course, pretending that she had done the Photoshop work in the current semester. She said the meeting went very well – the teaching assistant seemed quite happy with her work.

Jensen. Jensen was a 24 year-old male enrolled in the masters IDD program. He was taking Design and Development Tools for the first time. His undergraduate degree, from a university near his home in a northeastern state, was in business with a focus on management information systems and human resources. He had worked full time for a year in a technical support position in the department of athletics at his previous university before coming to this university's graduate school. He explained that his technology background and human resources background seemed to lead logically to the instructional technology field, bringing together the

people who want to learn and the technology ("In my head, it works out."). He described himself as a fun-loving person with a "creative side" to his personality. He loves the outdoors and outdoor recreational activities; he is also a rowdy sports fan, particularly at football games. Demographic and Blue Sock Award data for Jensen are presented in Table 4.6.

Table 4.6. *Demographic data for Jensen. The number at left correspond to Jensen's placement within the group of seventeen, as given in Table 4.1.*

PARTICIPANT	COURSE	AGE	GENDER	ETHNICITY	PROGRAM	TTCT:F BEFORE?	BLUE SOCK AWARD
15 Jensen	6190	24	M	White	IDD - Masters	No	Yes

Jensen referred, in one of his earlier design journal entries, to a "creative side of my personality," long before he would have known the topic of this study or considered participating in it. He described liking "new media" types of classes because these combined his technical background with that creative potential. He also referred to his technical background as a source of confidence in problem solving. Data structure and non-narrative data for Jensen's personal creative ability are presented in Table 4.7. His views about creativity and his creative ability are discussed in the *Conceptions and Measures of Creativity* section below and in Appendix F.

Jensen injected humor into his design journal at several points. For example, "Actually the only people who lose are the ones who don't see [my project]. (That was a joke.)" and "OK good, two steps down, wow this design thing is easy, haha, NO." He aspires to be an instructional designer for a school system or possibly a military instructional designer for high-tech applications.

Table 4.7. *Data structure and non-narrative data for Jensen's personal creative ability.*

Personal Creative Ability – Jensen		
As Viewed by Self	From Interview	Self View (see text)
		Perception of How Viewed by Others (see text)
	Additional data from Design Journal	(see text)
	Assessment of Personal Creativity From Questionnaire	Q1. **A. "Yes, definitely, and others seem to regard me this way."**
		Q2. **6** (on a scale of 1-8)
As Viewed by Others	CPSS Average – **3.3473** (on a scale of 1-7)	Novelty - **3.9375**
		Resolution - **3.4375**
		Elab. & Synthesis - **2.5667**
	Blue Sock Award Status	**Received Award**
As Measured by the TTCT:F	Composite Percentile – **86**	Fluency percentile - **8**
		Originality percentile - **72**
		Elaboration percentile - **99**
		Abstractness of Titles percentile - **63**
		Resistance to Premature Closure percentile - **25**
		Creative Strengths - **14** (out of a possible 26)

Chitra. Chitra was a 33 year-old Asian female enrolled in the masters IDD program. She was taking Design and Development Tools for the first time. She came to the program with about seven years of experience working at a management level with companies that provided web development and e-Learning services. This sector in her home country, particularly one company where she had recently worked for 1 ½ years, had recently experienced what she called "phenomenal growth." She described her own growth over the years as a professional, moving from doing solo work, which she once preferred, to teamwork and to managing teams. She expressed confidence in her ability to work with teams, a confidence that seems to have surprised her as it developed. In this work she also had found that she grasped instructional design issues

"very properly" because of her experience with what she called "content across media." She gave herself credit for landing one of the largest contracts her company had ever taken. Demographic and Blue Sock Award data for Chitra are presented in Table 4.8.

Table 4.8. *Demographic data for Chitra. The number at left correspond to Chitra's placement within the group of seventeen, as given in Table 4.1.*

PARTICIPANT	COURSE	AGE	GENDER	ETHNICITY	PROGRAM	TTCT:F BEFORE?	BLUE SOCK AWARD
14 Chitra	6190	33	F	Asian (Ind)	IDD - Masters	No	No

Chitra holds a prior master's degree in business management. She had taken one course in HTML a few years earlier but otherwise claimed no experience with the multimedia tools before entering the Studio program. She explained her interest in coming to the U.S. and enrolling in this program as, in part, getting to know the production side of eLearning work, to complement her experience with the management side. She also explained that there were "no instructional design courses" in her home country, so instructional designers there were generally self-taught. Data structure and non-narrative data for Chitra's personal creative ability are presented in Table 4.9. Her views about creativity and her creative ability are discussed in the *Conceptions and Measures of Creativity* section below and in Appendix G.

Chitra also described herself personally as having no hobbies per se, though she loved to read and counted Geoffrey Archer and Terry Siegel among her favorite authors. Watching movies and listening to music also counted among her preferred activities. She described her spiritual side in terms of pursuing personal growth and practicing meditation. Notably, she spoke about spiritual things in response to the question early in the interview about who she is as a person, what motivates her, what "makes her tick." She said she tries "to evolve myself on four

different levels - professional, personal, spiritual, and physical. I mark myself on all these four levels, and I try to advance myself year after year." She had attended a ten-day meditation camp each of the last five years, and had plans to attend again in the coming year. She expressed her desire to be more aware of what is going on around her than the average person, and, in particular, to have a deeper, rather than superficial, understanding of people.

Table 4.9. *Data structure and non-narrative data for Chitra's personal creative ability.*

Personal Creative Ability – Chitra		
As Viewed by Self	From Interview	Self View (see text)
		Perception of How Viewed by Others (see text)
	Additional data from Design Journal	(see text)
	Assessment of Personal Creativity From Questionnaire	Q1. **C. "Sometimes I have moments that I regard as creative but my strengths are in other areas besides creativity."**
		Q2. **6** (on a scale of 1-8)
As Viewed by Others	CPSS Average – **4.4034** (on a scale of 1-7)	Novelty - **3.1875**
		Resolution - **5.1563**
		Elab. & Synthesis - **4.8667**
	Blue Sock Award Status	**Not Nominated**
As Measured by the TTCT:F	Composite Percentile - **78**	Fluency percentile - **95**
		Originality percentile - **99**
		Elaboration percentile - **96**
		Abstractness of Titles percentile - **1**
		Resistance to Premature Closure percentile - **64**
		Creative Strengths - **11** (out of a possible 26)

Chitra also described herself personally as having no hobbies per se, though she loved to read and counted Geoffrey Archer and Terry Siegel among her favorite authors. Watching

movies and listening to music also counted among her preferred activities. She described her spiritual side in terms of pursuing personal growth and practicing meditation. Notably, she spoke about spiritual things in response to the question early in the interview about who she is as a person, what motivates her, what "makes her tick." She said she tries "to evolve myself on four different levels - professional, personal, spiritual, and physical. I mark myself on all these four levels, and I try to advance myself year after year." She had attended a ten-day meditation camp each of the last five years, and had plans to attend again in the coming year. She expressed her desire to be more aware of what is going on around her than the average person, and, in particular, to have a deeper, rather than superficial, understanding of people.

Marla. Marla was a 24 year-old female enrolled in the School Library Media program. She was taking Design and Development Tools for the first time, as an elective. Like Jensen, she had spent one year working full time before coming back to school. In Marla's case, this took the form of teaching a high school technology class. She had left this position out of frustration, primarily due to a lack of budget support for her class. She also cited this lack of resources as forcing her to be more creative with her lesson planning. She said that her long-term goal had been "to do something with school library," so the frustration in her first year of teaching led her to "speed up that long-term goal." Demographic and Blue Sock Award data for Marla are presented in Table 4.10.

Table 4.10. *Demographic data for Marla. The number at left correspond to Marla's placement within the group of seventeen, as given in Table 4.1.*

PARTICIPANT	COURSE	AGE	GENDER	ETHNICITY	PROGRAM	TTCT:F BEFORE?	BLUE SOCK AWARD
9 Marla	6190	24	F	White	School Lib. Media	Unsure (not recently)	nominated

Marla's Christian faith was the initial focus of her response about who she is as a person and what motivates her. She had experienced a Christian conversion as a freshman in college. "That's pretty much the biggest thing in my life. With every breath I take, I strive to glorify God through encouraging others, through studying His word, through excellence in school or whatever He calls me to do at a certain time, and to be sensitive to just His call on my life." She also said simply, "I love my family." Data structure and non-narrative data for Marla's personal creative ability are presented in Table 4.11. Her views about creativity and her creative ability are discussed in the *Conceptions and Measures of Creativity* section below and in Appendix H.

Table 4.11. *Data structure and non-narrative data for Marla's personal creative ability.*

Personal Creative Ability – Marla		
As Viewed by Self	From Interview	Self View (see text)
		Perception of How Viewed by Others (see text)
	Additional data from Design Journal	(see text)
	Assessment of Personal Creativity From Questionnaire	Q1. **B. "Yes, but I don't know if I'm perceived that way by others."**
		Q2. **5** (on a scale of 1-8)
As Viewed by Others	CPSS Average – **3.9910** (on a scale of 1-7)	Novelty - **3.4625**
		Resolution - **4.3438**
		Elab. & Synthesis - **4.1667**
	Blue Sock Award Status	**Nominated**
As Measured by the TTCT:F	Composite Percentile – **99**	Fluency percentile - **60**
		Originality percentile - **85**
		Elaboration percentile - **98**
		Abstractness of Titles percentile - **87**
		Resistance to Premature Closure percentile - **96**
		Creative Strengths - **17** (out of a possible 26)

Quilting is "a huge hobby and interest" for Marla. She also referred to herself as "a real techy nerd." It appears that she was already doing a volunteer project of creating a logo for her church at the beginning of the semester, and then she discovered she could do this for credit. Her ten hours of service were thus fulfilled by the first Studio class session, though she continued to work on the logo project for about two more weeks afterward.

Marla described a personal pet peeve about academic jargon. To her, education is very practical, and therefore the language used to describe education should also be practical. "I understand the need for theory ... but I believe that the ivory towers of academia can get a little carried away."

Renee. Renee was a 39-year-old female enrolled in the masters IDD program. She was taking Design and Development Tools for the second time. Her educational background included a bachelor's degree that she spent six years pursuing (changing majors along the way from Chemistry to English). She holds a previous master's degree also, in library and information science. She is also a practicing painter and photographer who has participated in many local and regional art shows and art competitions. Demographic and Blue Sock Award data for Renee are presented in Table 4.12.

Table 4.12. *Demographic data for Renee. The number at left correspond to Renee's placement within the group of seventeen, as given in Table 4.1.*

PARTICIPANT	COURSE	AGE	GENDER	ETHNICITY	PROGRAM	TTCT:F BEFORE?	BLUE SOCK AWARD
1 Renee	6190-2nd	39	F	White	IDD - Masters	Unsure (not recently)	yes

She described herself emphatically as a lifelong learner. "I love to learn and I love to be in the environment where I am surrounded by people who are learning." She had become

interested in the instructional technology program because she was looking for something that would combine her various creative interests in an online, multimedia context. She also says she loves puzzles. She is "constantly looking for the puzzle that exists." She used the idea of a puzzle as an analogy to illustrate the commonality she sees between her visual art and her database troubleshooting work at the library – each activity consists largely of an ongoing search for some missing piece. She said "People have a hard time understanding, how can you be an artist and a librarian and how can you do web design and do painting - they don't really see how all those pieces fit together." Her work at the library also includes graphic design and "web stuff." Data structure and non-narrative data for Renee's personal creative ability are presented in Table 4.13. Her views about creativity and her creative ability are discussed in the *Conceptions and Measures of Creativity* section below and in Appendix I.

Renee presented herself as a kind of Jacqueline of all trades and master of none. She said, "I've always felt like I was a person who was good at a lot of things, but maybe not an expert at any one thing. ... I have a lot of things I'm interested in." In her design journal, she also called herself "a font addict," on the one hand, and on the other, "Anyone who knows me knows that I am all about color."

She said she's always had a bad problem with time. "I start reading a book, it's 3 AM. I start writing some code, it's, 2 AM. I mean it just, it ceases to exist. ... I've always been that way, I was that way when I was a kid. I'd stay up all night and read, and my mom would come in, and like 'It's almost time for you to go to school!' It's like one more chapter. 'You've been up all night reading!?' 'No.'" Accounts such as this suggest that the flow experience (Csikszentmihalyi, 1990) came very easily to her.

Table 4.13. *Data structure and non-narrative data for Renee's personal creative ability.*

Personal Creative Ability – Renee		
As Viewed by Self	From Interview	Self View (see text)
		Perception of How Viewed by Others (see text)
	Additional data from Design Journal	(see text)
	Assessment of Personal Creativity From Questionnaire	Q1. **A. "Yes, definitely, and others seem to regard me this way."**
		Q2. **6** (on a scale of 1-8)
As Viewed by Others	CPSS Average – **5.0472** (on a scale of 1-7)	Novelty - **5.0125**
		Resolution - **5.4625**
		Elab. & Synthesis - **4.6667**
	Blue Sock Award Status	**Award Received**
As Measured by the TTCT:F	Composite Percentile – **99**	Fluency percentile - **69**
		Originality percentile - **98**
		Elaboration percentile - **98**
		Abstractness of Titles percentile - **82**
		Resistance to Premature Closure percentile - **96**
		Creative Strengths - **13** (out of a possible 26)

The Multimedia Projects

For the fall 2005 Design and Development Tools course, the case study participants created five unique multimedia projects that were published on the World Wide Web, each accompanied by a design journal and other required documentation (including a record of desk crits and evidence of service hours fulfilled). Four were personal projects and one was created for an external client; all were informational rather than overtly instructional (though the boundary between these two paradigms is admittedly rather blurry). Two were built entirely in Flash; two were built in html, and one was built in html with extensive use of cascading style sheets (CSS). The projects consisted of a teaching resource website for teachers of fashion

merchandising (Delinda); a Flash-based personal website presenting an interactive view of the student's recent travels (Jensen); a redesign of an official website for a partnership between the university and a nation in North Africa (Chitra); a Flash-based interactive overview of quilting (Marla); and a website displaying video and email interview responses from 18 visual artists describing their creative experience, along with samples of their work (Renee).

In addition to the above five projects, Renee was a "second-timer" in the course and thus had created a previous project for the same first-level course in the spring of 2005. This project was also informational, built in Flash, html and CSS. It presented a gallery of the student's artwork, corresponding to an art show that was scheduled for later that spring. A detailed description of each project is given in Appendices E-I.

Design

Each of the five case study participants were asked in the interview for their concept of what makes good design. Responses included good navigation combined with good aesthetics, the "wow factor" combined with good usability, appropriate use of technology to serve the design, an easy user experience, intuitively clear functionality, a good color scheme, and lack of clutter on the screen. Further details of each participant's response about design is given in Appendices E-I.

Conceptions and Measures of Creativity

Each of the five case study participants were asked in the interview for their personal view of creativity as a concept. Additionally, all gave an assessment of their own personal creative ability, and how they imagine their creativity to be viewed by others, via their

questionnaire responses and via the interview (sometimes with supporting data from the participant's design journal). Further, the creativity of participants, as seen through the eyes of others, is represented by the CPSS scores on their projects, as rated by experts, and their standing in the Blue Sock Awards, as given by their peers for the Fall 2005 semester (Note, however, that the Blue Sock award is not given specifically for creativity but for excellence in overall design, organization, appropriate use of technology, and aesthetics.). Finally, an attempt at a standardized measurement of the creativity of each case study participant is represented by the TTCT:F scores.

The five individuals' concepts of creativity were expressed in terms such as people who have lots of ideas; putting one's personal stamp on something; combining functionality and good aesthetics; finding new ways to do familiar things; knowing when to set the rules aside and take risks; and the idea that creativity can happen in any medium. Three participants also used the phrase "thinking outside of the box." All five identified the need for adequate technical skill in order to be able to be creative. For example, Chitra stated:

> I think [creativity] is more limited by the technical aspect of things. The first thing I think is whether I'll be able to do it. I may envision it, but the moment I think that, whether I will be able to do it technically, you know, then I think – no, no, I don't want to go and do any creative approach or anything. I just want to keep it simple and, you know, workable, and that's it.

As another example, Jensen observed classmates struggling in their efforts to get up to speed learning the multimedia development tools. He described it as a fear of the tools, "like a

monkey on their back," and suggested that if there is a way to help "ease them through that," their creativity could be helped along.

Regarding creativity and design, all five case study participants affirmed that creativity is necessary for good design. For example, Delinda emphasized the importance of creativity for the aesthetic aspect of design. Jensen said that they go "hand in hand" and explained, "If you want to do good design, you should think creatively and kind of think out of the box in that respect." Chitra did not wait to be asked about these two terms, but began speaking of design as soon as she was asked about creativity. She called these "very related terms" and spoke of both concepts in terms of usability and aesthetics. Marla said "Good design requires creativity. So that's a huge statement, that if something is well-designed, then whoever's behind it has to be able to think outside of the box." Finally, Renee expressed the view that the best designs are creative. She gave a cogent description of design without creativity and creativity without design, which concluded with the following:

> I think when you have creativity without design, you don't have the framework to help you understand it. To understand what the person is trying to present. Whereas I think when you have design without creativity, you have the framework and the structure but you don't have anything to interest you.

While Renee, the artist, gave the most well-developed view of the two concepts, all seemed to be repelled by the thought of design that lacks creativity.

Participants' views of their own creativity ranged from highly creative (Renee and Jensen) to fairly creative (Marla) to average or below average (Delinda and Chitra). Their

composite TTCT:F scores ranged from 145 (99th percentile) to 124 (78th percentile). The overall CPSS ratings of their projects ranged from 5.0472 to 3.3473 on a scale of 1 to 7. Among the five, there were two Blue Sock awards received (Renee and Jensen), and one additional nomination (Marla). The remaining two (Delinda and Chitra) were not nominated by their peers for this award.

The Design Process

The five case study participants kept the required journals of project design work, thus providing a description of their design experience that preceded any knowledge they might have of the research topic for this study. Journals consisted of eight or nine entries roughly corresponding to the final eight weeks of the course. In addition, during interviews, participants were asked to "tell the story" of their course experience from beginning to end. While the amount of detail is not consistent across the cases, nonetheless the combination of data provided glimpses into the process of design and development for each student. The "telling the story" portion of the interviews also brought to light a few points of criticism about the Studio learning experience, which will be discussed in the *Reflections Across the Five Cases* section below.

In each case, the design journal revealed project ideas in formative stages. Two students specifically mentioned designing on paper to some extent before transferring their design ideas to the computer screen, while one student later expressed regret that she had not taken this approach. Early conceptions of what the project would look like or how it would function would be replaced by more mature designs over the course of the journal. For example, in his initial project description Jensen wrote:

> I would like to have some kind of animation happen when you click on a place, perhaps the map zooms to the spot, or you see a little Jensen walking towards your destination. I'm not sure just yet, I have to sit down at my laptop for a few hours and see what I can conjure up.

Later, the zoom and walking ideas were replaced with an animated race car, with Jensen in it, racing to the location on the map clicked by the user, after which the screen changes to a page about the trip to that location.

During the interviews, participants were asked about their project work in relation to the concept of flow (Csikszentmihalyi, 1990). All five students reported episodes of flow lasting from two to five hours or more. Additionally, four out of five regarded flow as being conducive to creativity (the exception being Delinda, who did not address this issue). The flow experience was primarily associated with working alone rather than being in the Studio learning environment.

Most important for purposes of this study, each participant described specific design problems encountered over the course of his or her project. These were occasions when a particular decision had to be made about the design. Though technical knowledge or technical decisions were typically part of the solution, these were more than technical problems. In many cases, solutions were found from among existing knowledge, whether from peers or from resource materials.

In two cases, however (Renee and Jensen), the design problem described was a creative roadblock that required the right design idea to emerge. In Jensen’s case, the impasse involved a lack of an idea for the welcome page. Using the example presented in one of the assigned

readings, the *Footholds for Design* article by Shahaf Gal (1996), he gave himself a break from the problem: "So I did what any good rock climber does, I saved my work, setup ‘base camp’ and stepped away from the project for a bit." After doing other things for awhile, including listening to music, the light bulb came on upon hearing a song that seemed tailor-made to be the theme song for his welcome page. After this idea came, he liked it so well that he changed the name of his project to fit the song.

In Renee’s case, the impasse involved the concept for her project being threatened by a lack of success in getting the content together. The project was initially to feature video interviews of a small number of artists. However, scheduling problems and technical issues with the videos created doubt as to whether this plan could be fulfilled in the time allowed. These constraints also provided the decisive reason to include herself in the project, as she was finding it difficult to have enough artists to include. She was facing a serious design problem: how to have a meaningful project when there is not enough material to fulfill the original concept.

She eventually had what she called an epiphany: if she were to broaden her approach to include email responses from artists, she could include many more individuals' responses to her questions and add a lot of depth to the project. At the same time, it reduced the burden of having a sufficient number of video interviews. She wrote in her design journal:

> What this required was a redirection of resources (me, webspace, content) and my choice was to allow artists to contribute their thoughts via email instead of solely relying on video. What I gained from tweaking my initial plan a little is a much richer and more well rounded website, more artist participation, and hopefully, a more interesting project.

By means of this new approach, Renee finished the semester with a total of 18 participating artists in her site, presenting a diversity of experiences and views. The occurrence of such creative solutions to design problems will be discussed further in the following section.

Finally, four of the five students reported receiving very useful feedback on their projects from desk crits, especially during the showcase dress rehearsal event. Renee was the exception in this case – she expressed the feeling that her work was not understood well by other students, and thus the desk crits were not as helpful as she thought they should be. As an artist, she seems to have been hoping for more feedback about her design concept rather than minor technical issues. More details on each participant's design process is presented in Appendices E-I.

Reflections Across the Five Cases

Importance of Creativity in the Thinking of Students. First, all five of the case study participants regarded creativity as necessary for good design. This finding is consistent with those of the second pilot study (Clinton, 2005), in which three interviewees, who were Design and Development Tools first-timers, expressed the same view. Students hold such a view without any targeted teaching on the subject of creativity in the Studio course.

All five students described important design problems encountered during their project work. Two of these, Renee and Jensen, reported clear instances of design problems that were *creative* roadblocks, causing them to have to wait for the right idea to come. The fact that these experiences were reported in student design journals is significant because this sequence of events matches the incubation and illumination stages of the creative process, as originally proposed by Wallas (1954/1988). Thus the experiences they have described support their view that creativity is a necessary ingredient for the design process. They are also significant because

they were described in the design journals long before the students would have had knowledge of this dissertation's research topic.

The other three students described design problems that required a solution from among known solutions. The photo album design that Chitra needed, and the technique for accomplishing it, were supplied by another student. The color issue Marla grappled with in the design of the interactive quilt block was solved, for the moment, by creating the game in black and white. The color scheme aspect of Delinda's design was solved by finding the right tool (www.colormatch.dk). Though these examples do not necessarily illustrate creativity, they do exemplify design problems that need to be solved in the work of students in the Design and Development Tools course. I have argued elsewhere (Clinton, Hokanson, & Luppicini, 2006) that such design problems are opportunities for creative solutions, a view that was independently echoed in Renee's design journal: "Even with judicious use of time, breaking the project up into smaller, more manageable pieces, most projects will still provide some unexpected challenges (and inherent in those challenges are opportunities for creative solutions)." There appears to be ample room, as well as a need, for creativity in the design process of these students.

Creativity Limited by Technical Ability. Second, all five students cited technical skill level as being a determining factor in allowing students to be creative with their designs. This view was expressed as a personal issue by those with little to no experience with the multimedia tools, while those with more experience spoke of this problem more in terms of what they observed in their classmates. This finding has important implications for instruction, as discussed below (see the Recommendations section).

Flow. Third, all five case study participants reported episodes of flow (Csikszentmihalyi, 1990) during their project design work, and four out of five regarded flow as being conducive to

creativity. Table 4.14 presents the length of flow sessions reported by each student. This finding is similar to findings of the two pilot studies that were conducted prior to this dissertation (Clinton, 2005; Clinton & Rieber, 2005). The relevance of the current practice of including flow theory in an instructional session each semester (in the context of teaching about self-directed learning to the first time Studio participants) seems to be supported by these findings.

Value of Desk Crits and the Showcase Dress Rehearsal. Four of the five (except Renee) described feedback they received from desk crits, either in the dress rehearsal or in separate exchanges with students (though these usually went together), as being helpful toward the last stage of improving their project. Giving meaningful criticism in any context is not an easy task, so this feedback from students seems to reaffirm the essential role played by constructive criticism among students, despite the hesitation they may feel.

Table 4.14. *Length of flow sessions in project work reported by individual cases.*

Length of Flow Sessions Reported in Project Work	
Delinda	Three hours or more
Jensen	Two or three hours or more
Chitra	Five hours
Marla	Four or five hours
Renee	Four or five hours

A Pattern of Responses Relating to Prior Experience and Creativity. One particularly clear pattern has emerged from comparing the qualitative data across the five cases. Among these five students a logical symmetry of responses can be seen in several areas, with those who

view themselves as unambiguously creative (Renee, Jensen) on one side, those who view themselves as average or below average (Chitra and Delinda) on the other, and one individual (Marla) who is roughly in the middle. Figure 4.5 illustrates this pattern.

As shown in the figure, the data suggest that there may be some connection between: 1) prior experience with the multimedia development tools; 2) description of one's own creativity level in the interview; 3) whether one cited artistic influence while growing up; 4) whether one related overt experiences of incubation and illumination during project work; 5) whether one expressed a need for more collaboration; and 6) whether one complained about the Thursday evening sessions devoted to gaming (Instructional gaming and game theory were treated as a special interest theme in the evening teaching sessions.).

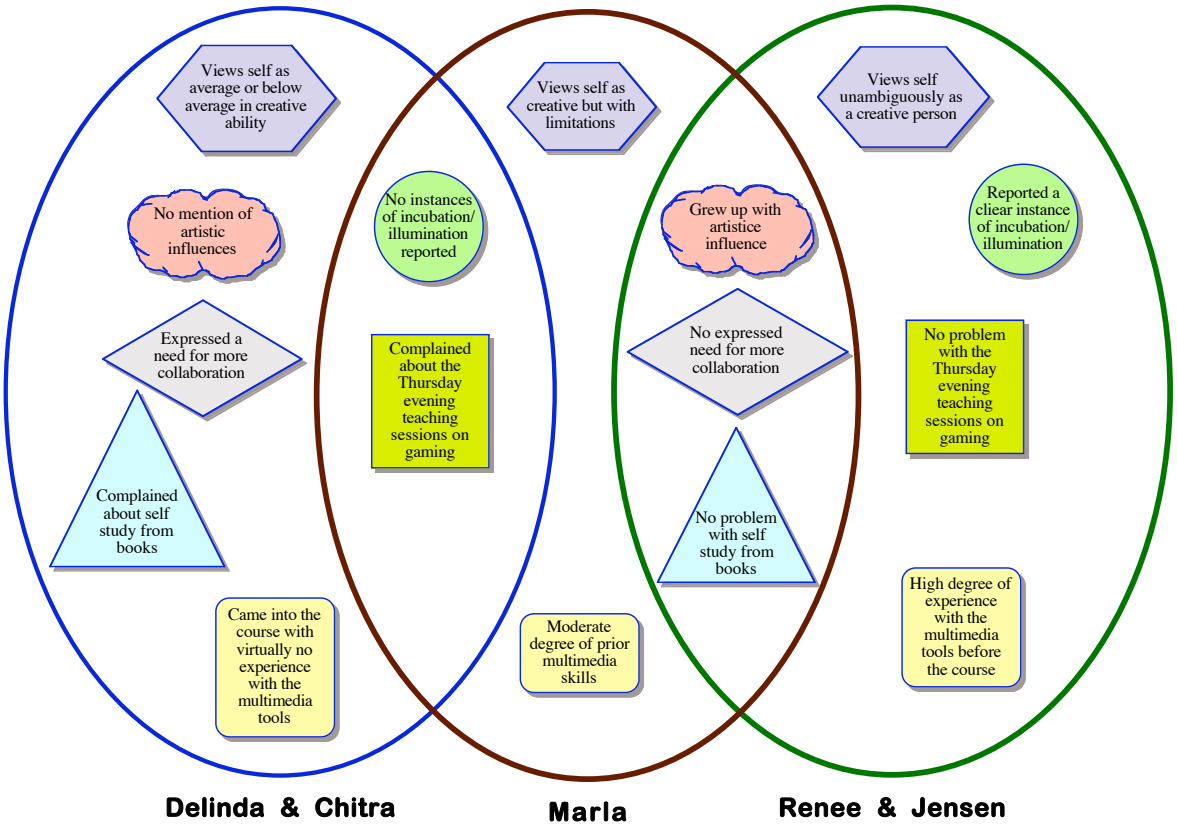


Figure 4.5. Venn diagram of student responses relating to prior experience and creativity.

Coincidentally, this pattern was also matched by the pattern of the Blue Sock Awards and the responses to Q1 on the questionnaire ("Do you consider yourself a creative person?") among these five students. However, I refer to these items as coincidental and have excluded them from the diagram because the consistency in these two items suggested by the data from the five case study participants is not at all replicated in the data for the larger group of seventeen students.

Note that one element which seems unrelated to those listed above is the student's level of prior education. The two participants among the five who already held master's degrees (Chitra and Renee) fell on opposite sides of the diagram. Also, two were full-time students (Chitra and Marla) and the other three worked full-time jobs during the day. This suggests that an appearance of being more creative or having more multimedia skills is not simply a function of having more available time.

It should also be noted that for the five case study participants, neither the TTCT:F nor the CPSS produced scores that show any consistency with the pattern in Figure 4.5. For example, Jensen's project received a relatively low CPSS rating from both experts (3.3042 and 3.3903, averaged together yielding 3.3473), and among these five students his TTCT:F score was second from last (composite standard score 129, 86th percentile). Yet apart from these measures, Figure 4.5 shows him appearing to have a lot in common with Renee, who received high scores on both of these (CPSS averaged rating 5.042; TTCT:F composite standard score 145, 99th percentile). Also, Marla's modesty about her own creative ability may be contrasted with her high TTCT:F score (145, 99th percentile).The implications of these apparent discrepancies are discussed below in the Insights from the Two Methodologies section.

Qualitative Findings: Discussion

It seems clear that every participant in the Studio program brings with them a pre-formed conception of creativity. This conception is an informal theory or mental model (Norman, 1983), a collection of mental images that likely includes what creativity entails, who and what are creative, and whether creativity is a stable trait or an ability that can be learned. Such informal theories can often be misconceived (Land & Hannafin, 1996) but are nonetheless used by learners to make sense of the world. Educators have the opportunity (and the duty) to influence these mental models by means of helpful conceptual models (Norman, 1983).

Differences in mental conceptions of creativity among the five case studies include Delinda's emphasis on the "people" side of creativity, Jensen's emphasis on the unique personality of the creative person, Chitra's emphasis on viewing a task from different dimensions, Marla's emphasis on new approaches to familiar things, and Renee's emphasis on the possibility of creativity being expressed in any medium.

One of the key features of the mental model of creativity brought by each student into the Studio program is the idea that creativity is necessary for good design. This idea has been consistent among the eight students interviewed in this study and in the second pilot study (Clinton, 2005). Some students have gone so far as to express concern, in their design journal entries, that their work may not be creative enough (Delinda in this study and three students from the first pilot study; Clinton & Rieber, 2005). The belief that creativity is necessary for good design thus forms an important backdrop to the thinking of students as they approach the topic of design. Yet this belief is not addressed in any direct fashion in the existing Studio curriculum.

Another important component in students' mental models of creativity is the belief that one must have a certain level of technical ability before one can be creative. This is important

because it suggests a balancing perspective to one of the constructionist premises underlying the Design and Development Tools course - that by allowing students to set their own project goals, appropriate to their skill level, the stressful process of tool-learning can be ameliorated and students can be successful on their own terms. The mental image of creativity as being dependent on technical skills, combined, in turn, with the image of design as being dependent on creativity, may mean that no amount of learner control will prevent the bar from appearing to be set too high for students who lack experience with the tools.

Insights From The Two Methodologies

Mixed-method research affords an opportunity to explore research questions from multiple perspectives. This opportunity is best fulfilled, however, only when both the quantitative and qualitative sides of the study produce useful data. While the quantitative data generated by this study are interesting in several respects, the quantitative portion as a whole fell victim to the combination of a small sample size (N=17) and lack of variance in the data, particularly in the TTCT:F scores and CPSS ratings.

Therefore, inferences cannot be made on the basis of quantitative data from the study sample. However, the lack of usefulness of inferential statistics for this study does not necessarily mean that the individual data points are invalid. While the questionnaire was created by the researcher, merely building on pilot study experience, both the TTCT:F and the CPSS were chosen on the basis of having a reasonably good track record of validation (Besemer & O'Quin, 1999; Cramond, 1993; Torrance, 1998). As mentioned in the quantitative findings discussion section above, the TTCT:F scores and the CPSS ratings may be viewed as snapshots of different aspects of individuals' creativity, while keeping the frame of reference in mind for

each measure. Thus one can reasonably treat the scores as authentic, even if there appears to be some contrast between TTCT:F and CPSS outcomes for the same individual. Meanwhile, a larger study sample could possibly shed more light on the meaning of these scores in relation to each other, and, by placing the scores in a larger context, could contribute to their individual meaningfulness in the qualitative portion of any future mixed-methods study.

Also, as noted there were issues to consider as to how participants interpreted one or both questions on the questionnaire. Yet these are the responses chosen by participants, and one cannot discount the idea that each response had meaning for that participant at the moment it was chosen. From a qualitative perspective, each questionnaire response was a specific behavior recorded for a participant, to be considered along with other behaviors.

Therefore, while a meaningful quantitative analysis of data for the larger group (N=17) has been a limited possibility, it seems best, in the case study portion of the research, to regard all the data points for each case as having potential meaning, and to include rather than discard them. One can then focus on that portion of the data that appears to fall into meaningful patterns. This is what I have endeavored to do.

Study Limitations

A number of limitations of this study have been noted in the discussion sections above. Additionally, the study could have been strengthened had there been opportunity for more follow-up interviews with the case study participants. More detail would have been desirable from individuals on a number of points during data analysis; however, the passage of several months between the interviews and the researcher's primary period of qualitative analysis was thought to be problematic, as follow-up interviews would increasingly be characterized by

diminished recollection and the introduction of new biases on the part of participants. Ideally, an early launch of the transcription and interview analysis process, within the first several weeks after the interviews, would have allowed more meaningful follow-up. This possibility was hindered by the need to attend to other problems associated with the study, in particular the need for a complete re-design of the expert rating protocol.

Finally, there is a possibility that the study topic and any unintended cues from the researcher may have had some effect on participant responses during interviews. Participants may have to some extent said what they thought the interviewer wanted to hear. The authenticity of participant responses cannot be fully guaranteed; however, the content of student design journals had been created before recruitment took place, and thus the inclusion of the design journals in the qualitative analysis provided a balancing element in the interpretation of student perspectives.

Recommendations

Instruction

This study has described students who come into the Studio program with a certain amount of technical background who thrive in the Design and Development Tools course and, on the other hand, students who lack this background who experience a great deal of frustration and who feel that the structure of the course was not created with their needs in mind. This finding is consistent with those of the second pilot study (Clinton, 2005), in which one of the three interviewees had come into the program with virtually no technical experience and expressed similar frustration. The study also illustrates a co-incidence of having a positive view of one's personal creative ability, on the one hand, with technical ability, on the other, among incoming

students. It may be that the greater one's technical ability, the more likely one would have found these skills to be a creative outlet at some level, or vice versa. More crucially, the greater one's technical ability, the more likely one is to thrive in the Studio program.

Placement. The questions raised by these findings are issues not just for instruction but also for placement of students in the appropriate class for their skill level. The existing Permission of Department (POD) status of the Studio courses already triggers a screening mechanism to help steer students, as interested students must inquire with the instructor. The instructor sends a standard email message describing the program, outlining the prerequisite skills, and emphasizing the amount of responsibility each student must take for their learning. However, the interpretation of this information and the judgment of whether to enroll appears to be left entirely to the student.

A personal interview with interested students would increase the chances of steering students effectively. However, given that faculty may not be able to allocate the time for lengthy screening interviews, they might wish to consider designing a screening survey tool that would provide specific information about each student's prior experience. Alternatively, they may wish to consider the implications of including a portfolio component in the applications process for admission into the master's IDD program. For example, Delinda clearly indicated that she was considering taking the recommended prerequisite course, that teaches basic multimedia skills, before beginning the Studio program, but she felt it would "throw her off course." There seems to be little doubt that she would have had a more meaningful experience in the Studio had she taken the multimedia skills course first. Perhaps a small set of work samples made available to the instructor would possibly have influenced his recommendation and granting of department permission.

Another way to view this issue is to note that Delinda and Chittra passed the first level course and since that time have appeared to progress steadily through the program. If those students for whom the Studio concept doesn't work as well are able to achieve this degree of success, perhaps the department can count this as another strength of the program. Moreover, one assumes that there will always be a range of student abilities and student feelings about the program among participants, and not all will be satisfied with their learning experience.

Support. In addition to the issue of screening, instructors might consider what additional support options there may be for those students who do enter the program with weak skill sets. The Studio Handbook contents, as well as the verbal teaching of the course instructors, encourage students to connect with each other and find resource people among those in the Studio community. However, this study and the second pilot study (Clinton, 2005) have suggested that this happens at a minimal level in the course, if at all; this appears true especially at any time prior to the last few weeks of the semester.

The recommendation I would like to make to address this problem is to adapt the service hours requirement for the third level students. Third level students would be required to contribute their ten service hours to tutoring of other students, with the total hours distributed evenly among the remaining students. This could be achieved with a tutoring schedule facilitated by Studio instructors.

Key to the success of this tutoring schedule in helping first level students would be that the schedule would be created during week 9 of the semester, and sign-up hours would be set during weeks 10-13. In this way, students signing up for tutoring would already have had their mid-semester interview with the instructor and would already have their project chosen, allowing a reasonable effort to be made at matching students with tutors based on what tools they are

using and what project they are trying to create. This timeframe should be beneficial for second level students as well, since it the tutoring would take place during the second half of the semester when second-level project work becomes more demanding. Meanwhile, all "official" tutoring would occur early enough to nudge the recipients along in their projects while not creating an end-of-semester burden for the tutors.

For example, if there were 12 third level students and 40 students in the first and second levels, then 120 tutoring hours would be made available to be split up among the 40 students, yielding 3 hours for each. Though enrollment numbers would vary, third level students would always be responsible for no more than ten hours of tutoring each, and the planned length of tutoring sessions would vary from semester to semester according to this limit. Even if there were only five third level students in a given semester, they could deliver 50 hours of tutoring, giving at least an hour of support to up to 50 other students.

Creativity instruction. Finally, given that eight students interviewed thus far have unanimously affirmed that creativity is necessary for good design (in this study and in the second pilot study), I recommend that instruction on the nature of creativity and its place in the scheme of things be included in the Studio curriculum, specifically in the second level course. A lesson on this topic would contribute a conceptual missing piece to the Studio curriculum, confirming and amplifying the personal conception of creativity that each student brings with them into the program. The lesson, itself, would hopefully be a model of creative instruction and would include the following elements:

- Definition(s) of creativity
- Examples of more creative and less creative instructional products

- Conceptual framework for understanding the role of creativity in instructional design and development (such as that proposed in the theoretical framework paper included with this dissertation)
- A value statement defining the Studio's role in welcoming and critiquing innovative ideas for instructional design and development
- An exploration of issues relating to the question of whether one can increase one's creative ability (accenting the positive)

I recommend including this lesson in the Learning Environments Design I (second level) course because students can enroll in this course only after having taken an introductory course in instructional design. A basic understanding of instructional design will provide the necessary structure of prior knowledge upon which students can construct their understanding of issues relating to creativity in instructional design and development.

Further Research

Despite its limitations, the overall concept for this study includes several aspects that point to potential for further study. First, the quantitative portion of this study could be attempted again with a larger sample, an improved questionnaire design, and an increased number of expert raters. A questionnaire consistently made up of Likert-scale responses and expanded to cover multimedia tool experience, learning style, and personal creative ability could provide meaningful data with which to compare the TTCT:F scores and CPSS ratings of projects.

Second, further research is needed to go beyond the learning of design principles and tools and to move into the role of creativity in multimedia design that is explicitly instructional.

Case studies of professional instructional designers in the field, with a specific focus on creativity, could make an important contribution to this area. In the Studio program, case studies could be conducted with students in the second level course, Learning Environments Design I, to illuminate the role of creativity.

Third, the possibility of being creative within the context of instructional design and development teams deserves exploration. Social, cultural, and group contexts are known to have a substantial effect on creative output (Paulus & Nijstad, 2003; Simonton, 1999). Ethnographic studies of design and development teams, with a focus on the creative element, could contribute insight into creativity and instructional design as well as to group creativity generally. In the Studio context, such a study could be conducted with students in the third level course, Learning Environments Design II.

Fourth, more research is needed on the degree to which instructional design students are self-conscious or self-confident about their creative ability, and how these perceptions interact with their learning and performance on their projects. For example, one question that was not addressed in this study would be described as follows: both of the two case study participants who regarded themselves as merely average or below average in creativity also expressed the view that creativity is necessary for good design; therefore, where does that leave these individuals when it comes to their anticipation of future success as designers? The interplay between these two seemingly discrepant views could be explored much further. Self-efficacy theory (Bandura, 1986) could possibly provide a helpful frame of reference for studying the needs of such students. Further literature review and research could be conducted to establish a theory of self-efficacy that is specific to creativity. This theoretical perspective, in turn, could

serve as a basis for exploring ways that students with low creative self-efficacy can best be served in instructional design and development programs.

Conclusion

The belief that creativity is necessary for good design appears to be a common belief among students of instructional design and development, if not a universal belief. Creativity is therefore a worthy topic of study within the context of graduate level training in this field. However, creativity research is known to be very challenging (Albert & Runco, 1999), and this study has been no exception. While not all of the goals of the study have been reached, it has nonetheless contributed information that begins to address the gap in the research literature regarding creativity's role in instructional design.

Specifically, on the quantitative side, this study was inconclusive in regard to relationships between composite and subscale scores of the TTCT:F and the CPSS; as well as relationships between either of these and responses to the creativity questionnaire designed by the researcher. While an important insight has emerged about how a participant's frame of reference can be influenced by the instructions given during data collection (whether creativity is compared to the general population or to a smaller social context), the overriding concern raised by the quantitative portion of the study is the need for a larger sample and more variance in the data.

On the qualitative side, the five case studies have helped to describe some of the conceptions of creativity that students may have, their perceived personal creative ability, what they feel could help or hinder their creativity, and what the learning experience can be like for them when confronted with a curriculum that teaches multimedia design tools and principles of

design. In particular, the study has provided a glimpse into the design process experienced by individual students in the first level course of the Studio program, suggesting a common occurrence of major design problems along the way, some of which are clear illustrations of the stages of creative thinking. Students consistently view creativity as a necessary ingredient for good design, and it appears that the Studio program makes room for creative expression in the context of students' project work, though not all students view themselves as successfully tapping into this creative opportunity.

Finally, the case studies highlight the critical importance of students having basic skills in multimedia development tools as a prerequisite to study of multimedia-based instructional design and development at the graduate level. Students who lack this background coming into such a program appear likely to experience frustration, to feel that their needs are not being met, and to fault the program's design for these problems. Most important, for the purposes of this study, is the view among students that the stress of tool learning prevents these inexperienced individuals from having the opportunity to be creative in their design work. In this university's Studio program, a remedy is needed that refines the screening of new students, or improves the scaffolding of less experienced students once admitted, or both.

CHAPTER 5

EPILOGUE: SUMMARY OF RESEARCH AND FUTURE WORK

In this dissertation I have attempted to describe not only a research project but also a research direction that has taken shape over the last several years. The first two major manuscripts included in the dissertation (Chapters 2 and 3) provide the theoretical and conceptual groundwork for the research reported in the two pilot studies and in Chapter 4, and point the way to ongoing work.

In this closing chapter I review and reflect upon the work accomplished to this point. I include a description of five interrelated items: the literature review and theoretical framework paper (Chapter 2); the IT@UGA Studio program theory paper (Chapter 3); Pilot Study 1; Pilot Study 2; and the dissertation research project (Chapter 4). Each of these items represents a substantial landmark in the progression of my studies. Following these, I present a brief reflection on mixed methods research, and I restate the future research directions that have emerged from this body of work.

The Literature Review and Conceptual Framework Paper

The literature review and conceptual framework paper (Chapter 2) will be published by the journal *Educational Technology Research and Development*. It has come together in layers, beginning with the inspiration and guidance of Dr. Michael Hannafin in his doctoral seminar course. Many helpful suggestions for this paper have come from Dr. Hannafin and my committee

members, as well as the ETR&D reviewers and Dr. Kathy Cennamo of Virginia Polytechnic Institute and State University.

Having been involved in creative work for most of my life and having studied theories of creativity under Dr. Bonnie Cramond, as well as having participated in the IT@UGA Studio program at UGA, I had become very intrigued with the importance of creativity in instructional multimedia design work. I had observed very impressive creative work among my Studio peers. I was also fascinated by flow theory, its inclusion in the Studio curriculum, and its connection to creativity. When I began a literature search on these topics I expected to find interesting material in the instructional technology literature. Instead, I found almost nothing. It therefore became clear to me that here was an opportunity to make a contribution to our field.

I began designing pilot studies addressing two closely related topics: creativity and flow. However, it seemed problematic to continue giving flow theory equal footing to creativity when my research interests were in need of a sharper focus (particularly for dissertation purposes). I therefore decided to formulate my framework paper on creativity and its role in instructional design and development, with flow theory treated as a related topic within the paper.

In the paper I begin building a case for research on creativity in instructional design and development by exploring relevant literature in other fields. First, I provide an overview of creativity and establish support for the crucial point that creative potential is present in all normally functioning human beings. The relevance of this point for my research lies in the idea that instructional designers need not be eminently creative in order to bring creativity to their work. Several areas of interest within the creativity literature are also highlighted. I then give an overview of instructional design and describe the connection that has already been made in our field between good instructional design practice and creativity, noting that, while the connection

is clearly present, it has not been explored to any great extent in our literature nor specifically researched. Literature from design fields such as architecture, engineering, and software design are also reviewed briefly to establish the point that creativity is fully embraced in these fields. The remainder of the paper presents a conceptual framework for thinking about the role of creativity in instructional design and development, followed by suggested areas for research. Major points include the following:

- Instructional designers can adopt an openness to creative ideas, within the constraints of a particular project;
- Instructional designers encounter many design problems, large and small, that need to be solved;
- Design problems can be opportunities for more than problem solving; they can be occasions for creative thinking;
- Creative thinking can occur in fairly recognizable stages: Preparation, Incubation, Illumination, and Elaboration/Verification (Csikszentmihalyi, 1996; Penney et al., 2004; Wallas, 1954/1988);
- Major design problems may be addressed via these recognizable stages, while the process may be more automated for lesser problems;
- Cycles through the stages of creativity may be regarded as "opportunistic excursions" (Tripp, 1994), represented conceptually as loops in the designer's path.

The conceptual framework consists of a visual representation of the above points, superimposed over a simple view of the stages of the ADDIE process: Analysis, Design, Development, Implementation, Evaluation. The framework is proposed as a tool for discourse in the instructional technology field and, especially, a means of engaging new instructional designers in the issues relating to the creative element in their work.

The Studio Program Theory Paper

The Studio paper co-authored with Lloyd Rieber resulted from the writing of my comprehensive exams. Prompted by comments from Michael Orey and Lloyd Rieber to the effect that doctoral students do too little reading of the original writings of great educational thinkers, I made a point of using the comprehensive exams as an opportunity to read selections from John Dewey, Lev Vygotsky, Jean Piaget, and B.F. Skinner, among others. I was struck by the vision Skinner outlined in *The Technology of Teaching* (1968) for essentially saving the world through teaching machines, and the great irony that behaviorism's fall from dominance was occasioned by the rise of computers and cognitive psychology, which ultimately gave rise to the quintessential teaching machine, the personal computer. I also spent time shoring up my understanding of the theoretical pillars of the Studio program – constructivism and constructionism, situated cognition, self-directed learning, and scaffolding.

The paper begins with an introduction to the IT@UGA Studio concept. The adoption of the Studio Handbook (Rieber, Orey, & King, 2006) in 1998 is likened to the start of a new form of government, as embodied in the ratification of the Constitution of the of the United States in 1776. Like the Constitution, the Studio Handbook has seen a number of amendments since its "ratification," but it has continued to provide guiding principles, based on a constructivist

philosophy of teaching and learning, for the Studio learning community year after year. An overview is given of the behaviorist roots of instructional design and development, followed by a treatment of each of the primary theoretical underpinnings of the Studio mentioned above. Finally, the paper provides a fairly detailed description of the curriculum of the Studio program.

Pilot Study I

This study (Clinton & Rieber, 2005) was my first attempt to explore the roles of creativity and flow in the experience of students of instructional design and development. Formal summaries of this study, pilot study 2, and the dissertation study are given in this section and the two following sections.

This study was a phenomenological inquiry into individuals' learning experience in an environment shaped by constructivist views of learning and instruction. Specific research questions addressed were 1) What are the characteristics of "flow" experience among adult learners participating in a constructivist design and development tools training environment? 2) What are students' perceptions of creativity as it relates to design? 3) How does a learner's perception of his or her own creativity influence the learning experience?

Method

Nine students, four males and five females, participated in the summer version of the first level Studio course, entitled Design and Development Tools. Ages ranged from early twenties to upper thirties. Two of these (two males) were "second timers," having taken this course before (normally taken twice in the master's program). The remaining seven students were taking the course for the first time. The four-week course was co-taught by the authors of this study.

The first half of the course was focused on tool and concept learning. The second half of the course was devoted to project completion, peer and instructor feedback, and fulfillment of related course requirements.

The primary deliverable for students at the end of the course was a multimedia project of their own choosing, displayed publicly in an advertised showcase event. An online design journal, containing at least eight separate reflections and including responses to required readings in the design literature, was required to be kept by each student.

A debrief session was conducted following the showcase. A portion of the debrief session was devoted to completion of a questionnaire, which consisted of a section of six exploratory short answer questions ("write the first thing that comes readily to mind"), followed by a more conventional section of five multiple choice and one short-answer question. The questionnaire activity was followed by a brief discussion of creativity and flow as they related to the students' learning experience.

Students' design journals were analyzed for themes relating to the research questions in a four-step inductive process. Questionnaire responses were compiled and examined for patterns. Whiteboard notes from the discussion were also included with study data. Compiled results from anonymous online course evaluations also served as contextual data.

Pilot Study 1 Findings

All nine students in the Design and Development Tools course reported at least some experience of flow, with three reporting that over 60% of their work could be described as accompanied by flow. Likewise, all students reported experiencing periods of flow ranging from

"30 minutes at most" to "over four hours." Seven of the nine students reported at least an hour or more of flow on at least one occasion.

Students' quick responses to the short-answer items on the questionnaire were difficult to summarize, but in general they corresponded with the essential definition of creativity taken from the psychological literature, that is, the generation of ideas that are both novel and useful (Csikszentmihalyi, 1996; Feist, 1999; Root-Bernstein & Root-Bernstein, 1999; Sternberg, 1999; Sternberg & Lubart, 1999). Responses also suggested a frame of reference having to do more with the artistic side, rather than the scientific side, of creativity.

Contrary to the expectations of the first author, students' perceptions of their own creativity varied widely and evenly. Responses suggest that for prospective students considering enrolling in the Design and Development Tools course, perception of one's personal creativity may not be a factor. Nonetheless, students who identified themselves as less than creative uniformly expressed a feeling of intimidation by what they perceived to be higher levels of creativity in other students.

Three students who identified themselves as lacking in creativity all initiated the topic of creativity in their design journals, whereas only one of the remaining students did so. This finding suggests that their discomfort "weighed on their minds" enough to find outward expression in their reflective writing. It would appear that most of the remaining students, prior to the debrief session, regarded creativity as an assumed aspect of their design work.

Pilot Study 2

The second study (Clinton, 2005) was an interview-based inquiry into creativity and flow as aspects of students' learning experience in a later iteration (fall 2004) of the Design and

Development Tools course. Research questions were 1) What are the characteristics of "flow" experience among adult learners participating in a constructivist design and development tools training environment? 2) What are students' perceptions of creativity as it relates to design? 3) How does a learner's perception of his or her own creativity influence the learning experience? 4) In what ways does the learning community support the experience of flow and creativity among students?

Method

The researcher conducted interviews with three female graduate students enrolled in the Design and Development Tools course. A six-step inductive analysis procedure was used on the data, including a combination of pre-existing and emergent themes, with consultation and feedback from peer-researchers employed at various points in the process.

Pilot Study 2 Findings

The three interviewees reported a favorable experience with the Design and Development Tools course and positive feelings about their projects. While two reported an unambiguously favorable learning experience, the third described her learning experience as having been tempered by her lack of prior knowledge of the multimedia tools. All three students offered some criticisms of the course and two gave a few suggestions for improvement. These suggestions might be summarized as: 1) more supports for tool learning; and 2) more scheduled, open computer lab time with less lecture.

The three students gave somewhat different views of what creativity is, but all three expressed confidence about their own creative ability. A relationship between creativity and design was clearly identified by all three participants.

All three participants appeared to readily relate to the concept of flow in their own experience. All reported episodes of flow and all said that flow takes time. Timeframes mentioned ranged from thirty minutes to six hours. Not all project work was said to have been accompanied by flow, and, according to one participant, not all flow experience is equally productive.

One surprise in the data was that all three participants very clearly pointed to an *escape* from the Studio social environment as a prerequisite for any serious experience of flow in their project work. The view expressed was, in effect, that seeds of flow may be sown in the group, but flow has to be allowed to blossom without interruption, something that happens in the privacy of home or in the lab after hours when there are few people present.

The Dissertation Study

As reported in Chapter 4, this study was a mixed-methods investigation designed to explore the role of creativity in the design experience of students in the first level course of the IT@UGA Studio program. I have attempted to find out whether students' self-reporting of creative ability is consistent with their performance on a creativity test and/or the ratings of their multimedia projects by two experts. The study also examined how five students conceptualized the role of creativity in their design experience. Specific research questions addressed are as follows:

1) What relationships can be found between: a) self-rating of personal creative ability by program participants; b) participants' composite scores on the Torrance Tests of Creative Thinking – Figural (TTCT:F); and c) ratings of participant projects by a panel of experts?

2) What does the design process of individual students look like?

3) What are participants' perceptions of creativity as it relates to their project work?

Research Design

Participants. The participants for this study were: 1) for the case studies, five students in enrolled in the first-level Studio course; and 2) for the group measures, the five case study participants plus twelve other students enrolled in the first two course levels of the program. For the case studies, purposive sampling was employed in an attempt to select participants most likely to be rich data sources. Two expert judges were also selected who possessed expertise in both multimedia development and creativity theory.

Data Sources and Procedures. Key data sources were: on the quantitative side, TTCT:F scores, questionnaire responses, and expert ratings of multimedia projects using the Creative Product Semantic Scale (CPSS; Besemer & O'Quin, 1999); and on the qualitative side, student multimedia projects, online design journals, and interviews. The TTCT:F and questionnaires were administered to the seventeen group participants; the five case study participants were also engaged in semi-structured interviews. Experts rated the seventeen projects using an online version of the CPSS. Collected data were analyzed along with existing documents and artifacts.

Analysis – Qualitative. The grounded theory method, along with an "inductive/deductive interaction" similar to that suggested by Strauss & Corbin (1990), was used for the qualitative portion of the study. Documents were analyzed for meaningful patterns, themes, and categories.

Analysis – Quantitative. An online version of the Creative Product Semantic Scale (CPSS; Besemer & O'Quin, 1999), eliciting responses to pairs of descriptive adjectives along a seven-point Likert scale, was developed for use by the two expert raters, who achieved an adequate level of interrater agreement. A correlation matrix was generated, using Pearson's correlation and SPSS software, between all composite scores and subscale scores of the TTCT:F and the CPSS. Correlations were also checked, using Spearman's rho and Kendall's tau, among the questionnaire responses (converted to ordinal rankings) and the CPSS ratings (converted to rankings) of the 17 projects.

Cross-Method Analysis. In addition to the above analyses, the qualitative analysis for each case study was also referenced to the quantitative data sources for context, and vice versa.

Findings

Low variance among the TTCT:F scores and among the CPSS ratings of projects precluded any inferential use of these quantitative data. Within the scores for the study sample, only one mild correlation was noteworthy (.366, $p = .074$) between a TTCT:F subscale (originality) and a CPSS subscale (novelty). All other correlations between instruments were at .34 or below and generally non-significant.

Three-way comparison of the questionnaire responses, TTCT:F scores, and CPSS ratings (all converted into rankings) also indicated no discernable relationships. However, the quantitative data overall indicate that the seventeen individuals: a) were highly creative relative to the general population (as measured by the TTCT:F); b) generally viewed themselves as creative persons (as indicated by questionnaire responses); and c) created multimedia projects that were rated as fairly homogenous in creativity by two experts (using the CPSS).

Qualitative data analysis for the five case studies yielded a number of insights into patterns of design, multimedia tool learning, and perceived creative ability. In particular, the five case studies describe certain students who enter the program having more skills with the multimedia development tools, who tend to view themselves as creative, generally thriving in the program. In contrast, other students who lack these initial skills may view themselves as less than creative and generally experience frustration in the program, needing additional support.

All five case study participants affirmed that creativity is necessary for good design, though each emphasized, from the perspective of his or her own skill level, that a basic level of technical ability is a prerequisite for creativity. All reported experiences of flow (Csikszentmihalyi, 1990) of two hours or more in their project work. The importance of peer feedback was also strongly highlighted among the experiences of the case study participants.

Concerning Mixed Method Research

Since the time I began to study research methods during my master's program, I have felt that mixed-method studies would have many advantages. Especially, employing the two types of methodology together in order to address a particular set of research questions should allow a well-rounded view of the issues associated with those questions. One could also report findings on a particular issue in essentially two languages – the language of quantitative investigation and that of qualitative investigation – to a broad audience in the academic community.

Now that I have completed such a study, the primary observation I have is that, for dissertation purposes, this study was too large in scope and in the amount of work involved. By undertaking to design a mixed methods study, I became subject to the pressure of needing to make each side of the study reasonably complete, following the logic of what I was trying to

accomplish to its natural conclusion within each methodology. I attempted to limit the scope of both methodologies in my prospectus, for example, by omitting the Torrance Tests and by limiting the number of case studies to two. But the committee felt that two case studies would be insufficient, on the one hand, and that the Torrance Tests would not add significantly to the amount of work for the researcher (they were incorrect about this, as became apparent later).

Future Research

The overall concept for the Chapter 4 study included several aspects that point to potential for further study. As stated in the recommendations section of Chapter 4: first, the quantitative portion of this study could be attempted again with a larger sample, an improved questionnaire design, and an increased number of expert raters. A questionnaire consistently made up of Likert-scale responses and expanded to cover multimedia tool experience, learning style, and personal creative ability could provide meaningful data with which to compare the TTCT:F scores and CPSS ratings of projects.

Second, further research is needed to go beyond the learning of design principles and tools and to move into the role of creativity in multimedia design that is explicitly instructional. Case studies of professional instructional designers in the field, with a specific focus on creativity, could make an important contribution to this area. In the Studio program, case studies could be conducted with students in the second level course, Learning Environments Design I, to illuminate the role of creativity.

Third, the possibility of being creative within the context of instructional design and development teams deserves exploration. Social, cultural, and group contexts are known to have a substantial effect on creative output (Paulus & Nijstad, 2003; Simonton, 1999). Ethnographic

studies of design and development teams, with a focus on the creative element, could contribute insight into creativity and instructional design as well as to group creativity generally. In the Studio context, this kind of study could be conducted with students in the third level course, Learning Environments Design II. A recent micro-ethnography by Holschuh (2006) was just such a study, except that the focus was not specific to creativity. Insights from the Holschuh study, including documentation of specific creative work (graphic design innovation), could be used as a basis for designing further research on group creativity.

Fourth, more research is needed on the degree to which instructional design students are self-conscious or self-confident about their creative ability, and how these perceptions interact with their learning and performance on their projects. For example, one question that was not addressed in this study would be described as follows: both of the two case study participants who regarded themselves as merely average or below average in creativity also expressed the view that creativity is necessary for good design; therefore, where does that leave these individuals when it comes to their anticipation of future success as designers? The interplay between these two seemingly discrepant views could be explored much further. Self-efficacy theory (Bandura, 1986) could possibly provide a helpful frame of reference for studying the needs of such students. Further literature review and research could be conducted to establish a theory of self-efficacy that is specific to creativity. Some efforts in this direction have recently begun to emerge (e.g., Tierney, 2002). This theoretical perspective, in turn, could serve as a basis for exploring ways that students with low creative self-efficacy can best be served in instructional design and development programs.

Conclusion

I believe that Mihaly Csikszentmihalyi (1996) and Richard Florida (2002) have been correct in asserting that civilizations and economies are driven forward by creativity. It is my privilege to study this all-important topic, and to bring such study to bear on major themes of instructional technology. Clearly, there is much to be done, and I look forward to continuing this effort.

Finally, in my experience with academic colleagues, in my music activities, and in other areas of personal life, I have had the privilege of associating with persons whom I regard as highly creative. Yet I believe, as E. Paul Torrance did (Cramond, 1993), that creativity is for everyone. I hope to go forward in my academic career, and in other pursuits, sharing my creative gifts and helping others to find theirs.

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APPENDIX A

ASSESSMENT OF CREATIVITY

Assessment of Creative Products.

Building on the work of others (e.g., MacKinnon, 1962), Amabile and colleagues conducted twenty-one studies in which creative products were judged by panels of experts (Amabile, 1983). In these studies, experts were asked to draw upon their own domain-specific expertise in judging the creativity of products. A subjective consensus among experts was thus the method for judging creativity as well as the basis for judging the validity of this approach. Amabile called this the "consensual assessment" technique. The technique is explained as follows:

> The consensual assessment technique can be seen as the conceptual reverse of the technique used in traditional "objective" creativity tests. In those tests, component tasks and subtasks are scored to yield a global assessment of an individual's creativity, as assessment that is ultimately based on the subjective judgment of the psychometricians who devised the subtasks or the raters who score them. Instead, the present technique begins with a global, explicitly subjective assessment of creativity. This global judgment is then clearly demonstrated to be a reliable one. Once this is done, the judgment of creativity can be broken down into component parts; that is, it can be examined to determine which other subjective judgments and, perhaps, which objective features of the product predict this judgment of creativity. As the studies presented here demonstrate, some progress toward this goal has already been made. (Amabile, 1983, p. 59)

In the first study of this series, 22 girls of relatively low socioeconomic status, ages 7-11, were invited to one of two "Art Parties." Participants were all given the same set of assorted colored paper pieces, poster board, and glue, and asked to create an "art design." They were encouraged to use the materials in any way they wished to create a "silly" design during an 18 minute period. The "silly" theme was chosen to create a reasonably high baseline of creativity and to reduce the potential variability of themes children might choose, in order to make the judging task easier.

Three separate groups of judges – 12 psychologists, 21 art teachers, and seven working artists - were employed to evaluate the artwork of the 22 participants. Groups of judges were not only different in terms of their professional orientation but also in the specific judging task given to them. The psychologists were asked simply to rank the designs from most to least creative. The art teachers were asked to assign each piece to one of five categories immediately after viewing it on a slide: (1) very uncreative; (2) rather uncreative; (3) undecided; (4) rather creative; (5) very creative.

The artists (artist-judges) were each asked to spend four hours judging the 22 products on 23 separate dimensions, beginning with the global judgment of creativity (creativity; novel use of materials; novel idea; liking; overall aesthetic appeal; pleasing placement of shapes; pleasing use of color; display; technical goodness; overall organization; neatness; effort evident; balance; variation of shapes; degree of representationalism; degree of symmetry; expression; silliness; detail; spontaneity; movement; complexity). A brief, "non-restrictive" definition of each dimension was provided, and the artists were asked to keep these dimensions as separate from each other as possible. For each of the dimensions, the artists were asked to rate the art pieces relative to one another along a continuous scale as well as rank them in a linear fashion. On four

of the dimensions (creativity, technical goodness, how much they liked the item, and silliness), they were also asked to categorized each piece as either high, medium, or low for that dimension. The order in which products were presented for judging was randomized.

Data from the three groups of judges were evaluated along several axes. First, among the artist-judges, 16 of the 23 dimensions showed interjudge reliabilities (analyzing between-product and within-product variance) of .70 or greater, with 10 of these greater than .80. Among the psychologists, reliability of rankings was .73; among the art teachers, reliability of ratings was .88. The correlation between the psychologists' mean creativity ranking for each product and that of the artist-judges was reported at .44, $p < .05$. The correlation between the art teachers' and artist-judges' rankings was reported at .65, $p < .01$. Factor analysis was also conducted on the ratings of all 23 dimensions by artist-judges. Two of the factors, creativity and technical goodness, were found to be largely independent statistically (orthogonal). Amabile noted that many of the 23 dimensions "clustered neatly around these two factors" (p. 45). However, liking, aesthetic appeal, and silliness did not follow this pattern.

The remainder of the studies described by Amabile (1983) present a gradual refinement of the consensual assessment approach, with fewer and fewer dimensions included in the rating instruments, until many of the later studies simply used the two dimensions of creativity and technical goodness, or creativity alone. The studies also employed variation in: a) ages of participants (from grade school students to college students); b) participant gender; c) type of creative task (visual art and poetry); and d) method of selecting judges (groups having variously defined expertise versus non-expert groups of judges). In all of the studies, interjudge reliability figures for creativity were high, ranging from .72 to .93 for the visual art studies and from .77 to .91 for the poetry studies.

In summarizing the findings of the twenty-one studies, Amabile (1983) stated: "Of primary importance, these studies show that it is possible to obtain high levels of agreement in subjective judgments of creativity, even when the judges are working independently and have not been trained to agree in any way" (p. 56). This finding suggests that expert judges may be employed in the present study with considerable confidence. However, Amabile also notes that in studies that placed high demand on judges (for example, a 4-hour task rating 95 products across 16 dimensions in study #2 of the series), the reliability across dimensions was low (.21 in this example; although the interjudge reliability for creativity alone in this study was still high - .79). It is easy to imagine how lengthy and highly intensive tasks for judges would tend to produce judge fatigue and a breakdown of consistent criteria across multiple dimensions of products.

In addition to the high reliability findings, Amabile found the consensual assessment technique to be adaptable for very different kinds of tasks. Further, she observed that the level of expertise of the judges does not seem to be critical for the kinds of products being judged in these studies. She found "no clear superiority" of artists over non-artists in average interjudge correlations. Regarding selection of judges, she comments, "It appears that the only requirement is a familiarity with the domain of endeavor in which the product was made" (p. 57). In some of these cases (e.g., American Haiku poetry), sufficient familiarity appeared to be present at a non-expert level, while complex domains (such as medical research) are expected to require more credentialed expertise.

Use of the consensual assessment technique has continued to grow in the years since Amabile's pioneering work (Plucker & Renzulli, 1999). Research support for the validity of the technique has also been extended. For example, Baer, Kaufman, and Gentile (2004) noted that

previous uses of consensual assessment involved the judging of a similar class of products produced specifically for experimental purposes. These authors argue that, conceptually, consensual assessment should apply to diverse products created under a variety of conditions. "In fact, works produced in response to similar, and tightly controlled, experimental constraints are rarely if ever the subject of real-world assessments of creativity" (p. 114). In a study of non-parallel writing products, they selected 103 stories, 103 personal narratives, and 102 poems written by 8th grade students from 125 different classrooms. These artifacts already existed before the initiation of the study. The study employed thirteen judges who were familiar with the writing of middle school students. All judges read and judged all 308 writing samples. Judges were encouraged to use a "sort into piles" method, and to change their minds freely about any given paper, in order to finally rank the papers into six groups, from lowest to highest level of creativity. Judges' work was completely independent, with final ratings sent in to the researchers by mail. The authors found that inter-rater reliability was exceptionally high – 0.940 for the stories, 0.957 for the personal narratives, and 0.940 for the poems. A more conservative method for calculating reliability (randomly selecting and comparing pairs of judges) produced no correlations below .61, and average correlations of .66 (poetry), .76 (stories), and .79 (personal narratives). Even the lowest of these figures were regarded as "just within" acceptable ranges of correlation. The authors suggest that the high reliabilities were in part due to the unusually wide range of creativity represented in the middle school writing samples, which came from students of all educational levels. The authors conclude, "creativity ratings based on consensual assessment by experts of artifacts gathered even under very open and uncontrolled conditions are indeed valid assessments" (p. 116).

In view of the work of Amabile and of others such as Baer, Kaufman, and Gentile (2004), the consensus-based assessment approach would arguably be sufficient for judging a group of multimedia products such as those examined in this dissertation. However, some scholars have found this approach to be less than convincing. Plucker and Renzulli (1999) refer to the inter-rater reliability figures reported in these studies as "adjusted reliabilities" that are difficult to justify. In the meantime, when one relies solely on the opinions and consensus of a panel of judges, the question of how the judges have been chosen becomes a larger question (Runco & Sakamoto, 1999). At least it can be said that a description of how judges are selected is of paramount importance for such studies.

Besemer and O'Quin (1984; 1999; Besemer, 1998; O'Quin & Besemer, 1989) have developed the Creative Product Semantic Scale (CPSS), a rating scale for assessing creative products based on a theoretical model originally proposed by Besemer and Treffinger (1981) called the Creative Product Analysis Matrix (CPAM). Research on this model has been "aimed at developing a measuring instrument which might be used by diverse groups, such as engineers, new product designers, artists, and students to consider and describe their creative products" (O'Quin & Besemer, 1989). As such, the CPAM framework represents an effort to make explicit those qualities in a product that, taken together, result in the product being considered creative. This stands in contrast with the consensual assessment technique, in which any a priori definition of the components of creativity is avoided. The CPAM is visualized as a cube having as its three dimensions 1) Novelty, 2) Resolution (functionality), and 3) Elaboration and Synthesis (style). Nine sub-facets are also identified. The Novelty dimension is composed of originality and surprise; Resolution is composed of logical, useful, valuable, and understandable; Elaboration and Synthesis is composed of organic, well-crafted, and elegant (Besemer & O'Quin, 1999).

The rating scale is composed of pairs of opposing adjectives (e.g., organized-disorganized, graceful-awkward, meticulous-sloppy) for each of which raters must respond on a seven-point likert-type scale in reference to a product. Various adjective pairs contribute to each subscale of the CPAM; for example, a participant's score for "elegant" is computed by taking the mean score from the five pairs graceful-awkward, refined-busy, coarse-elegant, repelling-charming, and attractive-unattractive. Originally there were 110 item pairs in the CPSS; this has since been refined to 71 and then to 55 item pairs (Besemer & O'Quin, 1989), then to 43 item pairs (Besemer, 1998; Besemer & O'Quin, 1999).

In one study, Besemer and O'Quin (1999) chose four instances of a common object - chairs - for evaluation. Three of these were uncommonly artistic chairs judged a priori by researchers to be highly novel, and a fourth chair was of traditional American design. The four chairs were judged by 185 lay judges (college students) using the CPSS. The authors expected to find that Novelty as well as Elaboration and Synthesis would be scored high on the three artistic chairs, and that Resolution would be scored high for the traditional chair. Response data were analyzed using a repeated-measures multivariate analysis of variance (MANOVA) and a confirmatory factor analysis (CFA). Novelty scores were highest for the three artistic chairs and lowest for the traditional chair. Both Resolution and Elaboration and synthesis were scored highest for the traditional chair. The authors indicate that all statistical analyses supported the integrity of the CPAM model for these products (Besemer & O'Quin, 1999). However, the CFAs were designed to fit the data and later modified somewhat to improve this fit.

The work of Besemer and O'Quin – the CPAM model and the CPSS rating scale – shows promise for rating of creative products. However, it is worth noting that the studies used to validate and extend this approach have all featured a small number of highly idiosyncratic

products chosen a priori by the researchers for their perceived similarities or differences in creative quality (e.g., two t-shirts with graphic designs, four keychains, three "novelty" Christmas gift products). Nothing like the large numbers of artifacts examined via consensual assessment, nor the large number of studies on record, appears to have been attempted with the CPSS. Considering the time required for each judge to rate each product (approximately 15 minutes), the limitation of number of artifacts is understandable. However, the study described in this dissertation was to involve as many as 30 or more individual multimedia products, each with a degree of complexity far beyond the artifacts used in the CPAM/CPSS studies, including multiple screens to be viewed as well as navigational and content relationships between screens. At least a 5-10 minute period of browsing and reading content would therefore be needed for each project before the rating scale could be administered. The resultant 20-25 minute task time for each project was not considered the first choice for this study. While it would be desirable to have CPSS-type rating data for each project, an adaptation of the consensual assessment technique (Amabile, 1983) was expected to yield a much shorter rating time for each project and was therefore chosen for this research. (Note: see Chapter 4 of this dissertation for an account of how the adapted consensual assessment approach failed to produce adequate interrater reliability, resulting in adoption of the CPSS for expert rating of projects.)

Assessment of Personal Creative Ability

All normally functioning people have creative potential, and psychometric testing of personal creative ability has been one of the centerpieces of creativity research. Generally these tests have focused on the divergent-thinking aspect of creativity (generating multiple responses to a stimulus, rather than seeking one correct answer), but have also attempted to include other

elements, such as problem identification and evaluative thinking (Plucker & Renzulli, 1999). Tests developed include instruments by Guilford (1950), Wallach and Kogan (1965), Getzels and Jackson (1962), and Torrance (1974). Limitations of these measurement approaches have been noted in the literature (Plucker & Renzulli, 1999; Sternberg & Lubart, 1999). In particular, these approaches have been criticized as weak in construct, discriminant, and predictive validity, and criterion validity in general (Plucker & Renzulli, 1999). However, gathering meaningful data to address these concerns is extremely challenging, and concessions to difficulties such as these are "part and parcel" with all creativity research (Sternberg & Lubart, 1999). Researchers who study only "Big C" eminent creators, for example, avoid the criterion problem with their approach to sampling, but also give up most of the generalizability that would be desirable in any research. Plucker and Renzulli recommend that "people who are interested in studying creativity should understand the merits and limitations of the available methods and the type of information that each method is best suited to provide about creativity" (1999, p. 49).

Difficulties with measurement of creativity have not seemed to curtail the widespread acceptance of psychometric tests in the education community. Among the instruments developed for testing of creativity, the Torrance Tests of Creative Thinking (TTCT; Torrance, 1974) "is by far the most commonly used test of divergent thinking and continues to enjoy widespread international use" (Plucker & Renzulli, 1999, p. 39). The TTCT is also the only creativity test that has been standardized with re-norming done on a national scale every ten years (Torrance, 1998). Moreover, the TTCT is noted for respectable measures of reliability and has continued to add support for predictive validity via longitudinal studies (Cramond, 1993). The test was developed in both verbal (TTCT) and figural (TTCT:F) forms.

While psychometric testing of creative ability clearly has its limitations, it nonetheless represents the best efforts of psychologists over the years in developing a way to measure “little c” creativity. Among these efforts, the TTCT:F (Torrance, 1974) stands out as the best available option for attempting to measure the personal creativity of adults.

APPENDIX B

PROSPECTUS METHODOLOGY CHAPTER

(Note: This appendix is provided for reference only. It is identical to the original prospectus methodology chapter with the exception of a few minor edits, for example, removing extraneous references to other parts of the prospectus.)

Research Questions

This study is designed to find out whether students' self-reporting of creative ability is consistent with their creativity test scores and/or the ratings and rankings of their Studio projects by a panel of experts. The study will also examine how two students conceptualize the role of creativity in their "Studio learning experience."

Specific research questions to be addressed by the study are as follows:

1) What relationships can be found between: a) self-rating of personal creative ability by Studio participants; b) participants' composite scores on the Torrance Tests of Creative Thinking – Figural (TTCT:F); and c) ratings of participant projects by a panel of experts?
2) When a Studio participant produces a project judged to be exceptionally creative, what does that design process look like?
3) When a Studio participant produces a project judged to be among the least creative in the group, what does that design process look like?
4) What are participants' perceptions of creativity as it relates to their project work in the Studio?

Methodology Background

The use of mixed methods in research may be regarded as the pragmatic use of available tools for solving problems within a socio-historical context (Schutz, Chambliss, & DeCuir, 2004). Specific research situations can benefit from both methods. For example, according to Hays (2004), case study designs may include both qualitative and quantitative data. This extends the idea of triangulation beyond multiple data sources to multiple methodologies. According to Patton (2002), the purpose of triangulation, whether between data sources or between methodologies, is not to demonstrate consistency of results but to test for such consistency and to afford an opportunity to look for deeper understanding if such consistency does not emerge. Schutz, Chambliss, and DeCuir (2004) caution that a mixed-methods research project requires a conceptually faithful application of both methodologies, and not simply a quantitative study with some anecdotal data thrown in: "Simply adding a few open-ended questions to a larger quantitative study will probably not meet the guidelines for conducting useful inquiry" (p. 275). While this study will be weighted toward the qualitative side, it will employ both methodologies extensively, drawing upon the strengths of each.

The case study portion of this project will make use of inductive document analysis (Shank, 2002; Patton, 2002), inductive analysis of interview data, and reference to individual TTCT:F scores and questionnaire responses. Documents analyzed will consist of student online design journals as well as course artifacts such as the Studio handbook and instructional materials. Test scores and questionnaire responses are not typically included in qualitative analysis but will add additional depth to the available data on each of the two cases.

A study undertaken in this manner will allow a naturalistic exploration of the role of creativity in the experience of Studio participants and the ways in which creativity is recognized

in student work. Qualitative inquiry is generally associated with a social constructionist or constructivist epistemology and may reference either realism or idealism as the researcher's underlying ontology (Crotty, 1998; see also Preissle & Grant, 2004). It is therefore incorrect to say that the ontology inherent in qualitative research assumes that reality is subjective. However, apart from whether the qualitative researcher believes in the existence of an external reality, he or she normally believes that knowledge of reality is uniquely constructed within each individual. The qualitative approach therefore, remains the most appropriate lens through which to view the unique perspectives and experiences of each individual; and therefore the case study portion of the study will primarily qualitative.

Context

The context for this study is the Studio program in the Instructional Design and Development master's curriculum, part of the Instructional Technology program in the UGA College of Education. The structure of the Studio is presented in Figure B1 and the structure of the master's program as a whole is given in Figure B2. A brief description of various aspects of the Studio follows.

The physical environment for the program consists of: a) a university classroom equipped with a cross-platform (PC and Macintosh) computer instruction station and projector; b) a split computer lab with ten PC and ten Macintosh computers; c) various other computer labs, video editing suites, classrooms, and conference room spaces used on an ad hoc or reservation basis in the college of education building; and d) an educational technology resource center. Individual students' personal work space, usually on home computers and/or laptop machines, may also be regarded as part of the program environment, because for much of the course students are not

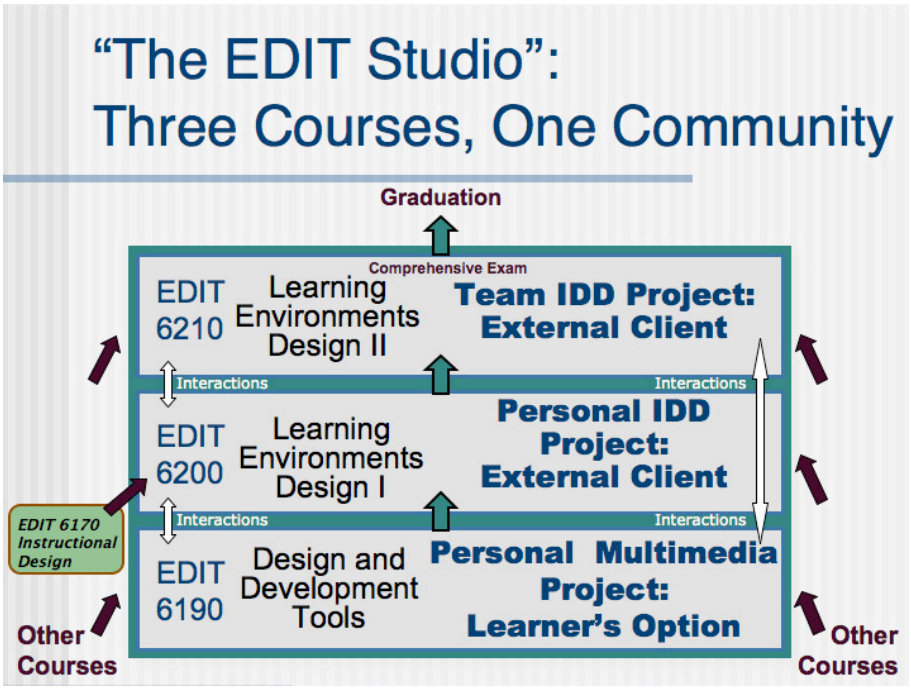

Figure B1. Structure of the IT@UGA Studio program.

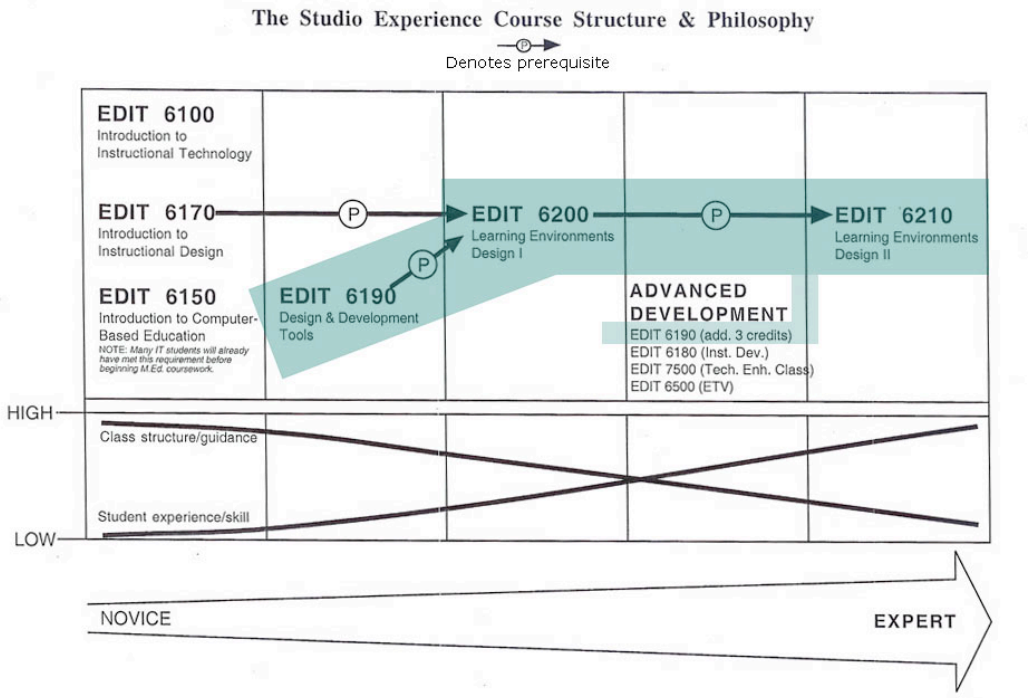

Figure B2. Structure of the IT@UGA Studio program in relation to the master's IDD program. Shaded area denotes actual Studio courses. (Adapted from Rieber, Orey, & King, 2006).

required to be physically present in the college of education building except insofar as it furthers their pursuit of course requirements.

The physical environment for the program consists of: a) a university classroom equipped with a cross-platform (PC and Macintosh) computer instruction station and projector; b) a split computer lab with ten PC and ten Macintosh computers; c) various other computer labs, video editing suites, classrooms, and conference room spaces used on an ad hoc or reservation basis in the college of education building; and d) an educational technology resource center. Individual students' personal work space, usually on home computers and/or laptop machines, may also be regarded as part of the program environment, because for much of the course students are not required to be physically present in the college of education building except insofar as it furthers their pursuit of course requirements.

Students are provided with a detailed course handbook. An initial "job fair" is held as a means of involving students from the upper courses in team projects and client-based individual projects. For newer students, introductory workshops are given in three Macromedia tools: Dreamweaver, Fireworks, and Flash; several additional computer-based tools are also introduced. Seminar sessions are conducted regarding the philosophy, procedures, and requirements of the course as outlined in the handbook, including topics such as principles of design (Winograd, 1996); constructivism and constructionism (Papert, 1991); self-directed learning (Candy, 1991), including requirements of the course that are designed to promote interaction between learners and between the different levels of the three courses); and flow theory (Csikszentmihalyi, 1990). For students in the EDIT 6190 course, the first half of the semester is focused on tool and concept learning and becoming part of the learning community.

The second half of the course is devoted to project completion, peer and instructor feedback, and fulfillment of related course requirements.

The primary deliverable for all students at the end of the course is an individual or team multimedia project, displayed publicly in an advertised showcase event. For the EDIT 6190 course this project and the skills needed to complete it are entirely dictated by the student's personal interests. For EDIT 6200 an individual project is completed according to the needs of an external client and EDIT 6210 is devoted to team projects (consisting of a unit of instruction; i.e. 3-5 related lessons) for external clients. Online documentation of projects is required of all students. For EDIT 6190, each student must maintain a design journal containing at least eight separate reflections and including responses to required theoretical readings. A debrief session for students of all levels is conducted on the last day of the course, following the public showcase.

Pilot Studies

Two pilot studies examined the role of creativity and flow in the experience of learners in the Studio program. Both of these studies informed the design of the present study, so a brief overview of each is provided in this section. In the first study (Clinton & Rieber, 2005), students' design journals, questionnaires, debrief session notes, and course evaluations were examined. In the second study (Clinton, 2005), three interviews with students were analyzed. While participants' assessment of their personal creativity varied considerably among the twelve students in the two studies, students stressed the importance of creativity in their design work, and all students reported episodes of flow.

Study 1

Purpose. The purpose of the first pilot study (Clinton & Rieber, 2005) to was to discover the roles of creativity and flow in a graduate-level, constructivist-based instructional design and development learning community. Creativity is understood to be the generation of ideas that are both novel and useful (Csikszentmihalyi, 1996; Feist, 1999; Root-Bernstein & Root-Bernstein, 1999; Sternberg, 1999; Sternberg & Lubart, 1999). Flow is defined as "...the state in which people are so involved in an activity that nothing else seems to matter; the experience is so enjoyable that people will do it even at great cost, for the sheer sake of doing it" (Csikszentmihalyi, 1990, p. 4). Specific research questions addressed by the study were: 1) What are the characteristics of "flow" experience among adult learners participating in a constructivist design and development tools training environment?; 2) What are students' perceptions of creativity as it relates to design?; and 3) How does a learner's perception of his or her own creativity influence the learning experience?

Theoretical Considerations. This study was a phenomenological inquiry into individual learning experience in an environment shaped by constructivist views of learning and instruction. Crotty (1998) states that phenomenology "invites" us to construct fresh meaning from phenomena, to do what constructivism describes. Constructivism may be summarized as the belief that each individual constructs his or her own knowledge uniquely as a result of interaction with the environment (Jonassen, 1991).

The literature on creativity presents diverse points of view regarding how levels of creativity should be categorized. Many authors (e.g., Csikszentmihalyi, 1996; Policastro & Gardner, 1999; Simonton, 1999) only study Creativity "with a capital C," exemplified by eminently creative persons in the likes of a Mozart or an Einstein. Entire branches of creativity

research, however, have been devoted to the study of creativity as a relatively stable aptitude existing in some kind of continuum among all individuals (e.g., Albert & Runco, 1999; Guilford, 1987; Torrance, 1974).

It was a premise of this study that students pursuing a master's degree in instructional design and development have come into the program with varying degrees of creative ability. We were interested in student perceptions of their own creativity, and the role that this perception plays in the learning process.

Flow (Csikszentmihalyi, 1990; Csikszentmihalyi, 1996) is described as an "optimal experience," a state of intense mental focus on a task or activity in which the challenges of the activity are appropriately matched to the skills of the participant. It includes a sense of productive momentum as well as timelessness and is highly motivating. Flow and creativity appear to be closely related, and, like creativity, flow is described as being available to all people.

Method. Nine students, four males and five females, participated in the summer version of a three semester-hour course entitled Design and Development Tools. Ages ranged from early twenties to upper thirties. Two of these (two males) were "second timers," having taken this course before (normally taken twice in the master's program). The remaining seven students were taking the course for the first time. The four-week course was co-taught by the authors of this study.

Students were provided with a detailed course handbook. Workshops were given in three Macromedia tools: Dreamweaver, Fireworks, and Flash. Skills were also introduced for several additional computer-based tools. Seminar sessions were conducted regarding the philosophy, procedures, and requirements of the course as outlined in the handbook, including topics such as

principles of design, constructivism and constructionism (Papert, 1991), self-directed learning, and flow theory (Csikszentmihalyi, 1990). Thus the first half of the course was focused on tool and concept learning. The second half of the course was devoted to project completion, peer and instructor feedback, and fulfillment of related course requirements.

The primary deliverable for students at the end of the course was a multimedia project of their own choosing (and not necessarily instructional in nature), displayed publicly in an advertised showcase event. An online design journal, containing at least eight separate reflections and including responses to required theoretical readings, was required to be kept by each student.

A debrief session was conducted following the showcase. A portion of the debrief session was devoted to completion of a questionnaire, which consisted of a section of six exploratory short answer questions ("write the first thing that comes readily to mind"), followed by a more conventional section of five multiple choice and one short-answer question. The questionnaire activity was followed by a brief discussion of creativity and flow as they related to the students' learning experience.

Students' design journals were analyzed for themes relating to the research questions in a four-step inductive process. Questionnaire responses were compiled and examined for patterns. Whiteboard notes from the discussion were also included with study data. Compiled results from anonymous online course evaluations also served as contextual data.

Study 1 Results. All nine students in the Design and Development Tools course reported at least some experience of flow, with three reporting that over 60% of their work could be described as accompanied by flow. Likewise, all students reported experiencing periods of "a

sense of momentum or 'flow'," ranging from "30 minutes at most" to "over four hours." Seven of the nine students reported at least an hour or more of flow on at least one occasion.

According to participants, the flow experience, when it occurred, lasted from up to 30 minutes to over four hours. It could be described as "fun" or extremely engaging ("I tried to go back to my reading but that was impossible") or something that "made me extremely happy." It could also be considered equivalent to "in the zone," or "productivity," although it may not be directly related to quantity of output. Flow may be thought of as "creative flow" in the early stages of a project, while later in the project it may be thought of as "procedural flow." Following the debrief session, additional observations were made in some students' final design journal entry, such as, "When you are working 'in the flow,' time doesn't exist." One student provided a lengthy elaboration of the distinction between "creative flow" and "procedural flow."

Students' perceptions of creativity were illuminated by the first section of the questionnaire. Students' "quick responses" to the short-answer items are difficult to summarize, but in general they correspond with the essential definition of creativity taken from the psychological literature, that is, the generation of ideas that are both novel and useful (Csikszentmihalyi, 1996; Feist, 1999; Root-Bernstein & Root-Bernstein, 1999; Sternberg, 1999; Sternberg & Lubart, 1999). Responses also suggest a frame of reference having to do more with the artistic side, rather than the scientific side, of creativity.

Contrary to my expectations, students' perceptions of their own creativity varied widely and evenly. Responses suggest that for prospective students considering enrolling in the Design and Development Tools course, perception of one's personal creativity is not a factor. The prospect of being engaged in intensive design tasks did not discourage less-creative persons (as self-described) from enrolling in the course. Moreover, course evaluations and project

satisfaction levels suggest that these students remain relatively undaunted and encouraged by their success in the course. Nonetheless, students who identified themselves as less than creative uniformly expressed a feeling of intimidation by what they perceived to be higher levels of creativity in other students.

Three students who identified themselves as lacking in creativity all initiated the topic of creativity in their design journals, whereas only one of the remaining students did so. This fact suggests that their discomfort "weighed on their minds" enough to find outward expression in their reflective writing. It would appear that most of the remaining students, prior to the debrief session, regarded creativity as an assumed aspect of their design work. Also, among these nine students of varied ages and backgrounds, there appeared to be a willingness to self-report one's personal level of creativity in a candid manner. The results of this study suggest that self-reporting may offer a viable window into perceived relative levels of personal creativity.

Study 2

The second pilot study (Clinton, 2005) was an interview-based inquiry into creativity and flow as aspects of students' learning experience in a later iteration of the Design and Development Tools graduate course described in Study 1. The research questions of the second pilot study were: 1) What are the characteristics of "flow" experience among adult learners participating in a constructivist design and development tools training environment?; 2) What are students' perceptions of creativity as it relates to design?; 3) How does a learner's perception of his or her own creativity influence the learning experience?; and 4) In what ways does the learning community support the experience of flow and creativity among students?

Method. The researcher conducted interviews with three female graduate students enrolled in the Design and Development Tools (EDIT 6190) course. A six-step inductive analysis procedure was used on the data, including a combination of pre-existing and emergent themes, with peer-researcher consultation and feedback employed at various points in the process.

Findings. The three interviewees reported a favorable experience with the Design and Development Tools course and positive feelings about their projects. While two reported an unambiguously favorable learning experience, the third described her learning experience as having been tempered by her lack of prior knowledge of the multimedia tools. All three students offered some criticisms of the course and two gave a few suggestions for improvement. These suggestions might be summarized as: 1) more supports for tool learning; and 2) more scheduled, open computer lab time with less lecture.

The three students gave somewhat different views of what creativity is, but all three expressed confidence about their own creative ability. A relationship between creativity and design was clearly identified by all three participants. In general they expressed the feeling that encouraging or discouraging creativity would be a difficult thing to do, but they each offered some factors that might make a difference in the creative output of students.

All three participants appeared to readily relate to the concept of flow in their own experience. All reported episodes of flow and all said that flow takes time. Timeframes mentioned ranged from thirty minutes to six hours. Not all project work was said to have been accompanied by flow, and, according to one participant, not all flow experience is equally productive.

One surprise in the data was that all three participants very clearly pointed to an *escape* from the Studio social environment as a prerequisite for any serious experience of flow in their project work. The view expressed was, in effect, that seeds of flow may be sown in the group, but flow has to be allowed to blossom without interruption, something that happens in the privacy of home or in the lab after hours when there are few people present.

Conclusions Drawn From the Pilot Studies

Students enrolled in the Design and Development Tools course indicated that they strongly associate both flow and creativity with their design work. This finding is consistent across the two studies reported in this paper, conducted using two different methodologies. Additionally, data from the two studies support the idea that creativity and flow are closely related (Csikszentmihalyi, 1996).

Findings of these studies, along with previous research and professional literature, suggest that the connection between creativity and multimedia design is substantial. Further studies are needed to verify that creativity plays an important role in *instructional* multimedia design, or instructional design in general. If established, this role should be formally conceptualized and taught as part of the instructional design and development curriculum. A similar relationship between flow theory and instructional design, or possibly between the three - creativity, flow theory, and instructional design - could also be considered. Research aimed at identifying and removing barriers to creativity (Collins & Amabile, 1999; Davis, 2004; Nickerson, 1999) in instructional design and development training programs is also needed, in the interest of more effectively serving the range of students who enroll in such programs.

Research Design

Case study research offers depth of understanding for individual study participants, and qualitative inquiry is ideally suited to this task (Patton, 2002). However, basic statistical processing of quantitative data from the larger group to which each participant belongs can add a perspective to the qualitative analysis that cannot easily be gained by other means. In this way, the use of relatively simple quantitative methods can be viewed as a means of more richly contextualizing the qualitative analysis when extensive observations or other techniques are beyond the scope of the study.

This study will focus on relationships between the creativity scores and perceptions of those who create (Studio students) and the perceptions of those who evaluate their creativity (experts). The study will also focus on the learning experience of two Studio participants and tell their stories, not only through what they share in interviews, reflective writings, and their individual data point out of the group measures (TTCT:F composite scores, questionnaire responses, ratings and rankings of the two projects within the group), but also with reference to various data sets from the larger group in which have been situated: the group's responses to creativity questionnaires, ratings and rankings by experts of the creative qualities of the projects of the larger group, and incidence of creativity issues in the online reflective writings of the group. With the exception of course observations, all data collection (that is, all creativity-related interaction with students) will be scheduled at or near the end of the semester, so as to avoid influencing the content of student design journals. Figure B3 provides a diagram of the data sources and analyses used in this study. The rest of the research design is described in the following sections.

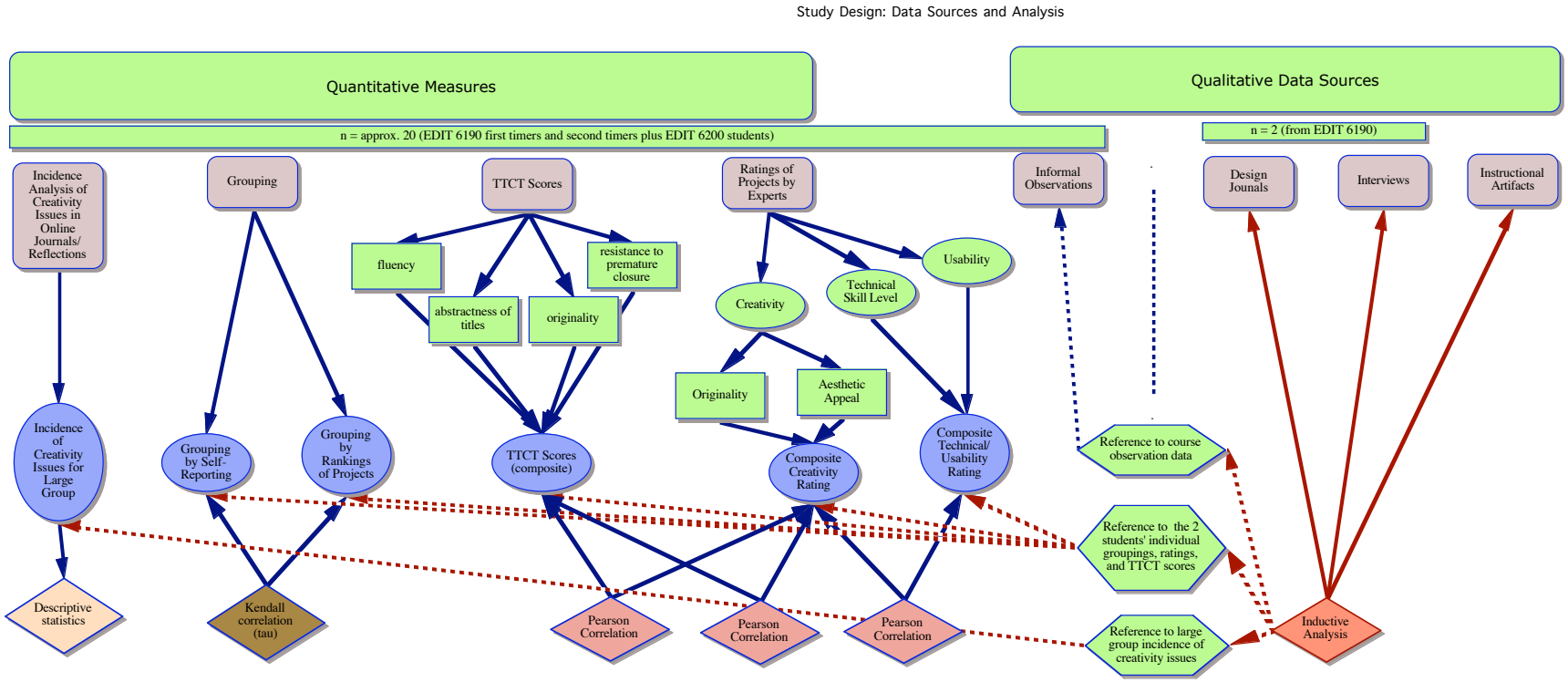

Figure B3. Mixed-method case study design.

Participants

The intended participants for this study will be as follows: 1) two EDIT 6190 first-timer students for the case studies, one whose project has been rated exceptionally creative and one whose project has not been rated especially creative; 2) all students enrolled in EDIT 6200 and EDIT 6190 for the larger group measures (Studio participants who are completing individual rather than team projects); and 3) two to four experts selected for their expertise in both multimedia development and creativity theory.

The larger group will thus be composed of the three subgroups: EDIT 6190 first timers, EDIT 6190 second timers, and EDIT 6200 students. While these groups may seem different enough to argue against studying them as a whole, their overriding commonality is that they are each engaged in a solo multimedia project that is an opportunity for creative work and whose scope is dictated by the constraints of one semester's work. They also share the Studio learning environment and the resources available through this environment.

Purposive sampling will be employed in order to select case study participants most likely to be rich data sources in relation to the research questions. Preliminary ratings and rankings of student projects by the panel of experts will be used to help identify two case study participants, one of whom has produced exceptionally creative work according to the panel, and one of whom has not. As an incentive, each participant will be given a small gift certificate to a local bookstore. Again, the panel of judges will be drawn from the ranks of current or recent instructional technology graduate students at the University of Georgia who have taken EPSY 8220 (Theories of Creativity) or similar courses.

Instrumentation and Data Sources

Data sources for this study have been chosen using a pragmatic approach based on study goals. Sources will consist of both qualitative and quantitative items, including student material, expert material, and course material. A full description of these sources follows.

Qualitative Data Sources

1. Student design journals of case study participants. These are online documents containing at least eight separate weekly reflections, including commentary both on their project work and on required theoretical readings in the principles of design.
2. Transcripts of student interviews. A follow-up semi-structured interview of approximately one hour in length will be conducted with each participant after the conclusion of the semester.
3. Instructional artifacts from the Studio. These will include the Studio Handbook and possibly other instructional materials.
4. Data from informal observations of the Studio learning environment. Two or three two-hour informal observations will be conducted in the Studio learning environment (classrooms or computer labs) during the course of the fall semester 2005. These observations will not be intensive but are intended to generate overall impressions recorded in field notes typed up after each observation. Reflective field notes by the researcher will be used to help guide the theory-generating aspect of analysis of the other data sources for the study.

Quantitative Data Sources

1. The Torrance Tests of Creative Thinking – Figural (Torrance, 1974). Attempts to measure creativity in individuals, especially in primary school children, have centered primarily around divergent thinking patterns, and test instruments of this type have enjoyed widespread use around the world (Plucker & Renzulli, 1999). Limitations of these measurement approaches have been noted in the literature (Sternberg & Lubart, 1999). However, the most widely used battery of tests in this genre, the Torrance Tests of Creative Thinking (Torrance, 1974), is noted for fairly respectable measures of reliability (Plucker & Renzulli, 1999) and predictive validity (Cramond, 1993; 1994). The TTCT:F uses non-verbal stimuli and is therefore the desirable form of the test for the mixed group of American and international students that typically make up the Studio community. The TTCT:F can be administered in approximately 30 minutes and yields scores of Fluency, Originality Elaboration, Abstractness of titles, and Resistance to premature closure, as well as a composite creative thinking score.
2. Brief questionnaires eliciting responses about personal creative ability.
3. A form for experts to fill out giving a rating for a) the creative quality and b) the technical quality (skill level and usability) of each of the student projects from the larger group (n = approximately 20). The form will also ask experts to rank all of the projects in order, with ties permitted, for both of the above aspects. Experts will be provided on the form with standard definitions of creativity and of technical integrity so as to increase the probability of interjudge agreement (Runco & Sakamoto, 1999).
4. Online design journals of all EDIT 6190 students and online reflections (“15/5 reports”) of EDIT 6200 students. These will be searched for number of occurrences of terms or

topics related to creativity. “Terms or topics related to creativity” shall be operationally defined for search and descriptive statistic purposes.

These data sources will be used both to address specific issues included in the research questions and to provide an overall context for consideration of those questions. Table B.1 provides a quick reference matrix of research questions and data sources used to answer them.

Table B1. *Data sources and research questions.*

Data sources	Research Question 1 – Correlations of Creativity Measures	Research Question 2 – Creative Process	Research Question 3 – Less-Creative Process	Research Question 4 – Student Perceptions of Creativity	Contextual Information
Qualitative 1 – Design Journals		√	√	√	
Qualitative 2 - Interviews		√	√	√	
Qualitative 3 – Instructional Artifacts					√
Qualitative 4 – Informal Observation Data					√
Quantitative 1 – TTCT:F Scores	√				
Quantitative 2 –Questionnaire Responses	√				
Quantitative 3 – Expert Responses	√				
Quantitative 4 – Design Journals – Topic Search				√	

Procedures

Students will be recruited with the cooperation of class instructors during the last several weeks of the fall semester 2005. Participants will be offered a gift certificate to a local bookstore as an incentive. Emphasis will be placed on participation being entirely voluntary, with no connection between participation and course grade. The data collection period will last approximately two months during December 2005 and January 2006.

Large group procedures (N = approx. 20).

Students will be observed during several sessions of normal course activities. At the end of the semester, a questionnaire and the Torrance Tests of Creative Thinking – Figural will be administered to students who have agreed to participate. The principal investigator or other trained and certified personnel will administer and score the TTCT:F.

This group of participating students will also have their course projects rated and ranked by a panel of 2-4 experts after the end of the semester. If possible, ratings and rankings of projects will be completed by the close of the grading period for the fall semester 2005. Experts will be recruited from current or recent graduate students in instructional technology; if possible, these will also have taken graduate courses in creativity.

Case Study Procedures (N = 2).

Selected students (2) will be interviewed toward the end of the data collection period. A tentative interview protocol is attached. Interviews will last for approximately one hour each and will be conducted in office or classroom space in the College of Education building as available.

Consent form will include permission to contact each interviewee for a shorter, voluntary follow-up interview if needed.

Audio recording for interviews will be accomplished using a Muse digital electronic recorder. Audio files will be stored securely via password access on the researcher's computer and erased within one year after the study.

These two students will also have agreed to have their online design journals analyzed for the study. Selected instructional artifacts from the Studio program will also be included in this qualitative analysis, along with the large group observation data and reference to large group quantitative data.

Schedule

Prior to Beginning of Semester	During Semester	End of Semester	End of Study
Initiate IRB	Observations;	Creativity questionnaire session; TTCT:F test session; Select and secure permissions from 2 student participants	Interviews
	Select and secure permissions from experts	Initiate ratings by experts	Receive expert data; Begin data analysis

Logistics

Logistics for this study will consist of the following: 1) managing the administration and scoring of the TTCT:F for the larger group; 2) coordinating schedules with the two student case study participants, who must commit to extra time at the end of the semester to participate in the follow-up interview; and 3) managing the asynchronous participation of the experts.

Analysis

Qualitative analysis. Inductive analysis is frequently used in qualitative studies as a means of discovering salient patterns, recurrent themes, and meaningful categories in the data, and to generate theories during the process of analysis (LeCompte & Preissle, 1993). The aim of inductive analysis is develop theory that is grounded in the data (Glaser & Strauss, 1967). Put another way, the researcher inductively builds an explanatory theory that accounts for the contents of the data rather than using the data to test a priori hypotheses.

For the qualitative portion of this study, the inductive method used will be the grounded theory method (Glaser & Strauss, 1967). However, some of my data categories will be strongly suggested by the research questions (and, in the case of interviews, interview questions). Therefore, a "pure" version of grounded theory, as described, for example, by Charmaz (2002) and Ezzy (2002), will not be possible. Instead, some of the analysis will take the form of the kind of "inductive/deductive interaction" suggested by Strauss & Corbin (1990).

Documents, observation data, and interview transcripts will be analyzed for meaningful patterns, themes, and categories with the assistance of NVivo software. Format for reporting the findings will be determined according to the results of the analysis.

Quantitative Analysis. A Kendall's tau correlation (Huck, 2004) will be computed for data from the two grouping mechanisms (by student questionnaire responses and by expert rankings) to see how closely students' own perceptions of their creativity match the view of experts evaluating their work. A Pearson product moment correlation (Weinberg & Goldberg, 1990, p. 111) will be computed for three pairs of data sets: 1) composite TTCT:F score/expert ratings of projects for creativity, 2) composite TTCT:F score/expert ratings of projects for

technical skill & usability, and 3) expert ratings of projects for creativity/expert ratings of projects for technical skill and usability.

Regression analysis may also be considered for the three scaled variables. Even though correlation may not be used to ascribe cause to a variable, a correlation may be used to predict the value of one variable based on the value of another (Weinberg & Goldberg, 199, p.133). If appropriate, a regression analysis will be used to describe the predictive value of the composite TTCT:F score in predicting the creativity scores that students' project work would likely receive (were the work of future students to be judged by an independent panel).

Online design journals of all EDIT 6190 students and online reflections ("15/5 reports") of EDIT 6200 students will be searched for number of occurrences of terms or topics related to creativity. Descriptive statistics shall be employed to describe these occurrences.

Cross-Method Analysis. In addition to the separate qualitative and quantitative analyses, the analysis for each case will also reference the qualitative data sources to the quantitative data sources in two ways: 1) expert ratings and rankings of students' projects, individual questionnaire responses, and individual TTCT:F scores will be used as additional personal data for each of the two case study participants, and 2) all quantitative analyses from the larger group will be used as contextual information to shed further light on each case.

Assumptions

This study is based on the assumption that the Studio program in the fall semester 2005 will be conducted in a manner consistent with recent history, with enrollment levels consistent with recent history. Another assumption is that among enrolled students will be found willing participants for the group and case study portions of the study. It is assumed that self-reporting

about creativity is reasonably reliable, as suggested by pilot studies (Clinton, 2005; Clinton & Rieber, 2005), and that responses by a panel of experts about student projects will be reasonably free from bias. Finally, it is assumed that student scores on the Torrance Tests of Creative Thinking – Figural (TTCT:F) will serve as an appropriate and useful data set for comparison with other study data.

It may be that these assumptions are not true and that adjustments may need to be made in the study design accordingly. An additional assumption is that the benefits gained from combining qualitative and quantitative methodologies will outweigh any logistical or conceptual difficulties encountered as a result of this combined approach.

Limitations

The Studio program is a rich environment for learning. Much other data could be gathered, both qualitatively and quantitatively, out of this environment in support of the research questions if time would allow. Particularly, in-depth observation data could be collected during course sessions and more student participants could possibly be found to add to the number of cases. However, the amount of data included in the analysis must be kept from becoming unmanageable for the researcher.

APPENDIX C

SEMI-STRUCTURED INTERVIEW PROTOCOL

Graduate Student Creativity During Training in Instructional Design and Development
Tentative Semi-Structured Interview Protocol
December, 2005

[Opening statement:
Thank you for your willingness to be interviewed. I am a doctoral student studying aspects of the Studio learning environment as part of my dissertation. As a participant in EDIT 6190, you are in a unique position to share what the course is like and to describe your personal learning experience. And that is what the interview is about: your experiences in the course and your thoughts about those experiences.
Any questions before we begin?]

Questions & Probes

1. **Please tell me a little about yourself and what may have led you to enroll in the Studio program**.

2. **I'd like you to tell me "the story" of your Studio experience, from beginning to end.**

   Probe: How does your project relate to your personal goals?
   Probe: How would you describe your feelings about your course project?
   Probe: How would you describe your prior experience with multimedia tools such as these?

3. As a student, **please share with me any overall impressions you have about the course**.

   Probe: Tell me any opinions or thoughts you have about how this course is put together.
   Probe: Have you ever experienced a course like this one before?

4. In this class you've been required to think a lot about the concept of design. **When you think of what makes *good* design,** in general, **what kinds of things come to mind?**

   Probe: What would you see in a well-designed user interface?
   Probe: When you see someone else's work and you perceive that the design is good, what kinds of characteristics of that work might give you this impression?

5. **What does the word "creativity" mean to you?**

   Probe: What kinds of things do you think of as being creative?
   Probe: What kinds of people do you think of as being creative?

6. I'd like to ask you something a bit personal. **What is your view of your own personal creative ability?**

   Probe: How do you think others think of you in terms of your creativity?
   Probe: How do you relate the creativity in your work to the creativity of other people?

7. In your view, **how do creativity and design relate to each other?**

   Probe: What are aspects of design that might require creativity, if any?
   Probe: What aspects of design might not require creativity, if any?

8. **What kinds of factors can encourage creativity** to happen in a course like this one?

   Probe: Anything the instructors are doing, or might do, to encourage creativity?
   ☆☆☆**Probe:** Let me ask if you can verify something for me. Do you recall any occasion during the course when the subject of creativity has been discussed? In a teaching session or in open work time. From faculty or among students.

9. **What kinds of factors can hinder creativity?**

   Probe: Anything the instructors are doing, or might do, to discourage creativity?

10. Tell me about **when you discovered the initial idea or concept for your project.**

    Probe: What was the experience like? When did it happen?

11. **When other important ideas or breakthroughs have happened** on your project, what was that experience like?

12. Related topic: If I use **the phrase "the flow experience,"** what impressions come to your mind?

    Probe: Your course instructor introduced the group to the concept of "flow" as a possible aspect of a designer's experience. Tell me about how the concept relates to your personal experience as a designer.
    Probe: Maybe a definition of Flow would help. Flow is described as "...the state in which people are so involved in an activity that nothing else seems to matter; the experience is so enjoyable that people will do it even at great cost, for the sheer sake of doing it." Does this sound like anything you have experienced?

13. Tell me about **any particular occasions when you have spent some time in "flow"** during your design project work.

    Probe: How long would "flow" last in a given work session?

14. **What kinds of factors can encourage flow** to happen in a course like this one?

    Probe: Anything the instructors are doing, or might do, to encourage flow?

15. **What kinds of factors can hinder flow** from happening?

    Probe: Anything the instructors are doing, or might do, to discourage flow?

16. **What should I have asked you** that I didn't think to ask?

17. Finally I need to make sure I've remembered to ask about your prior experience with multimedia design tools such as those taught in the Design and Development Tools course. Also your prior experience with self-directed learning such as the approach used in the Design and Development Tools course.

APPENDIX D

TABLE OF SUPER-CATEGORIES, CATEGORIES, CONCEPTS, AND SUB-CONCEPTS.

Super-Category	Category Level I	Category Level II	Category Level III
Self	Demographics	Demographic Information	
	Identity Statements		
	Family		
	Personal Goals		
	Prior Experience	With Similar Courses	
		With Multimedia Tools	
	Comparison to Peers		
	Personal Learning Needs		
	Reasons Enrolled in Studio		
	Feelings		
The Design and Development Tools Course	Course description	"The Story" of the course	
		Learning Community	
		Course Requirements	Description of requirements
			How students handle the requirements
		Course Philosophy	
		Key Theoretical Concepts	
	Course Critiques	Positive	
		Negative	
Creativity	Creativity Concept	Creative Person	
		Creative Process	Creativity and motivation
			Creativity and flow
			Incubation
			Problem solving
		Creative Things	
		Sources of Ideas	
		Creativity in Constraints	
		Limited by Technical Ability	
		Limited by Time	
	Personal Creative Ability	Judged by Self	Self-view
			Percept. of others' view
		Judged by Others	CPSS ratings
			Blue Sock outcome
		Measured by TTCT:F	Scores
	Relation to Design		
	Factors that Encourage Creativity		
	Factors that Discourage Creativity		
Design	Good Design		
	Bad Design		
	Personal Design Process	By the Rules/By Inspiration	
		Design on Paper	
		Sources of Ideas	
		Project	A motivating project
			Project idea
			Project scope
			Setbacks
			Breakthroughs
			Support
			Time management
			Level of satisfaction
		Flow	Flow concept
			Personal flow experiences
			Flow duration
			Flow alone
			To encourage flow
			To discourage flow
	Relation to Creativity		
	Interactivity		
	Accessibility Issues		

APPENDIX E

CASE 1: DELINDA

Project Description, Design, Creativity, and Design Process

Project Description

The project Delinda created for the first level course is a resource website for teachers who teach high school fashion merchandising classes. It presents an outline of the full two-semester curriculum divided into eight units in the first semester and seven units in the second semester, with the second semester units left unfinished. The welcome page of the website displays a compelling Flash animation with fashion-related images silently flying across the screen vertically and horizontally from all directions. After the brief animation (about seven seconds), the user must click a “Skip Intro” button to continue to the main page of the site. The main page presents a vertical menu along the left side; the contents that are controlled by this menu are presented in a separate frame on the right. The user may click through the menu to access introductory information, information about the authors of the content (Delinda and two colleagues), course materials, and a link to a Blogspot.com account set up to be used with this website.

Delinda’s satisfaction level with the project was mixed: "I spent a lot of time on the design, but it’s just – it’s not very good. (laugh) It’s very amateur-y. Basic." Her closing comment in her design journal, however, was upbeat (though she acknowledged that "on the contract that I filled out initially I had no idea what I was doing"). She emphasized that the experience had been fun, but that time management had been a challenge; and she expressed her desire to learn more.

Delinda's View of Design

Good design was, to Delinda, something that is easy to navigate and aesthetically pleasing. She commented on how the initial appearance of a design can be appealing, but may or may not turn out to be designed well. "Some look really, really good, but you won't really know how good they are until you get into it."

Delinda and Creativity

Creativity concept. The creativity concept was, for Delinda, a matter of creative people. She talked about creativity in terms of people who have lots of ideas, lots of things going on in their brains. Her description thus emphasized fluency over other aspects of creativity. It also seemed to reflect her basically gregarious nature as the lens through which she saw creativity.

Upon being asked about creativity, Delinda went further into her thoughts about design. She divided design into three aspects: navigation, content, and aesthetics, and emphasized that creativity is necessary for the aesthetic aspect of good design. She also seemed to be painfully aware of her lack of experience with the multimedia tools at every step, and she cited this as a limit to creativity:

> If I had drawn out exactly what I wanted, it would have - you know what I'm saying - and then learn how to do all those things, I think would have been more creative. Rather than getting into the software, and saying, ok, this is what I know, this is my limited knowledge. Ok, I can only be this creative. Because I only know the software this well.

Delinda's creative ability. Delinda was enigmatic in that she discussed creativity in her design journal more than anyone other than Renee, and yet in her interview she tended to present a very matter-of-fact, cut-and-dried picture of her project work. She claimed that there were no "aha moments" in her project work other than discovering that her initial project idea was not going to work out (due to copyright issues). She seemed to almost mock the whole idea of having any kind of creative breakthrough:

> But there wasn't, as far as being something like 'Oh, I just got this really great idea,' (spoken in a sing-song manner). I knew from coming into this course. I knew what I was going to need to do, so I had ideas coming in. I was prepared.

Though she credited herself early in the interview with being fairly creative, by the time the interview was finished she seemed to have excluded herself from many common conceptions of being creative and had rated her creativity as "below average" in the eyes of the people around her. The progression of comments about her personal creativity in the interview was as follows:

> I consider myself to be pretty creative. I think there are some aspects that I struggle with. Sometimes I get a creative block.

> I definitely think that I'm better than average, but definitely along the average.

> My creativity is more internal, I think.

> If somebody's doing something creative, I can appreciate it, and I think it's great, but I don't find myself wishing that I could be more like that.
>
> I don't really express my creativity. So if someone's doing something that's creative, normally I don't identify with it. Because usually I'm not that creative, I guess.
>
> [How others view her creativity] Probably average. Maybe a bit below average!

The above statements are corroborated by design journal entries that tended to mention creativity as something she was not able to fulfill. For example, "I don't feel like this is the most creative idea but I feel like sometimes you have to start small," and "My creative energy was difficult to portray on screen." Overall, in her design journal and in the interview, Delinda seemed to be making an effort to show concern about being creative, to treat creativity as important, while at the same time this effort seemed to be contrary to her personal view.

The discrepant situation described above seems to be mirrored in Delinda's questionnaire responses (see Table 4.5), in which she chose C, "Sometimes I have moments that I regard as creative but my strengths are in other areas besides creativity" for Q1, but rated her creativity a six on a scale of 1-8, relative to the general population, for Q2. It may be that her frame of reference shifted between the two questions (see the *Qualitative Findings: Discussion* section); however, in Delinda's case, the Q2 response seems inconsistent with her overall self-view. Her TTCT:F scores were relatively high, in keeping with the high skewness of the TTCT:F scores as a whole among her peers. Her elaboration score, in particular, placed her in the 99th percentile

according to the test norms. The two experts gave her project a CPSS score of 3.7854 on a scale of 1-7. Finally, her peers in the Studio did not nominate her project for a Blue Sock Award.

Delinda's Design Process

After the semester midpoint, Delinda's project design work may be divided into weeks 8-12, in which she was working on her first-choice project idea, and then weeks 9-16, in which she actually worked on the final project for the course showcase. Both of these project ideas would, if completed, address a need in her teaching. She journaled initially about her first project idea without any indication of doubt as to continuing with that idea. She described her basic concept and the features she hoped to include. She described what she hoped the end product would do for her students. She would use Dreamweaver, Flash, and Hot Potatoes. The switch to the second choice project was precipitated by a copyright issue. At the suggestion of Dr. R., she called the publisher of the material she was planning to use online. In her design journal she wrote: "After calling them last night it looks like I will need to use the next idea that I have for this project." By "next idea" she appeared to be referring specifically to the list of project ideas she brought with her into the course.

In her design journal, she described her concept for the introductory page of the fashion design project, and mentioned creativity along the way: "The basic idea of the intro will be a white background and similar to other fashion websites - high fashion words and photos will be timed in from the left, right, top and bottom of the page. I don't feel like this is the most creative idea but I feel like sometimes you have to start small." In the interview she described her project as "basically, teaching teachers to teach fashion merchandising." The main content, a two-semester curriculum for teaching fashion merchandising, was a collaboration with two other

business teacher friends in other high schools in the area. It had already been created, and she called it a "*great* resource." She expressed pride in what they had accomplished, and said they had aspirations for this curriculum being adopted at the state level.

According to the interview, the flow experience was a reality for Delinda. Although she could not identify the meaning of “the flow experience” at first in the interview (which was also true of Chitra and Marla), she readily identified with the concept of flow after I refreshed her memory about the early teaching session on self-directed learning and flow theory. She reported flow sessions of three hours or more while working on her project, particularly while working on the introductory Flash movie in her site. She associated this experience with being alone, either at home or at her school after hours; she did not associate flow with being in the Studio environment.

APPENDIX F

CASE 2: JENSEN

Project Description, Design, Creativity, and Design Process

Project Description

Jensen's project was built entirely in Flash and consists of a single .swf file. The welcome page shows an animated photo of Jensen, extracted from its original setting and attached to the driver's seat of a drag racer, zipping back and forth across the screen to the sound of a drag racing engine revving up. The animation ends with Jensen and the car stopping in the foreground while an audio clip plays from the song "Comin' to Your City" by the band Big & Rich. A Start button is displayed for the user, which leads to an introductory screen titled "The Story" that explains the concept of the site, showing a map of the eastern U.S. and his hometown marked with a pushpin. A Begin button then leads to a screen with an interactive version of the map, displaying the hometown marker plus nine additional push-pins marking places where Jensen has visited. Jensen and the race car are at the lower left, and when one clicks on one of the pushpins, the car revs up and then zips across the screen to the location of the pushpin, after which a new screen appears providing information and one or more photos about that location.

Jensen seemed quite pleased with his project, though he acknowledged that it had some imperfections: "Now it wasn't 100% exactly like I planned it out to be, there were some changes made along the way. In fact, if I had a better knowledge of Flash I probably would added in some more features and tweaked a few minor things. But like most people who do design, I can say I am 90-95% pleased with the outcome of the project."

Jensen's View of Design

"I like simple things," Jensen said when describing his project design in the interview. "I want it to be, you know, kind of like easy to use and things like that." Later, when I asked him specifically about good design, he reiterated that good design is about simplicity and ease of use. "It should be kind of intuitive, I think that's a huge part of it." Good design is, to me, not having a, you know, so much reading an instruction booklet." He acknowledged that people should be willing to read an owners manual if they want to use a design, such as a copy machine, to do something complex. "But for the little things, you shouldn't really have to think about it too much."

Jensen and Creativity

Creativity concept. For Jensen, creativity was a reflection of oneself, something unique that only one person can do, something no-one else has done, or done in this way. According to his view, in being creative one puts one's own kind of spin on something, puts one's personality into it. One also thinks out of the box. He cited Leonardo da Vinci as a supreme example of a creative person, but also described the drawings of a little child that he thought were creative in their own way.

Jensen also said that good design and creativity go hand in hand. "You don't have to be that creative to have bad design of something. … If you want to do good design, you should think creatively and kind of think out of the box in that respect." He gave evidence in his design journal, however, that one's creative design can be constrained by the limitations of one's technical skills: "If I had better knowledge of Flash I probably would have added in some more features and tweaked a few minor things." He also acknowledged skill level as a prominent issue

for other students he had talked with whose prior skill were far less than his. He described it as a fear of the tools, "like a monkey on their back," and suggested that if there is a way to help "ease them through that," their creativity could be helped along.

Jensen's creative ability. When I asked Jensen how he views his personal creative ability, he began by saying that he didn't have a set answer for this question, but that he thinks he is a somewhat creative person. When he makes things, he tries to make them different and unique. He said it's hard to describe, something that just happens. He tries to do what others might like, but what suits his own personality at the same time. He also said that others view him as a creative person. For example, his uncle had recently suggested a particular endeavor to him because "you're a creative person." He always took art classes in high school, so he felt that people's tendency to associate him with creativity seemed like a natural thing.

Finally, Jensen said he really had no self-confidence problem when it came to being creative. I asked him whether being creative is part of his identity, and he said, "A Little bit."

Of the two questionnaire responses from Jensen (see Table 4.7), his answers seemed to match his interview data well. For Q1 ("Do you consider yourself a creative person?") he chose response A, "Yes, definitely, and others seem to regard me this way as well." He also scored his personal creativity a six on a scale of 1-8, relative to the general population, for Q2. His TTCT:F composite score placed him in the 86th percentile, with a notably high Elaboration subscale score (in the 99th percentile) and a notably low fluency score (in the 8th percentile). He was nominated for and received a Blue Sock Award by his peers, and the two experts rated his project with an overall CPSS score of 3.3473 on a scale of 1-7.

Jensen's Design Process

Jensen wrote that when he began considering his project, early in the semester, he had no idea what to do. Several weeks of the course passed before the idea came to do a project about some of his experiences. He later wrote in his design journal, "I knew it could be about anything. But I guess I'm used to being told in class what the project has to be about, so that threw me off for a bit. After thinking about it, I decided to do it on me!" He was still new at the university at that time, and felt that people didn't know him well yet. So he began to conceptualize a project that would recount some specific trips he had made:

> What I initially intend to do with this project is a make a flash program that literally maps out some of my 'adventures'. I intend to have a map of the USA (mostly the east coast), and mark places I have been and the things that I did when I was at those cities.

He made the decision early on to do this project entirely in Flash, in order to fulfill a personal goal "to really beef up my Flash skills, particularly design and ActionScripting." The early concept for the project looked like this in his design journal:

> So (and this remains to be seen) what I would like to see as the end result of this project is to have a map of the USA with some sort of markers (pinpoints, tacks, etc) marking out different points in the US that I have visited. When you click on one of those markers it will pop open a new window which will have a brief description of what I did there, and have some pictures, or something of that nature. On top of that (and here is where the ActionScripting comes in) I would like to have some kind of animation happen when you

> click on a place, perhaps the map zooms to the spot, or you see a little Jensen walking towards your destination. I'm not sure just yet, I have to sit down at my laptop for a few hours and see what I can conjure up.

He eventually arrived at a race car theme for the interface, with a graphic symbol of himself in a race car that would zoom across the screen to various places on the map. But then he ran into a design problem that he called a "a bump in the road" and "a mental roadblock." He couldn't think of how to finish the welcome page. Using the example presented in one of the assigned readings, the *Footholds for Design* article by Shahaf Gal (1996), he gave himself a break from the problem: "So I did what any good rock climber does, I saved my work, setup 'base camp' and stepped away from the project for a bit." This setting-aside of the project gave Jensen an incubation period until the right idea appeared, enabling him to go forward again:

> After taking a step back the idea finally hit me while I was listening to some music on my computer. A song from one of my favorite artists, Big & Rich came on, "Comin' to your city", and there it was, I had it! The song fit perfectly because they sing about traveling all around the US visiting all these different cities, and the good times they had. It was a match made in heaven! So I was able to import a small section of the song into my project, and I liked it so much I even renamed my project after it; Jensen's Comin' to Your City!

Jensen knew right away what I meant when I asked him what the flow experience means:

> When you say "the flow," that means to me, like, I'm in a zone, and I'm just working, and I'll go at it for hours on end. Like if I get into something, you get like working on a project or, if I'm doing a website or writing a paper, you know … it could almost be anything. You get in that zone, and I guess you could go for hours and not even think about it, and the next thing you know, it's like midnight, and you're like, "Where did the time go?" But you don't want to get out of it because things build on each other. I'm thinking when you're in that creative flow, or, I like to say, the zone, you're just there, and you could almost have like horse blinders on, where you're just really focused, and things are happening for you, and you don't want to stop it.

Jensen reported that this state of affairs was frequent and could last two or three hours at a time, "if not more," during his project work. In his comments he highlighted the pleasurable aspect of flow, that one doesn't want it to end, that "things are happening for you" and this is something precious enough that one doesn't want to let go of it. He associated flow with working alone at home rather than being among Studio participants.

APPENDIX G

CASE 3: CHITRA

Project Description, Design, Creativity, and Design Process

Project Description

Chitra's project consisted of a cycle of web development for this university's educational partnership with the nation of Tunisia. The blue-themed home page consists of a horizontal menu along the top, followed below by an attractive horizontal banner with graphics showing a combination of a map of the world and symbols relating to the university and Tunisia. The middle area of the home page displays two blocks of text, one titled "About the Tunisia Educational Partnership" and one titled "Accomplishments," each with a "More>>" link leading to the full version of the section. The top menu provides access to the various sections, with the menu and the look and feel remaining consistent. In addition to the two topics mentioned above, the sections included information on the project vision, funding sources, and the partner organizations, as well as a set of six photo galleries and a set of reports on various projects associated with the partnership. The quantity of content was quite large relative to most first level course projects (Chitra stated that there were around 40 individual html pages in the site).

Chitra seemed reasonably satisfied with her project. However, this feeling seemed to be tempered by the fact that the project's scope did not permit completing it that semester. Though she had been aware of the scope issue from the beginning, the open-ended aspect led to inclusion of a large amount of content before she reached a stopping point. She said, "I feel good, but I think I could have done better. It took a lot of time, actually."

Chitra's View of Design

Chitra tended to view good design in terms of whatever "dos and don'ts" she could learn from authoritative sources. She had recently prepared a profile of Donald Norman for another class, and she indicated that his views influenced her thinking about her project. In responding to my question about good design, she cited Norman directly, saying there should be the "wow factor," the aesthetic appeal, and then it should work in a manner in which it's supposed to work. "It should be intuitive for the person, to give a cue about how it is to be used."

Chitra and Creativity

Creativity concept. When I asked her about the meaning of creativity, Chitra spoke right away of creativity as it relates to design. To her, creativity is how uniquely you approach a certain aspect of a design, or the ability to view the same aspect from different dimensions. From the user's perspective, she said, both creativity and good design involve the emotional aspect, the "wow factor," and the utilitarian aspect. She closely associated good design with creativity, calling them "very related terms" and making virtually no distinction between them in her other comments.

Like Delinda, Chitra articulated the limits one's technical abilities can have on creativity, from a perspective of one who came into the Studio with virtually no experience with the multimedia tools:

> I think [creativity] is more limited by the technical aspect of things. The first thing I think is whether I'll be able to do it. I may envision it, but the moment I think that, whether I will be able to do it technically, you know, then I think – no, no, I don't want to go and

do any creative approach or anything. I just want to keep it simple and, you know, workable, and that's it.

Chitra's creative ability. When asked about her personal creative ability, Chitra indicated that she didn't consider this to be a strength for her. "I don't see myself as really high on the creativity level." She explained that in her experience working in e-Learning companies, she had people around her whose specialty was creative problem solving. "I never actually thought I could do that." She viewed this as their job, not hers. "I was not concentrating on being creative." When asked about the view of others on this, she likewise commented, "Vis a vis the people around me and the way I'm seen, I don't think I rate very high in creativity."

Chitra's questionnaire responses (see Table 4.9) mirrored those of Delinda. She chose response C, "Sometimes I have moments that I regard as creative but my strengths are in other areas besides creativity" for Q1 but rated her creativity a six on a scale of 1-8, relative to the general population, for Q2. The percentile ranking from her TTCT:F composite score, 78, was the lowest among the five case study participants; however, this score had been pulled downward by the fact that she did not give titles, as requested by the instructions, to any of the pictures in the second section of the TTCT:F. Thus her standard score for the Abstractness of Titles subscale (40) was in the 1st percentile. Meantime, her project received a rating of 4.4034 on a scale of 1-7 from the experts via the CPSS. Her peers did not nominate her project for a Blue Sock Award.

Chitra's Design Process

Chitra had thought early on that for her project she would try to create an online resume that would model a well-known animated resume on the web. But her interest in this lessened

when she came to understand that the known example was created in Flash, whereas she had been learning Dreamweaver and Fireworks in her tools contract, and had no experience with Flash. Thus when an opportunity came to be involved in the Tunisia partnership's website, which could be accomplished in the tools she had been learning, she switched her focus to this. Her topic switch happened just after the midpoint in the semester. She described sketching her design ideas on paper before implementing them on the computer. According to her design journal, she did this just after reading the software design manifesto by Mitchell Kapor (1996).

Chitra's design journal also included the following description of a specific design problem:

> For one of the sections on the website, Dr. H. mentioned that we need to put up all the photographs of all the workshops that have happened on to the website. This involves putting up more than a hundred photographs. I did not really know how to go about it. Should I create Dreamweaver pages with these photographs or is there an easier way of doing this?

A known solution to the problem appeared through the expertise of a person connected to the project (outside of the Studio):

> Then I took help from R., who helps Dr. H. in technical aspects. He showed it to me, how I can create the photo album through the software "Album Creator Pro."

Ideas for improving the project came via the showcase dress rehearsal. Chitra recounted that four different solutions were offered by other students regarding a problem she was experiencing with some pixellated-looking text.

In general, Chitra said she wanted a more collaborative experience than what the first level Studio course affords; but she reported a great deal of flow during her project work. “Suddenly I realize that, ok, it’s like five hours gone, and I would not realize that had gone.” She identified this as a solitary experience. “That is more working individually. Because obviously, you know, you’re working on it. You’re thinking to your own being. You’re not thinking to ten people.” She described her flow experience in terms of losing track of time, especially, and of enjoyment of the work process.

APPENDIX H

CASE 4: MARLA

Project Description, Design, Creativity, and Design Process

Project Description

Marla's project was a website providing an introductory guide to quilting, titled "A Quilt Review." Like Jensen's project, the site was created entirely in Flash. The simple home page presents a graphic of a quilt design against a blue background, with a four-item vertical menu to the right of the graphic: How to for beginners, Gallery, Glossary, and Design your own quilt. The first section explains the basics of quilting step by step; the gallery provides numerous color photo examples of different quilt types; the glossary explains quilting terms; and the final section provides an interactive drag-and-drop activity for designing a nine-square quilt block.

Marla expressed a lot of enthusiasm for her project and seemed quite happy with the results, while acknowledging that there were still things that could be taken further, such as the fact that the interactive quilt-block game was presented in black and white rather than in color. The black and white version was all she had time to develop.

Marla's View of Design

"Good fit," between the design and the technology used to create that design, is Marla's view of good design in a nutshell. She elaborated to say that users should not only be able to use the design intuitively, but also "to troubleshoot it, to know the workings behind it." Speaking explicitly from the vantage point of her technology education and technology literacy background, she expressed the view that if something goes wrong, users shouldn't have to work terribly hard to know what to do. She also said that good design depends on the kind of design

one is talking about, that the meaning might be different in the case of artistic design, for example, versus interior design.

Marla and Creativity

Creativity concept. In the interview, Marla began her response about creativity with the idea of thinking outside the box. Her conception of creativity seemed to be not just new ideas, but specifically new approaches to familiar things, or fulfilling a certain function differently from the normal way. She pointed to the Muse mp3 player I was using as a backup recording device, and cited the Apple iPod as a more creative way to accomplish the same thing.

Regarding good design and creativity, she said:

> I think good design requires creativity. So that's a huge statement, that if something is well-designed, then whoever's behind it has to be able to think outside of the box … I mean, they kind of go hand in hand in a certain sense.

To Marla, good design requires thinking outside of the box; there is no good design without creative thinking. She also added that design can exist without creativity in the form of bad design. Like Jensen, however, she acknowledged in her design journal that one's creative design can be constrained by the limitations of one's technical skills. For example, "I realized that I am lacking the ActionScripting aptitude and knowledge to complete the game on that level," and "I wish I could have taken this project a step further and provide more information and a more comprehensive definition and explanation of quilting, but I am afraid I lack the knowledge and expertise in quilting and the multimedia tools."

In citing her lack of knowledge and expertise, Marla included her limits as a subject matter expert along with her limits in multimedia development skills. It is noteworthy that while she saw the limits of her technical skills, she also regarded herself as “a step ahead” of many students because of her prior skills; she viewed this as a factor that allowed her to be more creative.

Marla’s creative ability. Regarding her own creative ability, Marla was measured in her responses. “I'm able to be creative in certain realms.” She cited the technology teaching job she had held the year prior and the lack of resources, and the creative solutions she was forced to put together in her lesson plans. “I was forced to be creative in my classroom because we didn't have a lot of the things that were necessary. … I thought I did a wonderful job of surviving the year through, you know, ‘OK, we’ve got cardboard and duct tape. What can we do?’” She also told of growing up in an artistic family and emphasized her enjoyment of creating art and craft objects for particular people to enjoy.

Regarding how others viewed her creative ability, Marla expressed the view that her creative abilities were hidden from others most of the time. "I'm not perceived as any great bastion of creativity necessarily." She said her previous students, in particular, “had no idea” of the creative thinking that went into her lessons. With her quilting, also, people unfamiliar with quilting might not see the "art" behind her work. Among quilters, however, her creativity may be more likely to be perceived and appreciated. She had recently won an honorable mention at an area quilt show, and in the interview she described the feelings associated with that event:

> I used to be a member of a quilt guild. And you know, of course, I was the only one my age, but it was a lot of fun. And in March, we had a quilt show in the civic center or

> community center, and my quilt got honorable mention. Which was so much fun, because more than half of the ladies in the guild didn't even know my name. I was just that youngster in the corner. But when I won something, when I won an award, they all knew and they were all, you know, "Congratulations." And that felt really good, and that was a lot of fun.

In response to Q1 on the questionnaire ("Do you consider yourself a creative person?"), Marla chose B, "Yes, but I don't know if I'm perceived that way by others" (see Table 4.11). For Q2 she rated her creativity a 5 on a scale of 1-8 compared to the general population. Both of these responses seem to match well with the estimation of her creative abilities given in the interview, in which she claims some creative ability but is careful not to overstate it. Her TTCT:F scores, however, are high even relative to this high-scoring group of graduate students: her composite TTCT:F score placed her in the 99th percentile, with strong subscale scores generally (one exception being the fluency percentile of 60) and a creative strengths score of 17 out of 26. The two experts gave her an overall CPSS score of 3.9910 on a scale of 1-7, almost exactly in the middle of the scale. Interestingly, her project was nominated, but not ultimately chosen, to receive a Blue Sock Award.

Marla's Design Process

At the beginning of the course, like many students, Marla was leaning toward working on her online portfolio as her final project. She explained that she was attracted to the practicality of that option.

> But then, when Dr. R. was talking about, “pick something that you’re really interested in doing,” and he even talked about, “I know that a lot of people are thinking about doing a portfolio,” or their own personal Web page, but really, to think about choosing something that you would enjoy doing. So, I was like, Well, you know, I’m interested in quilting. And I’ve already had a lot of people ask me, like a lot of my friends will ask me, “Well, how do you do it? What do you do?' And telling them about all of those special terms that we use and the process: “Well, first you do this, and then you do this.”

Thus Marla chose to do an introductory website about quilting, a highly intrinsically motivating project topic for her. She made this choice just after the semester midpoint, and soon she became quite absorbed in the project. She squeezed most of her project work into a couple of weeks, to the exclusion of some of her other course work.

An important idea for her project had come via a suggestion from Dr. R. to create an interactive game: “I showed him a flash puzzle I downloaded off of flashkit.com, and he thought that I could change that around to make it a quilt block. I took the idea and ran with it.” There were also two technical breakthroughs that stood out in her mind from her project work, as described in the interview:

> It was when I was ActionScripting the game, when I really found out that I knew how to do the drag and drop actions. Then I was so happy. Uh, slap-happy. It was just great. And I'm like, “Oh, I can do this!” And also, when I learned how to import things into the Flash library, I was very happy, too. But yeah, those, those are probably the two biggest ones. When I finally figured out the ActionScripting was the big one. When I knew that

> this was exactly what it was, and this is how it was going to work, and this was definitely going to work, and you know, I tested it and it worked and I was so excited. So, that was a great feeling.

Close to the end of her project work she experienced a major technical setback, according to her design journal:

> And of course, there was a major technological mishap at this point. Just when I thought it was all done the remote site was not updating and I had trouble looking at it on the internet. So, I synchronized the remote site with the local site, and stupid me erased all my changes. Luckily I listened to Dr. Rieber's advice and backed up my flash file several places, so I just had to go through and change around file names and it worked again.

For Marla, the lure of the flow aspect of her project work seemed palpable. She was taking a heavy course load and had assignments to do for other classes, but "I pushed my other schoolwork aside. … I completed the whole thing in about a week and a half, but it was straight days. Because this is something that I love to spend my time on so much, that once I knew what I was going to do, and knew what I wanted it to look like, then I just did it." She related how a local café provided her with a quiet place to work (and free wireless internet access), and she vividly described the temptation to continue with her Studio project rather than attend to other work:

> Luckily it didn't have any adverse effects on my grade. But I definitely ignored, I mean, it was exactly that. I ignored everything else, you know. When I would sit down … I was like, "OK, I really need to work on 6300 today. I really just need to do a certain thing." But, you know, once that computer was up, I'm like, "Umm, yeah … I don't know. I'll just do one thing that I thought might help. So I'll just do this one thing on my final project, and then I'll go back and I'll work on this reflection" or something that I was doing for 6300. And so I would ... and it's the same way with anything that I'm doing in Dreamweaver. I just like to do that kind of stuff more than, you know, reflections or reading articles.

She said that she knew all the workers at the café and that she would stay four or five hours at a time, but she also recalled a particular Saturday when she stayed for ten hours in all.

APPENDIX I

CASE 5: RENEE

Project Description, Design, Creativity, and Design Process

Project Description

Renee is the only student out of the five cases who was a second-time Design and Development Tools student. Thus she had two semesters of experience with the course behind her (Spring and Fall, 2005) and two first level course projects under her belt. Her first project was a website called "Spiralisms" that showcases some of her artwork, intended to complement a coming photographic art show focusing on spiral shapes. The color scheme of the site consisted mainly of earthy blues and greens. She built the project in html using cascading style sheets (CSS), which was the primary technical challenge of the project for her, since she already possessed various multimedia development skills coming into the Studio program. The use of CSS allowed her to create a user option to change the color scheme and graphic background of the site from a blue emphasis to a green emphasis, while leaving the content unchanged. The welcome page of the project presents a Flash animation with a rotating spiral; this gives way automatically to the main screen in which the menu is presented vertically on the left and the gallery of photos appears in the middle-right content area. In addition to the gallery of 14 photos, from the menu one can access an information piece about spiral patterns and another piece about this particular project. There are also links away from the site to various related sites, including Renee's own website.

Renee gave only one direct indication of discontent with her Spring 2005 project: that she had found no solution to an intractable technical problem involving how Flash content is handled in different browsers. However, she also expressed disappointment with how others responded to

the project. She said students didn't seem to get the idea that it was an online art exhibit, and this apparently led some to look for an instructional component in the site that was not there.

For her second Design and Development Tools project, Renee took on the challenge of interviewing other artists and having them discuss their creative process. As an artist, this seems to have been a natural topic area for her to consider; however, it is remarkable to the researcher that this robust, creativity-focused project was being undertaken in the Studio program in the very semester in which I was to conduct my study, by someone with whom I was unacquainted and who had no knowledge of my research topic.

Renee's Fall 2005 project was called SPARC (Spark of Potential: Artists Reflect on Creativity). In it she compiled responses from eighteen artists to questions about the creative process in their personal experience. A few artists had participated in videotaped interviews, from which one or more clips were presented on the website; the remaining artists had responded to the questions via email and their responses were presented as text. The website consists of a welcome page with an original title graphic in the middle, against a black background. In the interview she described the color theme overall as consisting of blue flame against a black background, and the title graphic does have a blue flame appearance, with subtle orange and purple elements. Under the title graphic is a horizontal menu that spans the length of the page, and below that is a brief teaser-type description of the project.

The main sections of the site are a slide show of visual art examples, interview and demo video clips, text responses to questions, artist information, more detailed information about this project, and related resources. There is also a link to a blog account that serves as an opportunity for others to add comments, an email link, and a link to a text-only version of the website.

Renee seemed quite happy with the final form of her project, though she had adapted to changes in the concept and scope of the work. It is clear that she had been disappointed, at first, with a lack of success in getting the desired videotaping done with the first target group of artists (see *Renee's Design Process* below). However, she had arrived at a robust number of participating artists and seemed to feel that she had accomplished what she set out to do.

Renee's View of Design

According to Renee, good design "has to work properly, for one thing." But beyond that, one has to be able to know what one can do, or should do, when looking at the design. "The thing I hate the most is when I go to a website and I can't figure out how to get someplace, or how to do something." A website can't just be pretty. "And I *like* websites that are pretty. But if they don't do anything then I'm not going to enjoy it, and I'm going to get bored with it." She also emphasized that the designer should try to think about what the user's experience will be, and, as an example, that a website should have a Help button. Finally, she expressed a view of good design being un-cluttered. "Layout-wise, there shouldn't be too much on the screen."

Renee and Creativity

Creativity concept. Like Jensen and Marla, when asked about the meaning of creativity Renee specifically mentioned thinking outside of the box. She talked about being flexible in the way you think and approach things, about perceiving when it's time to change the rules. She talked about listening to yourself and allowing yourself to be creative. She talked about problem solving and risk-taking. Especially, she made the point that anything can be creative – that is, any medium. "Creativity is everywhere." Her descriptions of her paintings are a testimony to this

view of creativity, in that she mixes media together frequently, usually as a way to add various textures to her creations. Renee also wrote in her design journal that unexpected challenges in projects have inherent in them opportunities for creative solutions.

Renee articulated the need for Studio participants' technique with the multimedia tools to reach a certain level before we can expect them to be creative:

> R. Talking more about the design in the larger sense, in the more creative sense, is a good thing. And I don't know that we talked about that so much. And it's a very hard thing to do, I think for [the first level course], especially for the first-timers. Because you're trying to get people at a certain skill set and ... catch them up if they need catching up a little bit. And then, make sure that they have the fundamental skill sets for what they're learning, so they can then do their projects.
>
> G. So you think that the process of just getting a handle on the skills is maybe one of those things that, maybe hinders creativity.
>
> R. Oh, definitely. ... I think you have to have the technique before you can in some ways have the creativity.

According to Renee's perspective on creativity and design, the best designs are creative: "I think the best things - be it an art project or Studio project, or food or whatever - are the things that are well designed, that are creative. That those two things go together." She presented a

compelling description of design without creativity and creativity without design, which she concluded with the following summary:

> I think when you have creativity without design, you don't have the framework to help you understand it. To understand what the person is trying to present. Whereas I think when you have design without creativity, you have the framework and the structure but you don't have anything to interest you.

Renee also made the point that creativity takes time. If sufficient time is not made available to work on a project, then creativity becomes an unaffordable luxury. "When I get too much to do, creativity is one of the first things to go. It's just get it done. Just get it done. Because it has to be done."

Renee's creative ability. Given that Renee was already a practicing artist, recognized in the local art community and exhibiting her work in public venues, and given that she included herself as one of the artists in her creativity project, it was an assumption from the beginning that she views herself as a creative person. She had already made this explicit in her design journal, referring to the responses from other artists: "As a creative person/artist, I really needed to hear these things." In the interview she made several unsolicited comments about her own creativity before I asked her about this topic specifically. Like Marla, she grew up in a family that valued creativity. To Renee, an important reality about creativity is that everyone can be creative, and having a family that nurtures creativity is a fortunate thing:

> I really do believe that everyone is creative, and if you say you're not, then you're not going to be. And if you say you're creative then you will be! … I was never told that I wasn't creative, and neither was my sister. (sudden laugh) And I'm very grateful for that, because I never thought for a minute that I wasn't creative. I thought for a long time that I couldn't be the artist in my family because my sister was, but I never for a minute thought that I wasn't creative. And I thought everybody else was too. And I still think that a lot of times.

In exploring creativity in the words of other artists, Renee's multimedia project reinforced her perceptions of her own creativity:

> It helped me learn more about what I think of myself as an artist. It helped me to sort of realize that yes, I really did fit into that world, kind of. It was very reaffirming, I think, to read what others had written. When I started looking at what I had written, and seeing what other people had written, like 'Oh my gosh we use the same words!' I mean it was a really good experience.

The interview with Renee was far-ranging and during the course of it I did not return, as I intended, to the topic of personal creativity to ask her about how others view her. However, there were indications in the data of others' perception of her as a creative person. First, she made reference to solo art shows she had done in public spaces, which may be taken as a strong indication that others recognize her creative gifts. Also, she recounted a complement she

received from another Studio participant: “Somebody had emailed me - it was in a desk crit. 'I always love to look at your projects. They're so creative.' And I was very flattered by that.”

Like Jensen, Renee responded to Q1 with A, “Yes, definitely, and others seem to regard me this way” (see Table 4.13). And like three of the other four case study participants, she gave her personal creative ability a six on a scale of 1-8, relative to the general population, for Q2. Her TTCT:F composite score placed her in the 99th percentile. The two experts gave her project an overall rating of 5.0472, the highest of the five case study participants; and her peers granted her project a Blue Sock Award. Thus Renee’s non-narrative creativity data was the most consistent among the five cases.

Renee’s Design Process

Because Renee had taken the Design and Development Tools course twice, there are two instances of her project design work to look at. In the Spring of 2005 she began thinking about doing a resource website for color and color theory, a topic in which she had considerable background and expertise, as well as being a thing close to her heart. ("Color is my old friend.") She started journaling on these ideas earlier than required, using a Blogger weblog account for her design journal. (Interestingly, it appears she received a "special dispensation" of some kind from Dr. O. about her design journal for this semester, as she included nothing in her journaling about the required readings.)

A class assignment, to find a photographable object that was inspiring in terms of design, led her to focus on a common motif that she would be featuring in an upcoming art show: spirals. Also, she had become concerned about the scope of the color project, that it could end up

becoming an "infinite project." She decided to build a website showcasing some of her art, with spirals as the theme. By about a week before the midterm, she had arrived at this idea.

So she launched into this project and chronicled its progress in the five remaining entries in her blog. At times she posted lists of items, either issues to be solved or lessons learned. She found later that her code checked out via the World Wide Web Consortium's validation tool (http://jigsaw.w3.org/css-validator/). She seemed to reach an equilibrium between her goals for the site and technical considerations, though one technical issue - Flash and CSS being handled differently in different browsers - was never resolved.

For Renee's Fall 2005 project, in contrast to the Spring semester, she came into the course with a project concept already in place. She actually attributes her choice to take the first level course again to the fact that she had this project idea. The project idea came together in the following manner, according to Renee in the interview:

> I guess I learned partially from my first project that people didn't really understand that they were just kind of looking at an online art exhibit. As to what it was supposed to be about. So I took that sort of problem that was presented to me and I thought about what I could do to explore art but maybe make it more approachable to people. And, hopefully make it more interesting to people. And then somewhere along the way, that idea combined with the fact that a few years ago I was interviewed, actually by one of my friends but he was writing for the paper and he asked me a lot of questions about what it was like growing up, was my family artistic, and what did we do with those sorts of things, and I sort of thought about his questions at some point and then thought about exploring art.

However, also contrasting with the Spring, she had not settled on what tools to use to develop the project. The selection of tools came together by about mid-semester.

Renee's design journal (blog) for this project offers a good glimpse of design ideas in formative stages. For example, the title of the project, which is a design element in a website (unlike a painting, in which the title is usually extrinsic to the work), was in the following form in an early journal entry: “Well, my project now has a name and a few artists. SPARK. I haven't figured out how I can change that into an acronym. Something P Artist R K? Who knows. ;) ”

Three weeks and two reflections later, the following emerged: "I do feel like my project is starting to breathe a little on its own and it now has a new name. It is now SPARC: spark of potential: artists reflect on creativity). Nifty acronym, eh? ;) "

Similarly, Renee gave the following early description of her concept for the project:

> My idea right now is an artists studio like A&E's 'Inside the Actor's Studio' but a multimedia website. I'm thinking I will interview/feature 4-5artists. I haven't decided if I will include myself or not, yet. (too much shameless self promotion)? I don't know. ... For each artist, there would be an interview (kind of how did you get started, when did you know you wanted to be an artist, etc.), some samples of artwork, and I haven't decided what beyond that. I really want it to be insightful in terms of the artists mind. Anyhow, this is an idea I've been kicking around for a while. Right now, I'm leaning toward a primary color scheme ala Mondrian (white with red, yellow, blue, black accents) but that could change at any time. Black and grey are used by a lot of art related websites.

The above set of ideas would evolve over time. She abandoned the primary-color scheme in favor of the blue flame motif against a black background. The scope of the design, also, progressed along an interesting path. She started out intending to do a videotaped interview of four or five artists whom she felt would respond well to her request for participation. However, scheduling problems and technical issues with the videos created doubt as to whether this plan could be fulfilled in the time allowed. These constraints also provided the decisive reason to include herself in the project, as she was finding it difficult to have enough artists to include. She was facing a serious design problem: how to have a meaningful project when there is not enough material to fulfill the original concept.

She eventually had what she called an epiphany: if she were to broaden her approach to include email responses from artists, she could include many more individuals' responses to her questions and add a lot of depth to the project. At the same time, it reduced the burden of having a sufficient number of video interviews. She wrote in her design journal,

> What this required was a redirection of resources (me, webspace, content) and my choice was to allow artists to contribute their thoughts via email instead of solely relying on video. What I gained from tweaking my initial plan a little is a much richer and more well rounded website, more artist participation, and hopefully, a more interesting project.

In the end she had eighteen participating visual artists. Along the way, she also added an external link to a blog account set up especially for the project, as a means to gather comments from users. The remainder of her project work consisted mostly of taking this design and

working out the technical aspects of making it work. Especially, she was careful to make sure her code validated and met accessibility standards.

Like Jensen, Renee responded without hesitation to my interview question about flow. Her first comment was about the fact that she had discussed flow explicitly in her Fall Studio project on creativity, in the comments she contributed as one of the artists: "Once I start, it becomes timeless and I am in the art. Nothing else exists and I am always amazed when I am done. I'll listen to the same CD over and over again. It's me, the music, and the flow." She characterized flow in the interview as "such an important word for me. And in a variety of contexts." She included running, painting, dancing, photography, and even her library database-troubleshooting work as activities in which flow could happen. She referred to flow as "a creative energy" and declared that "when you're really in the middle of it, time ceases to exist." Most importantly for this study, she also cited sessions of flow specifically in her Studio project work: "It was more of like, when I was doing it and things were just kind of coming together, and I knew that they were coming together … There's moments when it just seems like it's sort of seamless. And things seem to be going along just like they should be." She said that on at least one occasion this condition lasted four or five hours. Also, she associated flow primarily with working alone. However, unique to Renee, she recalled a session in the Studio computer lab in which conversation in the room gradually settled down and a lab full of busy Studio participants became very quiet and focused on their work. "It was one night when we weren't having the Studio. And there were quite a few people in there working. And it was *very* quiet. And everybody was working on their own projects and stuff and so in that way, I think that is more like sort of the art studio experience where everybody is working on 'their thing.'" She affirmed that these were Studio participants and not merely random persons using the computer lab. This

recollection, which Renee compared to a typical art studio experience, suggests the possibility of flow occurring in the midst of the Studio environment. However, the scene was composed of individual students doing individual work.