COMMUNITIES OF INNOVATION:

EXPLORING INNOVATION WITHIN A COMMUNITY

OF GRADUATE INSTRUCTIONAL DESIGNERS

by

Richard Edward West

(Under the direction of Michael J. Hannafin)

ABSTRACT

The rise of the Information Age, computing technologies, and an emphasis on innovation in the modern economy has made creativity an especially critical skill for modern workers. In addition, workers are asked to develop innovative ideas within teams and groups, and researchers have found that "collaboration is the secret to breakthrough creativity" (Sawyer, 2008, p. ix). Theories on the nature of group learning and working have traditionally emphasized models where acquisition of knowledge or development of expertise are central. However, the modern emphasis on collaborative innovation requires a new framework to help us understand the nature of community relations and collaboration when innovation is the goal.

This dissertation explores the development of a Communities of Innovation (COI) framework. I present a theoretical framework of COIs drawn from research on social learning, creativity, and organizational behavior. Based on this framework and utilizing phenomenological interviewing (Seidman, 2006) and Critical Incident Technique (Flanagan, 1954), I conducted an exploratory study of four members of a graduate

community of designers with many characteristics emblematic of COIs. Findings included in-depth details of the experiences of the four cases, as well as overall evidence for the inclusion of some aspects of the proposed COI framework. In addition, I identified challenges and recommendations to establishing a COI within a graduate educational setting and possible new directions for research using a variety of different methods to better understand the nature of COIs and how to effectively develop them.

INDEX WORDS: Communities of innovation, Communities of practice, Communities of learning, Social learning theory, Innovation, Creativity, Critical Incident Technique, Innovation Age, Information Age, Higher education, Organizational learning.

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DEDICATION

When a man gets the right kind of wife, his career is made—and I got just that.
— Harry S. Truman, June 28, 1942 letter to Bess

This work is dedicated to my wife, Stephanie, who has also served as my transcriptionist, peer debriefer, peer reviewer, and, above all, best friend. Without her continual confidence, patience, love, and diligence in "holding down the family fort" while I finished this task, this dissertation would not have been possible. Truly when I married her, I had my career made. This dissertation is also dedicated to Danika, Karli, and Logan, who have brought happiness to each day with their smiles, laughter, and love.

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CHAPTER 1

THE NEED TO STUDY COMMUNITIES OF INNOVATION

Psychologist Joy Paul Guilford is respected for his progressiveness on many topics. His Structure of Intellect model outlined 180 different mental abilities (1975, 1980), effectively foreshadowing future research into multiple intelligences (Gardner, 2006) and educational/learning taxonomies (Anderson, et al., 2001). He also strengthened the fledgling field of creativity research in 1950 by decrying the lack of research and outlining a framework for future research (Guilford, 1950). Lost among his forward-thinking theories are reflections about what a supercomputing economy and society might mean. In his 1950 presidential address to the American Psychological Association, Guilford predicted that "thinking machines" would grow to envelope our entire society. When that happens, he predicted a new "industrial revolution" would change the nature of how people learn and work:

> "There are several implications in these possibilities . . . In the first place, it would be necessary to develop an economic order in which sufficient employment and wage earning would still be available . . . eventually about the only economic value of brains left would be in the creative thinking of which they are capable" (1950, p. 448).

Almost 60 years later, we are beginning to understand this statement. As Guilford predicted, supercomputing has begun to establish a new economic order, particularly as computers have been networked together through the Internet. There are still many careers and sources of employment that have remained the same through the past several

decades, but many jobs have moved from areas of production to areas of creation. Because of this, Castells (1999) calls this the Information Age to distinguish it from the Industrial Age.

In the Information Age, it may no longer be critical to be a master of information because information is freely available through the networking of Guilfords' "thinking machines"—the modern computer. Some domain and general knowledge will always be relevant, but in today's society creativity and problem solving, or the creation of physical or conceptual artifacts, bear economic value. This modern emphasis on creativity—evidenced in part by a 68.3% increase in the level of patent applications from 1996-2001—has led our emerging society to be called the "creative economy" (Banahan & Playfoot, 2004). In fact, Ogunleye (2006) suggested that creative skills are key requisite skills in the current workplace and are critical to job and business success.

Guilford did not, however, write about the future importance of collaboration and the integration of professionals into social communities of learning and working. In ways that psychologists from the mid-20th Century could not have imagined, these "thinking machines" have enabled many new kinds of communication, interaction, and collaboration (while some may argue they have disabled others). Consequently, the nature of social relationships is changing. Boyd (2007), a digital ethnographer, noted

> this introduces questions about the boundaries of cultures. Geography is not the only meaningful delimiter or framer of culture, although it is not completely absent either. It just requires re-examination. Culture is still made up of people, artifacts, symbolism, etc. It's just that the underlying architecture that we've taken for granted has changed.

In effect, relationships, social networks, and communities are no longer bounded by geography. Instead, people form these networks based on other criteria and mediated by communication technologies.

Do these two trends operate independently or does the nature of work (with a turn towards the creative) and collaboration intersect? Indeed, Keith Sawyer (2008) argues, "Collaboration is the secret to breakthrough creativity" leading to "group genius" (p. ix). Collaboration during the creative process may not be new, but the necessity of group creativity is. "With the information explosion and growing necessity of specialization, the development of innovations will increasingly require group interaction at some stage of the process" (p. 3). Despite the potential benefits of collaborative creativity, few researchers have attempted to study the mutual effects of collaboration, community, and creativity. Harrington (1990) noted that the lack of careful study has impeded our understanding of human innovation, since creativity "does not 'reside' in any *single* cognitive or personality process, does not 'occur' at any *single* point in time, does not 'happen' at any *particular* place, and is not the product of a *single* individual" (p. 149).

Two areas of research might be expected to contribute to our understanding of group creativity: 1) research on creativity and 2) research on social learning and collaboration. Most researchers do not study group creativity, focusing instead on individual factors. For example, Mockros and Csikszentmihályi (1999) noted that

> For the most part, attention is focused on how cognitive factors, or other individual characteristics such as personality, values, problem-finding orientation, and motivation, contribute to the appearance of creativity and eminence. Such an orientation only peripherally addresses issues related to how historical, social, and cultural environments impact . . . expressions of creativity (p. 175).

Paulus and Nijstad (2003) added that most creativity research dwells on "the factors responsible for creative people and activities" including personality, developmental experiences, motivation, and cognitive skills (p. 3). Mayer (1999) summarized the topics from Sternberg's (1999) *Handbook of Creativity*, but none emphasized group creativity explicitly.

While creativity researchers have mainly focused on individual creativity, social learning researchers and theorists emphasize how human learning and understanding is situated in social contexts (Lave & Wenger, 1991), tacit knowledge is gained through apprenticeships (Brown, Collins, & Duguid, 1989), and communities form to develop shared practices (Wenger, 1998). Researchers have focused on the socialized nature of practical knowledge, such as rituals, practices, procedures, and processes; but they often do not focus on creativity as another shared, social endeavor.

Recently, however, social learning researchers have begun to clarify what it means to belong to a community or group. Four boundaries, or possible definitions, have emerged regarding who may be included in any particular community: physical, emotional, functional, and mental. *Physical boundaries* have been used traditionally to define communities, usually focusing on people who are "present" together (Rovai, 2002; Rovai, Wighting, & Lucking, 2004). However, Moore (2007) and others have written that "transactional distance" best describes the nature of "presence," especially when communities move into virtual realms. *Emotional boundaries* are often referred to as the psychological sense of community (PSOC) existing within a community, as measured through responses given by members on survey scales or in interviews (Glynn, 1981; Hill, 1996; Sarason, 1974).

In contrast, *mental boundaries* of a community refer to members who share the same goal or vision. Members may belong to a community because they share the same goal, even if they are not working on the same project, are in the same space, or feel any emotional connection to each other as individuals. Thus, a profession or organization might be called a community because its members are working towards the same vision (such as more equitable education or higher literacy rates. For example, Schrum, Burbank, Engle, Chambers and Glassett (2005) summarized this characteristic of learning communities by saying that they are "individuals who share common purposes related to education" (p. 282). Royal and Rossi (1997) described effective learning communities as being built on a common vision or sense of purpose. Another way to conceptualize the presence of shared mental visions is the evolution of individual members' identities around a community's vision (Wenger, 1998).

Finally*, functional boundaries* are defined by members who are working towards the same end goal. Individuals might be working on the same project, and thus have a shared relationship, but still not share the same goal or ultimate vision. Astin defines involvement in a college community as both "the quantity and quality of the physical and psychological energy that students invest in the college experience" (Astin, 1984, p. 307). Astin suggests that learning is improved when students are involved in the academic and social environments of their schools. Being involved socially reflects the emotional characteristics of the community, while involvement in the academic work of the school represents the functional boundaries.

Problem Statement

While the contributions from social learning and creativity theory and research have been important, we lack an understanding of the social nature of innovation, including how community-based innovation compares with community-based learning. In addition, little is known about the processes and attributes that influence creative collaborations, and how innovative ideas are developed into community artifacts. Finally, research is needed to examine how innovative communities can be fostered and developed.

Research Study Focus and Significance

The purpose of this research study was to provide a first step to understanding the nature of innovative communities in the context of higher education. As part of this research, I describe a community, an instructional technology studio comprising three courses of students and their instructors. I describe the community primarily through members' descriptions about their psychological/emotional sense of community, augmented by occasional references to the mental, physical, and functional community boundaries. I used a mixture of qualitative methodologies to identify how and when group innovation elements emerged and to refine a working theory about how communities of innovation are created and experienced. Specifically, my questions for the current study were:

1. Do elements of a community of innovation emerge among members of an instructional design studio?

2. If so, how do members of this community describe those elements? If not, what do members report might have impeded the development of a COI in this setting?

The findings from this study have the potential to further develop our understanding about collaborative innovation and the principles guiding innovative communities. This could help instructional designers understand the differences between communities of practice or learning and communities of innovation, so that innovative communities can be more purposively designed. This is critical for higher education especially as many graduates, in order to succeed in their careers, will need to know how to function successfully in communities focused on being innovative.

CHAPTER 2

WHAT IS SHARED? A FRAMEWORK FOR UNDERSTANDING SHARED INNOVATION WITHIN COMMUNITIES[1]

According to Feather (2003) the Information Age entails real economical, technological, sociological, and historical changes. These changes have enabled ubiquitous access to information (through the Internet, public databases, digital media, etc.) and ubiquitous communication, or access to social networks (through emerging social technologies and mobile devices). These two trends combine to create a very different society from previous generations—one that necessitates a different understanding of how people learn and work as communities. Ubiquitous communication has stimulated collaboration and community-based development of new ideas, technologies, and practices, while ubiquitous information in capitalistic societies has required many companies to prize the creation of new knowledge and artifacts (Proctor, 2005). Simply knowing how things have been done is no longer sufficient as creative output is valued, and often required, through collaborations among workers. Researchers and practitioners have called these skills the "essential competence" (Hakkarainen, Palonen, Paavola, & Lehtinen, 2004, p. 139), the "critical pre-requisite" (Coakes & Smith, 2007, p. 74), and the "ultimate economic resource" (Florida, 2002, p. xiii).

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[1] A version of this paper is currently in press with *Educational, Technology, Research, & Development* as the winner of the 2008 ECT Young Scholar Award, and is reprinted here with permission of Springer Publishing (DOI: 10.1007/s11423-008-9107-4).

Because of the characteristics of the Information Age (ubiquitous access to information and social networks), a new innovation economy has developed (Banahan & Playfoot, 2004; Coakes & Smith, 2007). It is disappointing, however, that despite these societal trends, educational systems have largely remained models of the Industrial Age (Reigeluth, 1994). Likewise, researchers have largely not been as attentive to the needs of learners and workers in an innovation economy. In this paper, I begin a discussion to fill this void by presenting a framework (communities of innovation, or COI) for understanding the communal, collaborative nature of innovation. I first explore ideas from two different academic disciplines that can inform our understanding of COIs. From social learning research I discuss theories on the meaning of "shared" learning and what exactly is shared and co-constructed among learners. From creativity research, I report a steady progression from individual perspectives to considering the group nature of creativity. I will then present my concept of communities of innovation and conclude by offering implications for research and design.

Development of Social Learning Theories

Social learning theories are key to understanding communities of innovation because they help us understand the nature of collaborative work and learning, and collaboration is a key element of innovation. Also, social learning theories provide insight into the impact that technology has on how we socialize as students or colleagues. Social learning theorists, as a group, have sought to understand what is shared in social learning, with a progression from concepts of shared meaning, to shared practice, to shared innovation.

Shared Meaning

Early social learning theorists explored how interaction between an individual, others, and the environment constructed shared knowledge understood among all of the participating members. Much of our understanding of shared meaning is traced to the Soviet psychologist, Vygotsky (1978, 1986, 1987, 1997). According to Vygotsky, before any concept or understanding is formed internally it exists external to the individual, and is thus social in its nature. “Any function in the child's cultural development appears twice, or on two planes. First it appears on the social plane, and then on the psychological plane” (1981, p. 162-163). As an example, Vygotsky described how an infant learns to communicate via gestures. The child makes a hand motion, but does not initially understand it to be a communicative gesture until the parent reacts and communicates love back to the child (Wertsch, 1985). This concept of shared meaning is the basis for Vygotsky's theory of the "zone of proximal development" (ZPD), or an area of development that could be facilitated through interaction with and scaffolding from the environment. Thus, with the ZPD, student learning becomes a negotiated process between the student and the environment to jointly arrive at an understanding that is afterwards internalized by the learner.

Bandura (1977, 1986) broadened these ideas of social interaction and suggested that behavior and learning occurred as the result of continual interactions among the person, the environment, and the behavior: "Many factors are often needed to create a given effect. Because of the multiplicity of interacting influences, the same factor can be a part of different blends of conditions that have different effects" (Bandura, 1986, p. 24). The

interaction between causal factors depicted in Figure 1 occurs continually, constantly renegotiating understandings and changing behaviors.

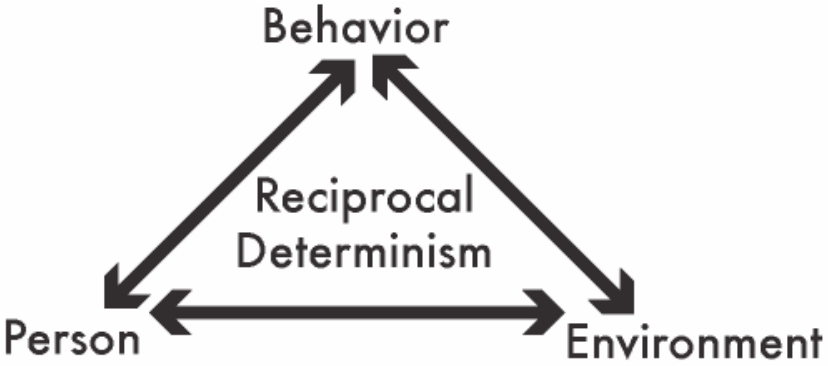

Figure 1. A model of reciprocal determinism, reproduced from Bandura, 1986.

Bandura's social learning theory opened new avenues for examining the effect of environmental/individual interactions on student learning, such as student motivation, self-efficacy, self-regulation, and other factors now seen as critical to successful learning. These concepts are also important to understanding shared innovation, which often depends on persons being intrinsically motivated and self-regulated, as I will discuss later. In addition, group innovation occurs from the juxtaposition of diverse perspectives with the group's shared understandings. In this way, the ideas of theorists like Vygotsky and Bandura are an essential first step to understanding communities of innovation.

Shared Practice

By developing theories of shared social practice—examples include situated cognition and communities of practice—researchers furthered our understanding of how community members interact and bring new ideas into the group. This trajectory for new ideas and perspectives laid a foundation for understanding innovation within

communities, but without addressing innovation directly. Brown, Collins, and Duguid (1989) presented a "fragment" of situated cognition theory by explaining that knowledge is inescapably tied to the context and practice in which it was used. Thus, the same word could have very different meanings depending on the context ("ball" could mean something hard or soft, depending on the context). Building from this conception of knowledge, Brown et al. (1989) argued that learning requires a student “like an apprentice, [to] enter that community and its culture" (p. 33). For effective learning, students must engage in authentic activities of that culture, even if only in minor or peripheral ways (Collins, Brown & Newman, 1989; Lave & Wenger, 1991) so they can "steal" tacit knowledge from experts through observation of their practices (Brown et. al, 1993; Brown & Duguid, 2002).

Brown et al. (1989) based many of their ideas on the work of Lave, who with Wenger (1991) developed theories about learning and working within communities of practice (COP). Wenger (1998) argued that social participation is the critical requirement for learning. According to Wenger, social participation comprises four components: meaning, or learning as experience; practice, or learning as doing; community, or learning as belonging; and identity, or learning as becoming. Thus, learning involves much more than knowledge acquisition because it engages the whole person in a co-constructive, interactive process oriented towards developing the expertise of people as they integrate into a professional community. In essence, the theory effectively shows how people learn to be efficient and gain tacit, procedural knowledge while working towards becoming experts. In Wenger’s words, knowledge within a COP is defined as competence in an endeavor in which one is actively engaged with others (1998, p. 4).

While the theory accommodates new ideas as part of the integration of new people into a community, the core of the theory is focused on gaining competence and developing meaning, rather than on creating innovations.

The Historical Development of Creativity Research

While social learning theories have explained how members of a community develop shared meanings, cultural practices, and expertise, a theory is still needed to explain how communities act and function when their primary purpose is not competence or knowledge, but innovation. Research into human creativity helps to develop this innovative aspect of a community of innovation framework. To examine potential links between creativity theories and social learning theories, I will provide a brief overview of the history of creativity research from its early roots to the present discussion on group innovation. Throughout this section of the paper, I mostly employ the term "creativity" because this is the wording used by this group of researchers (Csikszentmihályi, 1990a). Creativity researchers use the term to describe "the creation of an *original* and *useful* product" (Mayer, 1999, p. 449), but their work often emphasizes the idea generation and selection stages of creativity—what is called divergent and convergent thinking. In all other sections of this paper I use the term "innovation" because I believe it is more expansive. Innovation theories include not only initial divergent/convergent thinking processes, but also idea development, the overall innovation climate within the community, and factors related to implementation (Amabile, et al., 1996; West, 2003).

Big Creativity

The roots of creativity theories grew from philosophical/mystical origins, as philosophers argued about the nature of divine intervention and of insight pouring forth

into a person's mind from some outside source (Albert & Runco, 1999; Sternberg & Lubart, 1999). For example, according to Plato, creativity and genius could not be developed or explained, as they came from God unexpectedly: "This gift you have of speaking well . . . is not an art, it is a power divine, impelling you . . . therefore each is able to do well only that to which the Muse has impelled him" (Rothenberg & Hausman, 1976, p. 31-32). Like Plato, Kant suggested that schooling could not produce creativity, and that creativity could not be harnessed or controlled. "[A genius] does not know himself how he has come by his Ideas, and he has not the power to devise the like at pleasure or in accordance with a plan" (Rothenberg & Hausman, 1976, p. 38).

Eventually, researchers began investigating the individual differences between creative people and less creative people (Albert & Runco, 1999). One prominent way to identify creative attributes was to focus on "Big C" creativity (Snyder & Lopez, 2002), or the study of people who displayed obvious flashes of brilliant insight. Thus, early (and some current) creativity researchers focused on the study of geniuses through biographies and historiometric methods (Albert & Runco, 1999; Mayer, 1999, Simonton, 1999). During the early 20th century, researchers pushed creativity research toward a study of human intelligence, linking high intellectual ability in children with eventual creative achievement as adults (Albert & Runco, 1999). This research emphasized the importance of the truly gifted, but also hypothesized about its developmental nature. Researchers began to question whether creativity could possibly be taught and developed, and thus exist in differing degrees among normal, everyday, people.

Everyday Creativity

The study of creativity was neither popular nor well respected until Guilford's (1950) famous presidential speech to the American Psychological Association. Guilford reported that only 0.2% of published psychological articles in *Psychology Abstracts* had discussed creativity, and he argued for rigorous experimental research into the topic. Researchers developed psychometric scales, tasks, and experiments for objectively measuring potential creativity and found associations between different personality traits, decision-making processes, cognitive processes, and the "everyday" or "little c" creativity of people (Sternberg, 1999).

As a result, substantial research identified the cognitive activities underlying creativity. These findings demystified creativity and provided increased power in predicting interventions that influence creativity (Smith, Ward, & Finke, 1995). Ward, Smith, and Finke (1999) wrote that creativity is simply an extension of normal cognitive processes available to everyone. Weisberg (1999) characterized creativity as incremental progress based upon prior knowledge. This view was shared by Ward, Smith, and Finke (1999), who suggested that novel ideas involve a restructuring of new information with old knowledge to create new mental representations (Smith, 2003). While some have argued against the pure cognitive approach to creativity (e.g., Bowers, Farvolden, & Mermigis, 1995), the end result of this theoretical movement was an appreciation of creativity as something that all could develop to different degrees.

Social/Group Innovation

Whether researchers have studied rare genius or everyday creative personalities and processes, a common thread has been the primary focus on individuals. Even when

researchers referred to environmental and societal conditions, they did so to show how they influenced individual creativity. In summarizing the leading research topics in the *Handbook of Creativity*, Mayer (1999) listed 12 questions, only one of which might be interpreted to reflect the social nature of creativity. Henry (2004) wrote that "until recently much of Western psychological thinking about creativity has assumed that creativity is a quality that emanates from an individual, and most creativity research has been framed in line with this assumption" (p. 158).

Recently, some researchers have written that there is an alternative view to creativity that emphasizes its group or social nature. Montuori and Purser (1999b) said that "many creative activities today involve social and collaborative processes" and yet "considerably less [research] has looked at how social factors can promote creativity for all" (p. 4, 5). Paulus, Brown, and Ortega (1999) concluded, "very little attention and recognition is given to the potential for group creativity" (p. 152). They noted that a computer survey of social science literature since 1989 yielded no citations for "group creativity." Even one of the most well known creativity theorists wrote that he has "reluctantly" come to realize that creativity must be studied as an event as much social and systemic as psychological (Csikszentmihályi, 1990a).

Why has creativity research focused so heavily on individual factors? Some researchers believed it was because of the influence of cognitive psychology perspectives (Mandler, 1995). Paulus et al. (1999) wrote, "this localization of creativity within the individual is consistent with a variety of cognitive or attributional biases that lead us to ignore the social or environmental context of creativity" (p. 151). Another reason for the lack of social creativity research could be the dominance of the Western World in

creativity research, and the Western focus on the individual. “Countries like Japan have an excellent record of continuous improvement in their products and processes, perhaps because they recognize that creativity is very much about collaboration over time and not just breakthroughs by a few individuals” (Henry, 2004, p. 170).

Near the end of the 20th Century, a social/group creativity research movement gained strength (Montuori & Purser, 1999a; Paulus & Nijstad, 2003; Purser & Montuori, 1999). However, this research often focuses only on group divergent thinking and group convergent thinking. Divergent thinking is the ability to deviate from the normal to consider novel possibilities. It is frequently used to identify an individual's creative potential (Runco, 1991) by posing a problem (or object) and asking for as many solutions (or uses) as possible.

Researchers have studied group divergent thinking by looking at the brainstorming process. They have found that group divergent thinking is often hindered by groupthink, which occurs when a dominant person offers an idea that is prematurely accepted by the group (Milliken, Bartel, & Kurtzberg, 2003; Nemeth & Nemeth-Brown, 2003; Smith, 2003). Seeking a balance in skills, backgrounds, and expertise within the group can help groups avoid groupthink and improve group divergent thinking. However, the benefit derived from group diversity might not surface if members do not feel comfortable in expressing their dissenting opinions (Nemeth & Nemeth-Brown, 2003). These findings support the need for a strong community where members feel valued, confident, and interdependent with each other, a feature of the community’s climate that I discuss below. Emphasizing this interdependence and strength in diversity can improve group divergent thinking processes.

During the divergent phase of an innovative project, the group generates as many novel ideas as possible. When the activity shifts towards collaborative convergent thinking, the group must winnow the ideas down to only the best. While some researchers characterize convergent thinking negatively (see, for example, Goncalo, 2004; Nemeth, 1986), others advocate a mix of positive divergent and convergent thinking within groups to foster creativity (Kaner & Karni, 2007). Diversity among membership is also important in convergent thinking, leading to superior ideas (Milliken, Bartel, & Kurtzbert, 2003) and improved decisions due to an increased number of possible critical evaluations. In convergent thinking, independent judgment is important in keeping the group from attaining consensus before fully evaluating all ideas, a process called "premature closure" (Kim, 2007). Because of this, full participation by all of the group's members is critical (De Dreu & West, 2001). To be successfully innovative, the group must function as one unified whole.

In addition to research on group convergent and divergent thinking, a few researchers have studied overall organizational climate conducive to innovation. Amabile et al. (1996), for example, presented a model for how an organization influences its members' creativity. This model (and subsequent measurement instrument) included five components: Encouragement of creativity, autonomy/freedom, resources, pressures (both positive and negative influences on creativity), and organizational impediments. A similar measurement device used to assess team climate for innovation is the Team Climate Inventory (Anderson & West, 1996). This instrument assesses participative safety (how much team members participate and feel safe with each other), support for innovation, vision, and task orientation. This work provides a good foundation for

discussing how organizational variables influence innovation, but many questions remain about how innovation emerges within these social communities.

Shared Innovation: The Communities of Innovation Framework

From this research on group creativity, we can identify a few key principles for the formation of a community of innovation. These include: diversity, interdependence and full participation among group members; idea generation and selection; and a supportive climate for innovation. By combining these principles with the rich theoretical foundation available in social learning research, we can derive a framework to explain how innovative communities might function and be fostered. Some theorists have already sought to describe the nature of a community focused on the creation of physical or conceptual artifacts. They have used various names to describe these communities, including wisdom networks (Benton & Giovagnoli, 2006), knowledge creating communities (Bielaczyc & Collins, 2006), creative organizations (Banahan & Playfoot, 2004), communities of creation (Sawhney & Prandelli, 2000), networked strategic communities of business (Kodama, 2005), and innovative knowledge communities (Hakkarainen, et. al, 2004). Coakes and Smith (2007) used the term "communities of innovation" to describe a community developed around a specific "innovation champion," although their work focused on the individual champion rather than the community.

In my framework, I also use the name *communities of innovation* to reflect the innovative nature of the community. In addition, while creativity has typically been associated with idea generation, the term *innovation* expands to include idea development and implementation (West, 2003). Finally, in the framework I am presenting, I focus

more on the development of the whole community, rather than an individual within the community (Coakes & Smith, 2007). Whatever these communities are called, there are elements that these frameworks have in common that can provide a basis for understanding what a community of innovation (COI) is. The following COI framework is based on elements derived from these different bodies of research: Social elements from social learning theories, creativity elements from creativity literature, and organizational elements from the emerging discussion about innovative organizations.

Elements of a Community of Innovation

Dynamic Expertise or Group Flow

Whereas expertise is often viewed as a finish line, where one has enough experience, knowledge, and wisdom to be viewed by his/her community as an expert, Hakkarainen et al., (2004) argued that innovative communities require dynamic expertise. This expertise is "characterized by continuous efforts to surpass one's earlier achievements and work at the edge of one's competence" (p. 243). This orientation allows the learner to take on new roles within the community: sometimes as the expert, sometimes as the novice, but always growing in expertise. Csikszentmihályi (1990b) incorporated aspects of dynamic expertise into his flow theory of learning, where he argued that learning is best accomplished by learners continually pushing themselves to complete intrinsically interesting projects that are just beyond their level of expertise. This kind of activity requires intense focus, learning, and development, but results in discovery and creation, among other outcomes (Csikszentmihályi, 1990b).

Keith Sawyer adapted Csikszentmihályi's concept of individual flow to explain a specific kind of optimal group flow (Sawyer, 2008). Drawing on his research with groups

as diverse as sports teams, jazz combos, and business organizations, Sawyer (2008) found 10 key conditions enabling group flow: 1) a shared goal, 2) close or deep listening to each other, 3) complete concentration, 4) being in control of the group's actions and environment, 5) blending of individual egos, 6) equal participation, 7) members' familiarity with each other, 8) constant communication, 9) elaboration of each others' ideas, and 10) frequent failure (and learning from failure). By developing and encouraging dynamic expertise, fluid role-sharing within the group, and the kind of synchrony leading to group flow, groups can most effectively become innovative.

Entrepreneurship and Ownership

Entrepreneurship is critically linked to innovation (Coakes & Smith, 2007; McFadzean, O'Loughlin, & Shaw, 2005). Laat and Boer (2004) identified three types of organizations: machine organizations, with a central bureaucracy and formalized procedures; professional organizations that are bureaucratic but with decentralized power; and entrepreneurial organizations. Entrepreneurial organizations are "simple, informal, and flexible organization[s]" (Laat & Boer, 2004, p. 61). Members of this type of community share intuitive knowledge through "intense" networking both inside and outside the immediate organization.

Entrepreneurial networking allows members of the community to retrieve organizational knowledge from other experts, re-use and repurpose the information, and create new knowledge that is then shared with the network. Banahan and Playfoot (2004), in describing learning within the "creative economy," explained that individuals will no longer be able to expect stability within work establishments as organizations grow to exist more virtually. They noted that individuals need to become increasingly

entrepreneurial and that adaptability and reactivity are critical elements of professional learning. McFadzean et. al (2005) added that “without the presence of some form of entrepreneurial activity to exploit opportunities as they arise within organizations (sic), innovation remains little more than an aspirational, rather than a tangible destination" (p. 353).

Workers must now learn how to change roles frequently and be multi-skilled instead of dependent on a trade. Thus apprenticeship models popular in situated cognition theories are not as applicable to COI as models that reflect adaptability and flexibility. Innovative communities need to develop the unique type of environment that allows enough structure to keep the community together and focused on an end goal, but enough flexibility to allow individual members to take ownership over their own projects and ideas.

Inquiry

Engeström (1999) identified inquiry, or questioning, as a critical element of his framework for expansive learning cycles, which are related to communities of innovation. Engeström reported that to be innovative learners, people must first raise questions, analyze the situation, model a new explanation, examine and implement the model, reflect on the process, and consolidate the new practice. For Engeström, this act of questioning includes “criticizing or rejecting some aspects of the accepted practice and existing wisdom” (p. 383), and is the first step in transforming abstract ideas into complex objects in activity systems.

Hakkarainen et al. (2004), in their knowledge-creating communities framework, believed it was essential for members to generate their own problems and questions to

guide their activities. “All models of innovative knowledge communities,” they argued, “. . . highlight the role of problems and questions that guide the process of knowledge creation” (p. 197). To be most useful, community members should generate these questions themselves. However, despite the focus by these and other researchers on inquiry-based learning, inquiry and argumentation rarely occur in modern schools (Kuhn, 2005), leaving many people ill prepared to be curious and questioning. In the Innovation Age, the focus on group inquiry will become increasingly critical as problem-finding, or seeking and defining questions to be solved, is a key precursor to innovation.

Group Reflectiveness

Reflection, the final stage of Engeström's learning framework, is a component of most innovative learning community frameworks. Bielaczyc and Collins (2006) argued that "The pulling together of disparate elements through reflection is crucial to knowledge creation. . . . [and] can support process and product refinement over time" (p. 44). Hakkarainen et al. (2004) explain that two kinds of reflection are important: intrapersonal reflection and interpersonal reflection. "All frameworks of innovative knowledge communities highlight the importance of self-reflection and reflection within a community. New knowledge often emerges as a consequence of these kinds of practices of reflection-in-action" (p. 133). Sawyer (2008) included this concept of group reflectiveness, or learning from past group failures, as the final key in his theory of group flow. For any community to be truly innovative, it must foster this communal, group introspection and reflection in an arena of psychological safety (Rogers, 1954) so that it can improve its own innovative processes.

Innoversity

In traditional communities of practice, diversity is a valuable way to bring in new knowledge from outside the community, and COP members reflect a diverse range of people brought together by mutual engagement in the shared practice. Diversity in skills or competencies, however, is not always critical for a successful COP, according to Wenger (1998), who described communities as sometimes consisting of *complementary competencies* and sometimes of *overlapping competencies*. In a case study of the latter, Wenger described claims processors who were a group of people diverse in backgrounds, opinions, and cultures, but who shared the same competency and work: They were all claims processors.

In communities of innovation, diversity plays a much more essential role because what is shared among the community is not competency or work, but the creation of something new. Justesen (2004) coined the term "innoversity" to describe how innovation is interlinked with diversity in a community. She defines diversity not in racial or cultural terms, but as variety in "techne (skills and abilities) and cognition" that allows for "new knowledge from previously separated domains [to be] exchanged and combined in new ways" (p. 80-81). Bielaczyc and Collins (2006) echoed diversity, or "multiple perspectives" as one of the seven characteristics of knowledge-creating communities. They argued that innovative learning communities require these multiple perspectives because "They raise questions about what is the best approach. They provide different possible solutions. . . . They offer ingredients for new syntheses. . . . [and are] critical to the invention process" (p. 42). Thus it is common for communities of innovation, like the industrial design firm IDEO, to engage psychologists, evaluators, CEOs, designers, and

many other kinds of professionals together to foster innovative thinking (Nussbaum, 2004).

New Community Boundaries, Visions, and Goals

In the past, time/spatial boundaries have often characterized communities (Rovai, 2002; Rovai, Wighting, & Lucking, 2004), and learners who work, study, or associate frequently together either by mandate (they are in the same class or work team) or by choice comprised these groups. In COIs, time/spatial boundaries are blurred, and it is more likely that members will rely on personal networks that include community members within spatial reach as well as those that are physically distant (Sawhney & Prandelli, 2000). In addition, the visions and goals of a COI are focused more on innovation than on efficiency. In discussing wisdom networks, their term for a COI, Benton and Giavagnoli (2006) argued that COIs cannot be harnessed or controlled by management, and should not have mandated deadlines, goals, or imposed leaders. This is because the purpose of these communities is not efficiency but innovation. As Sawhney and Prandelli (2000) argued, these communities must have "a permeable system, with ever-changing boundaries. [These communities lie] between the closed hierarchical model of innovation and the open market-based model" (p. 25). Innovation communities must have emergent goals, visions, and ever-changing boundaries as they accommodate the influx of diverse perspectives and networked experts and respond to the emerging needs of their audience.

An example of this principle in practice might be user innovation communities (Von Hippel, 2001). These groups come together without management oversight and for reasons other than job performance and efficiency to form communities that create new

products and ideas. More traditional corporations such as Google, 3M Company, Gore-Tex and others (Sawyer, 2008) often attempt to imitate the characteristics of these user innovation communities by allowing employees some flexibility with their time and resources so they can pursue emerging projects that are intrinsically motivating to them and meet developing needs of consumers (Google, 2008). This flexibility enables workers to chase the moving target that is innovation by encouraging them to work on ideas they feel are interesting, with whom and what resources they think will best help them. This also allows for constantly changing and evolving technologies to support further innovative growth because a flexible design process can adapt to emerging technologies more readily.

Motivation: The Hacker Work Ethic

Members of a COI experience different motivations for their work than members of traditional COPs. Pekka Himanen (2001) described this motivation as the hacker work ethic, because it is often prevalent among computer hackers. The term "hacker" has negative connotations, but the term rightfully describes anyone who cares about their craft and finds it intrinsically motivating and compelling. Himanen believed that many modern innovators follow a hacker work ethic, which he contrasted with traditional Protestant work ethics that value work as an obligation to be done by responsible citizens. Instead, Himanen wrote that solving complex, real-world problems motivates hackers. He argued that hackers care deeply about their work, are dedicated to producing quality for its own sake, but yet also find their work joyful, intrinsically interesting, and even playful. As a short vignette, he explained the intensity with which hackers engage with their work: "The classic hacker has emerged from sleep in the early afternoon to start

programming with enthusiasm and has continued his efforts, deeply immersed in coding, into the wee hours of the morning." Raymond (2003) explained this motivational philosophy in loyalist terms: "You have to be loyal to excellence. You have to believe . . . [it is] worth all the intelligence and passion you can muster . . . you need to *care*. You need to *play*. You need to be willing to *explore*." Whether the community is engaged in research, programming, marketing, teaching, or learning, finding problems that are interesting and enjoyable to solve often leads to innovative solutions.

Contrasting Frameworks

To understand the distinctions in this communities of innovation framework, it might be helpful to compare it with the communities of practice framework, which is dominant within the fields of business, learning sciences, and instructional technology (see Figure 2). I make this comparison only after two caveats. First, I do not assume that one framework is preferable to another, only that they promote different kinds of learning and working based on a conception of what is mutually shared, either shared practice or shared innovation. My argument is that COP frameworks are very effective in some situations, but that our evolving innovation economy requires us to also consider the need for communities whose primary focus is on innovation. Second, the lines of demarcation between the two frameworks are not often clear. Many communities of practice sometimes function as a community of innovation, and some COIs, after developing an innovation, morph into a COP to implement the innovation. Thus, these frameworks have many overlapping features, which is natural, since they are based on similar social learning theories. Nevertheless, in order to understand the implications of the two frameworks, it is necessary to emphasize the differences.

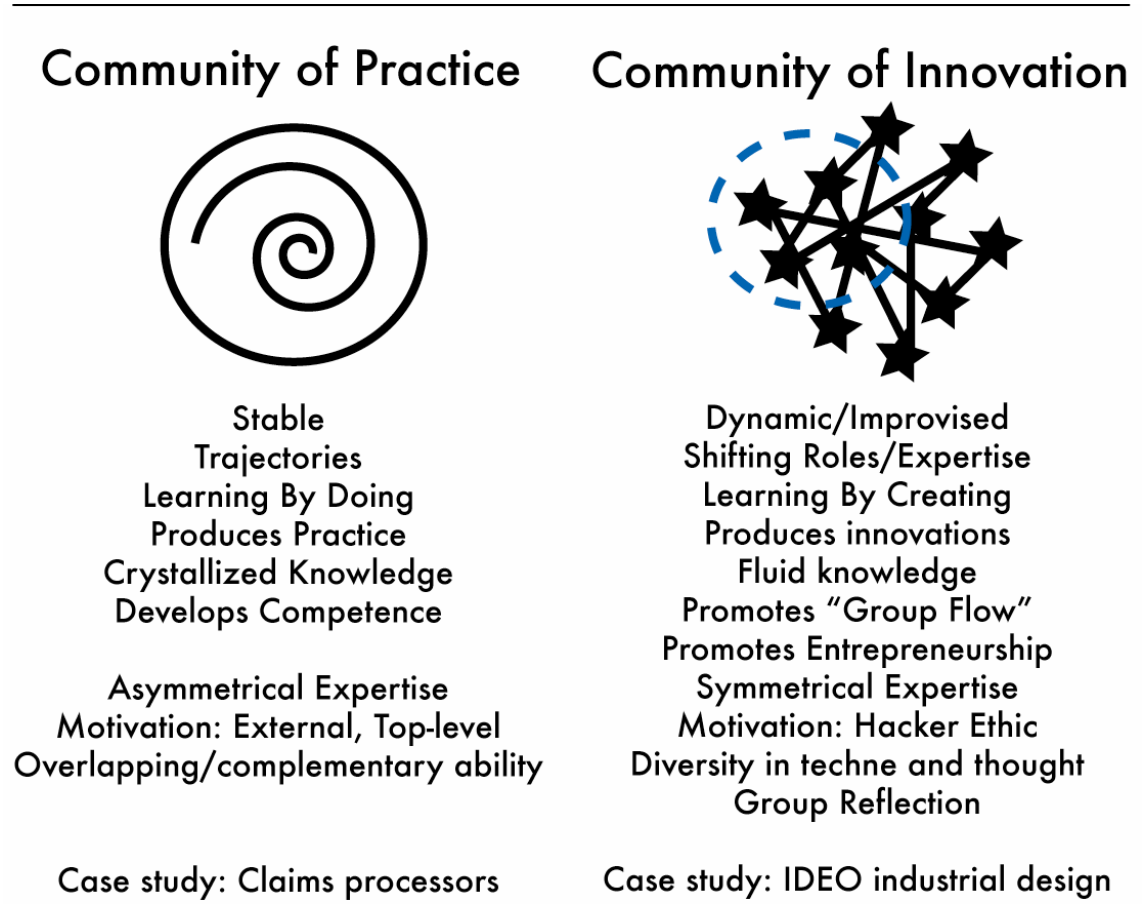

Figure 2. A comparison of Communities of Practice and Communities of Innovation frameworks for formal and informal learning. This comparison is drawn from authors cited in this paper. The iconic images are my own, representing how I visualize the differences between the two frameworks. For CoPs, novices are mentored into a community as they follow a trajectory of gradually acquired expertise until they are experts within the group. For COI, boundaries are less clear, the community more dynamic and evolving, and expertise more asymmetrical.

To contrast these two frameworks, I refer to Wenger's (1998) own example of a typical COP comprised of insurance claims processors. This community is stable, in that Alinsu (the company in the case study) will still have the community of insurance claims processors years from now, even though some individual members of the community may come and go. This profession emphasizes efficiency, which Wenger shows by

detailing the penalties for phone calls over 15 minutes, the blazing typing speed of one of the members, and the frequent monitoring of how much time it takes to complete claims. In fact, reaching "production" goals early "is something worth announcing to your neighbors" (p. 33). Participants interact with each other frequently in this community, but the knowledge shared is often procedural. "Medical claims processing . . . is very much focused on procedures" (p. 40).

Members of this community, as they develop expertise, become more proficient at the set of tasks that define their practice. Their knowledge, while ever growing, is thus somewhat crystallized into one area of expertise. Because of the focus on competency, the community's expertise is hierarchical, as is the leadership, which we learn about on the first page of the vignette when the protagonist moans the lack of privileges from being only a "level 6" (p. 18). The participants' roles within this community are well defined, and their trajectory and role in the community is clear: As they become more efficient and acquire more procedural knowledge and skills, they will progress to higher levels in the hierarchy and mentor the newer members.

In comparison, a typical community of innovation might be IDEO, a leading design consultancy. Whereas the insurance claims processors were a stable community, IDEO design groups are much more dynamic. When IDEO begins a project, it assembles a diverse community of its own employees and managers, as well as social scientists, architects, engineers, cognitive psychologists, and even CEOs (Nussbaum, 2004). Some members may be pulled from outside of IDEO to participate in this community, and when the project is over, the members return to other projects or former professions.

Once a particular design group is formed, the members participate in "managed chaos" (Nussbaum, 2004) as they research the context of the problem and collaboratively brainstorm a solution. During this process, there is no hierarchy, and expertise is distributed asymmetrically. All members of the group contribute ideas and receive equal consideration. With many members working on a problem that stretches the normal definitions of their professions, they learn to adapt their knowledge to fit new contexts. After brainstorming, the best ideas are rapidly prototyped and developed for evaluation. Participating clients learn answers to their marketing and strategic planning problems through this process of collaboratively and iteratively working with IDEO to create solutions. Observers have said that the process is fun, exciting, and very informative, and many are intrinsically motivated to continue the association (Nussbaum, 2004).

Learning and working in a community of innovation such as IDEO requires members to have high levels of self-regulatory, metacognitive, and cognitive abilities, as well as social/emotional skills. These are necessary because COIs are less restrictive and more entrepreneurial. This leaves the COI members with first, the task of identifying problems that might not be clearly defined while, second, motivating, regulating, and pushing their efforts to solve the problems. Today's schools, which still emphasize the Industrial Age-model of efficiency over creativity and problem solving, often do not teach these skills (Reigeluth, 1994). However, members of innovative communities must successfully learn these adaptive, dynamic abilities (Hakkarainen et al., 2004).

Not all professions consist of COIs, but many do, yet we still lack the theoretical frameworks to understand these COIs. Perhaps because the construct has not been thoroughly researched, understanding the principles of what enables or fosters a COI

requires synthesizing many disparate bodies of research, as I have done in this paper. From the social learning movement, we learn how knowledge is negotiated externally to an individual through interactions with an environment and other persons. We also learn that many kinds of knowledge are situated in particular contexts shared practices of a community. My assertion in this paper is that other kinds of learning and expertise are gained through shared innovation within communities. Also, technological affordances of the Information Age (ubiquitous access to information and communication) require us to reconsider our frameworks of social learning and working. Because of these technologies, modern COIs can be expected to exist in virtual or blended (online/offline) settings, and "presence" will be measured more psychologically than physically.

From creativity research, we have learned that innovation can be partially understood as a function of cognitive processes, although harnessing these processes is terribly complex. Finally, we have learned that innovation has a powerful social component, and that there are discernible processes to group innovation. An innovative group engages in divergent thinking (idea generation), convergent thinking (idea selection), and idea or artifact development and implementation. During each of these processes, the group climate must encourage entrepreneurship and yet interdependence, group reflection, dynamic (progressive) expertise, and intrinsic motivation. In addition, there must be enough trust and psychological closeness among the community members to be able to share new ideas freely, and yet enough diversity to force consideration of alternatives. This dissertation attempts to answer initial questions about these theorized COI elements, and how they may be manifested in an educational setting.

CHAPTER 3

METHODOLOGY

The purpose of this research study was to examine case studies of four students involved in a design community as an example of a potential community of innovation. In addition, I investigated the common incidents, both actual and psychological, that these designers noted were significant in their innovative process. My specific research questions were:

3. Do elements of a community of innovation emerge among members of an instructional design studio?
4. If so, how do members of this community describe those elements? If not, what do members report might have impeded the development of a COI in this setting?

Operational Definitions

Since several terms have been used differently among authors, I will operationally define two key terms to increase the precision with which my findings can be discussed, compared, and related to corresponding literature.

Innovation

I define innovation as the development of new ideas, products, or conceptual tools that are useful or are influential to a particular context or community (see Paulus & Nijstad, 2003; and Mayer, 1999). The key components of innovation involve originality

and practicality (or utility), even if this originality is simply rearranging or remixing pieces of other ideas or projects. I believe innovation to be more inclusive than creativity, because creativity is often talked about as the idea or the spark, whereas the term innovation (perhaps because of its roots in business and technological research) includes the development of the idea into a product or tool.

Community

Building from the work of previous scholars, I define community as a group of people who consciously or unconsciously define themselves by one or more common boundaries. Because of the setup of the Instructional Technology Studio, the subject of this study, students will already share some *physical* connections because they work side-by-side, and *functional* connections if they are part of a work team engaged in the same project. Thus, I expect that community based on these two categories will already exist. *Mental* boundaries to the community, or members sharing the same vision or goal, may exist, but this is not a critical component for this research study and will not be relevant. Instead as I study the community existing in this design studio, I will primarily focus on the *emotional* community, or the psychological sense of community (Glynn, 1981; Hill, 1996; Sarason, 1974) as it emerges in the Studio and affects innovative processes.

Sampling Procedures and Rationale

The Instructional Technology Studio (hereafter called "Studio") is a main component of the Instructional Technology master's program at a large university in the southern United States. This studio is comprised of three different courses meeting together as one design studio. I purposively chose the Instructional Technology Studio

because of its 1) relevance and 2) my own contextual sensitivity to this setting as a former Studio graduate teaching assistant.

The Studio was relevant to my research topic because the main activity of the class was to design and create, in this case multimedia projects, and these designs usually met a practical purpose or fulfilled a client's need. In addition, Studio instructors emphasized creativity, specifically the creative design of computer-human or human-human interaction. The Creative Interaction award was developed during the 2007-2008 school year as a recurring award for a student or team that developed an especially creative and interactive product, as evaluated by the common consent of the instructors. In Fall 2007, a new faculty member who specialized in creativity taught a creativity special interest group in the Studio. Also, during Fall 2008, the Studio instructors encouraged creative projects in whole-group instruction, modeled previous projects that exemplified creative approaches to instruction, and hung posters in the Studio lab rooms that asked participants to be creative. The result was that participants often mentioned creativity as one of the goals for their projects. All of these structures indicated an intentional focus on developing innovation, although the extent of that intention and how it was realized in the lived experiences of the Studio members was a focus of my research.

The Studio also emphasized the development of community and collaboration between the students. This was encouraged through many activities, including:

1) Social events such as "pizza nights."
2) Desk crits, which were the critique of one students' project by another student, with an eye towards giving positive, formative feedback. Each

student was required to give at least four desk critiques and receive as many as he/she could.

3) Voluntary SIGs, or Special Interest Groups, where students and instructors met to learn about topics relevant to design.

4) Mentoring and consulting, where EDIT 6210 students mentored newer Studio members and EDIT 6200 students served as "consultants" in assisting the 6210 students with their team projects. EDIT 6190 students also participated in 6210 team meetings as observers.

5) Class meetings focused on showing the whole Studio community the progress made by 6210 and 6200 students in their projects and asking for feedback.

6) Showcase dress rehearsal, where students displayed prototypes of their projects and gave feedback to each other.

7) Final Studio Showcase, where the entire Studio membership displayed their projects to each other and the greater academic and outside community.

I also chose to conduct research on the Studio because of my experience in and contextual sensitivity to the Studio setting. In Fall of 2006, I was a graduate teaching assistant in the Studio, assisting with the EDIT 6190 course. This opportunity increased my understanding of the Studio experience, and enhanced my potential to explore "beneath the obvious to discover the new" (Strauss & Corbin, 1998, p. 46). While increasing my contextual sensitivity to the setting, this exposure could have also influenced my subjective judgments as a researcher. In Appendix A, I explain this and other potential subjectivities as well as how I accounted for them in my analysis.

Case Sampling

Within the Studio context, I purposively sampled the participants for my case studies. I sought the participation of seven students initially, but after collecting data I limited my analysis to four by focusing on the participants who provided the richest data. All participants received compensation and were asked to fully participate in the study. I selected the initial seven cases by consulting with the course instructors, observing the first few class sessions, and inviting students according to the following criteria:

1. Every course in the Studio sequence was to be represented
2. At least two participants from each gender
3. At least one non-traditional student (traditional meaning an American young adult student)
4. If possible, students that the faculty recognize as exhibiting one or more of the following qualities:
    a. A sense of entrepreneurship or autonomy
    b. Intrinsic motivation for the design work
    c. Deep listening to peers
    d. Learning new interpersonal roles
    e. Seemingly well-networked and connected, within and without the Studio
    f. Creative in previous work
    g. Good collaborator

I chose these characteristics because they represented theorized qualities necessary for a community of innovation. By following this protocol, I recruited seven participants. After

beginning data collection, one student withdrew from the study due to a car accident and ensuing complications, and a second student withdrew near the end of the study because of loss of employment. Another yielded sparse data in the voice memos and journals, primarily because English was her second language. In the end, four individuals participated consistently throughout the study, and I focused my analysis on their experiences (see Table 1).

Description of the Research Setting

The Instructional Technology Studio was a three-course lab focused on developing instructional design and development skills. It was a required set of courses for master's Instructional Technology (IT) students, but on occasion students from the IT doctoral program and other master's level programs enrolled. Each Studio course was taught by a different instructor. (see Figure 3). For the semester of this study, there were 12 students enrolled in EDIT 6190, 12 in EDIT 6200, and 8 in EDIT 6210.

General Requirements and Activities

A typical Studio class session began with a whole-group meeting before the student groups divided into their own class sessions. According to Rieber, Orey, and King (2008), this is typical of design studios in schools of architecture and art, "in which students spend considerable time first learning the "tools of the trade" followed by applying these tools in creative ways to design projects individually and in groups" (p. 4). Table 2 summarizes the activities I observed within Studio during Fall 2008, the semester of this study.

Table 1.

Description of final sample of study participants.

Name	M/F	Nationality	Course	Background	Data Yield
Jamie	F	Jamaica	6210	Jamie was the only member of the current Studio participants who had previously won the Creative Interaction Award. She was also a winner of the Blue Sock Award.	8 memos + extra interview
Lori	F	U.S.A.	6200	Jane was a former teacher currently attending school full time, who commuted from the Atlanta area with peers from EDIT 6200. She had previously been awarded the Allen Bullock Service Award.	10 memos
Robin	F	U.S.A.	6190	Sheryl, a former teacher and current coordinator of study abroad programs, had some basic previous design experience. She won the Blue Sock Award during the semester of this study.	12 memos
Boyd	M	U.S.A.	6190	Boyd was a former college librarian with database experience. He entered Studio with very limited design expertise.	9 memos

Notes. From the Studio Web site, the Blue Sock Award is "a peer-nominated award for excellence. . . . Students from . . . EDIT 6210 make up the reviewing committee." The Allen Bullock Service Award "recognizes those individuals who give selfless service to their classmates . . . [and] extraordinary help and support." The Creative Interaction Award is "determined by the current Studio faculty and conferred by the IDD faculty."

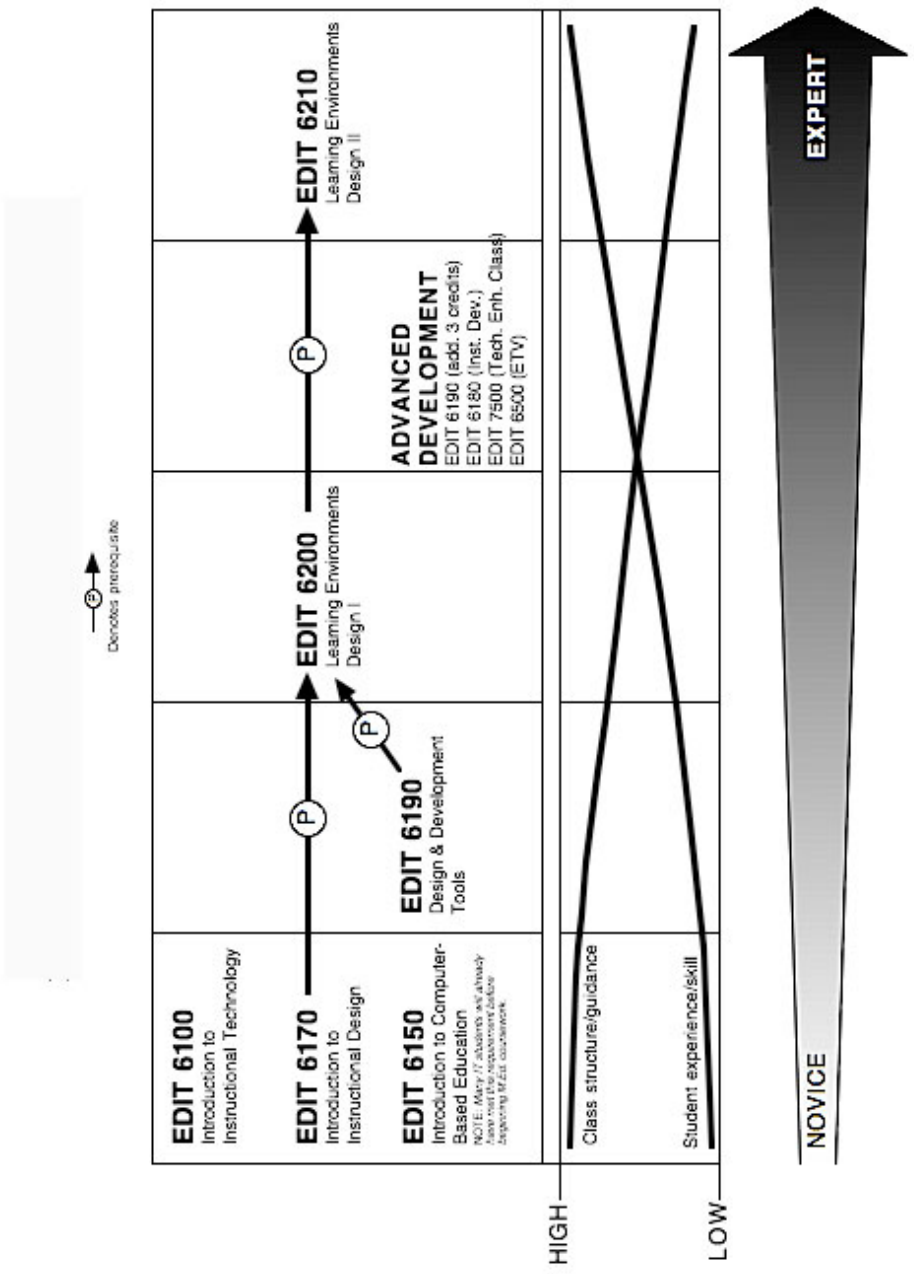

Figure 3. An overview of the Studio courses from Rieber et. al, 2008, p. 6.

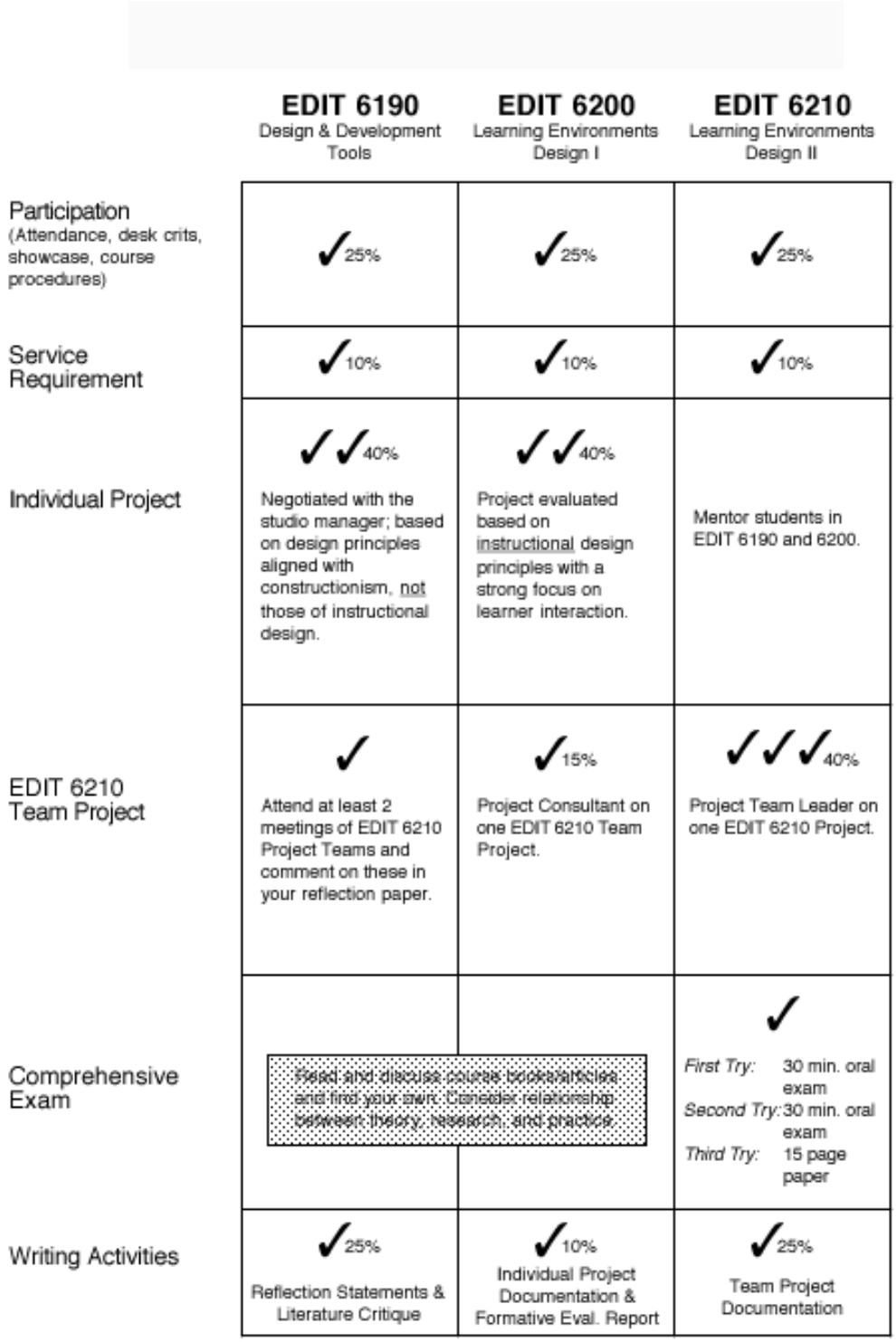

Figure 4. Common and unique assignments in the various Studio courses, from Rieber et. al, 2008, p. 10.

Table 2.

Description of Studio activities during Fall 2008 semester.

Date	Class Activity	Significance to Study
8/21	Studio orientation	Instructors emphasized community norms & values and pointed to experienced students as models and mentors. Studio Skill Inventory introduced as way to share expertise in community. Class introductions.
8/28	5 p.m. — Q&A Pizza Party; EDIT 6210 panel 6 p.m. — individual class workshops	Instructors encouraged discussion and positive critiquing among Studio members. EDIT 6210 instructor shares how Studio is different because of the supportive community. He unveils creativity posters to be displayed in classrooms and leads creativity discussion.
9/04	5 p.m. — Studio briefing 5:30 p.m. — individual class workshops	Project Nights are encouraged as ideal time for getting feedback. During Moodle workshop, short discussion occurred about using Moodle for collaboration.
9/11	5 p.m. — Studio briefing 5:30 p.m. — individual class workshops	Instructors led discussion on the Creative Interaction Award (CIA), showing a past example and discussing their definitions of creativity.
9/18; 9/25; 10/02; 10/23; 11/20	5 p.m. — technology demonstrations & workshops; guest presenters	
10/09	5 p.m. — briefing 7 p.m. — EDIT 6210 team meeting	Instructors focused on emerging projects, EDIT 6210 consultant needs, and teaching how to give good peer critiques. "We really believe that the design community sets the standards . . . the notion of having the peer critiques is just fundamental" one instructor said.
10/16; 10/30	4:30 p.m. — Special guest presentation (whole group) 5:30 p.m. — Project Day 7 p.m. — EDIT 6210 team meetings	During Project Days, EDIT 6190/6200 students worked on their projects while EDIT 6210 members were available, along with instructors and graduate assistants, to provide assistance.
11/13	5 p.m. — Showcase Dress Rehearsal 7 p.m. — Individual classes	The EDIT 6190 instructor explained to the whole Studio, "[This is] the last good opportunity to have everyone's project [critiqued]." Everyone had an opportunity to show their work and receive feedback.
12/04	Studio Showcase 7 p.m. — Final Studio briefing (whole group)	Studio members displayed projects for each other and visitors, and had a final wrap-up pizza party and debriefing, where the senior students gave design and Studio advice.

Note. "Significance to study" represents events that I observed that appeared to be relevant to building community within the Studio or to encouraging innovation.

The Studio handbook further indicates that Studio courses are collaborative by design:

> The studio experience expects students and faculty to collaborate in the design and development of authentic and meaningful multimedia projects. No single studio course functions in isolation. Consequently, students in the studio will be collaborating and cooperating in ways that resemble that of professional development teams (p. 4).

Because the Studio courses are offered both independently and collaboratively, several activities are similar across courses (see Figure 4). The EDIT 6190 students complete a design journal, while students in the other two courses complete "15/5s" or reflective assignments describing in five minutes their progress each week. I collected these journals and 15/5s because they provided a weekly student accounting of the most significant events and progress being made in the projects.

EDIT 6190, Design and Development Tools

This course was designed to help students learn a minimum of two multimedia development tools (usually Adobe Dreamweaver, Fireworks, and/or Flash), and demonstrate their competence in an independent project. According to the instructor, the projects and decisions are student-driven: "The projects that students have are going to dictate for the most part what the tool will be." Accordingly, the course was developed based on learning theory about learning communities and constructionism. Consequently, his goal was to "create a community of individuals" that was "focusing on design" throughout the semester. In an effort to promote community, the instructor emphasized positive peer critiquing and whole-group class discussions during the semester. "I think the notion of having conversations person to person about design . . . is how I would

think about this." His goal was to encourage peer mentoring: "We really try to make sure that people begin to talk to one another and not to always defer to the instructors."

In addition to emphasizing community, this instructor was a strong proponent of flow theory, which is often linked to creative thinking (Csikszentmihaly, 1990b) and is a part of the COI framework described in Chapter 2. "I love flow theory," the instructor said, explaining that in the Studio, "We're asking people to unlearn some of [their previous class expectations]. . . . There isn't somebody like the instructor saying here's exactly what you need to do this week then next week. It has to be much more self-directed." In promoting creative thinking, he said

> We tried to make 6190 a place where people would recognize that they had an opportunity here to be creative and to be innovative and to try to take advantage of the opportunity. . . . We try to not hide the fact that people need to be creative.

To accomplish these goals, EDIT 6190 students were expected to self-regulate their learning by choosing any project—whether instructional or not—in which they were passionately interested, and choose technologies to accomplish their design goals. Students also shared reflective, online journals, and engaged in peer mentoring and group discussions and attended EDIT 6210 team meetings.

For my study, I observed 6190 students during project days, desk crits, workshops, and large-group meetings.

EDIT 6200, Learning Environments Design I

In EDIT 6200, students individually designed an interactive instructional product or lesson for a client, and gave regular reports on their progress to the class and instructor and provided feedback to each other. According to the instructor, "The main focus of my class is for them to apply what they have learned in terms of the instructional design

process." The students individually chose their client and project provided it was instructional in nature, continuing the Studio model of student autonomy. "Studio we try to . . . bring some real-world constructionism into the setting and have them have the ownership of their learning and project."

Because of the focus on self-guided learning, the EDIT 6200 instructor stated that "We as instructors become a member of their learning community. So in class a lot of times, I just try to play as a consultant, not as an instructor who tells them what to do." The elements of community were further developed through the large group meetings, peer desk crits, and the consulting service of EDIT 6200 students who lent their expertise to help the EDIT 6210 teams complete their projects. In addition, the EDIT 6200 instructor and graduate assistant emphasized prototyping and group sharing to develop ideas. An individual prototyping meeting among the instructor, the graduate assistant, and the student was a critical event in the students' design processes where they often clarified their design goals and ideas. The EDIT 6200 instructor also encouraged "dynamic calendaring," attending other Studio workshops, or requesting workshops as time permitted based on emerging student needs.

For the instructor, the most important goal of EDIT 6200 was to help the students learn to design instructional projects based on theory. During meetings with one student, for example, the EDIT 6200 instructor encouraged Lori to develop a theoretical base for her project and offered case-based experiential learning as a possibility that she accepted. Beyond attention to theory, the instructor noted, "I think that promoting creativity could be my secondary issue" by helping students learn to "be flexible within those theoretical frameworks [so] they can play with different kinds of interactions that are very

innovative but are still linked to the existing learning theories." To encourage creativity, the EDIT 6200 instructor along with the other Studio instructors developed the Creative Interaction Award to complement the student-driven Blue Sock Award so that instructors could provide "clear direction about … the outstanding product we are envisioning."

For this study, I observed some interactions between EDIT 6200 students as they gave peer desk crits, presented prototypes and offered feedback to each other in large groups. I also observed some of their consultations with EDIT 6210 teams and interactions with other students in large- and small-group Studio sessions.

EDIT 6210, Learning Environments Design II

In EDIT 6210, the capstone Studio course, students formed design teams of 3-4 individuals to complete instructional products for clients, once again that they had selected. Because these team projects were often similar to the EDIT 6200 projects, the scope was expanded. For example, students were encouraged to create projects that were increasingly interactive and represented longer instructional periods. Student team members assumed different roles within the team, maintained project documentation and project management records, and applied advanced instructional theories and models to create interactive learning environments. Again, student autonomy was paramount according to the instructor:

> First of all I try to create as positive of a learning environment as I can . . . The students have a lot of autonomy and I'm here to support them in doing their projects and scaffold them . . . and not clog up their time with [unnecessary] instructional class sessions.

In addition, the instructor stated he tries "to share little hints and things about creativity along the way." This was particularly important to the EDIT 6210 instructor, whose dissertation focused on the connection between creativity and the Studio context. To

encourage creativity, he displayed a poster on creativity in the Studio rooms to remind students to think creatively about their designs.

The instructor promoted community by formalizing a system for EDIT 6210 students to count the mentoring of EDIT 6190 students toward required volunteer hours. In addition, he encouraged the other instructors to require additional face-to-face collaboration time for Studio members, including the creation of the "project days" that were instrumental to Robin, Boyd, and Lori receiving quality feedback on their projects during the semester. EDIT 6210 students worked collaboratively as teams to complete their project and interacted with EDIT 6200 students as consultants. EDIT 6190 students also attended the EDIT 6210 team meetings to observe the group design process and offer ideas. In fact, while visiting an EDIT 6210 team meeting, an EDIT 6190 student offered the team a critical lead that led to a breakthrough in the design. The team later credited this student for the model they followed. Finally, the EDIT 6210 instructor also encouraged opportunities for the EDIT 6210 students to interact with other students as role models. "We try to give those students a leadership role, and we try to give my students multiple opportunities to share about how to be successful in Studio."

During my study, I observed EDIT 6210 students when they mentored EDIT 6190 and EDIT 6200 students, participated in large-group meetings and project days, and interacted as EDIT 6210 team members on their projects.

Data Collection Instruments and Methods

Student Interviews and Weekly Critical Incidents

The purpose of the student interviews was to document the students' design processes, and whether theoretical elements of a community of innovation emerged in

their experiences. To accomplish this purpose, I modified a 3-interview (all semi-structured) process developed by Seidman (2006). This process involved interviewer and interviewees exploring together and co-interpreting the participants' experiences. Seidman advocated for three interviews, each 90 minutes in length. During the first interview, the researcher asks the participants to tell as much as they can about themselves in light of the topic of study in order to help the researcher to understand the context for the participants' experiences. During the second interview, the researcher concentrates on asking about the concrete details of "the participants' present lived experience" (p. 18). During this interview, the researcher does not ask for opinions, but rather for details. Opinions, however, do matter, and in the third interview, the researcher asks the participants to reflect on their experiences and to interpret them.

Early in the semester during my first interview with participants, I asked questions related to their Studio experiences, backgrounds in Studio and instructional design, previous project collaborations, and expectations for the semester. I then modified Seidman's model by making the second interview optional and instead using the Critical Incident Technique (CIT) (Flanagan, 1952) to collect extensive data on the participants' experiences. In this technique, an incident is defined as "any observable type of human activity which is sufficiently complete in itself to permit inferences and predictions to be made about the person performing the act" (p. 61). Some researchers have suggested that the incident must also be observable (Gremler, 2004). However, according to Butterfield, Borgen, Amundson, and Maglio (2005), the method has been broadened to encompass more than simple, observable behaviors to include psychological and cognitive constructs that impact a person's experience. Researchers have since used CIT to study everything

from emotional immaturity to work motivation to the links between cognition and emotions. Even Flanagan (1978) later used the method for a psychological study of perceptions of quality of life. This shift follows a trend towards using the CIT method for exploration within an "interpretive of phenomenological paradigm" (Chell, 1998, p. 51). Indeed, Ellinger and Watkins (1998) argued that CIT needed to be "updated" and applied within a constructivist paradigm.

The key to observing critical incidents, whether actual or psychological, is to provide definitions. Indeed, the first step in the CIT method is to establish discrete descriptions of the incident under study. In this study, I applied Kain (2004)'s definition of an incident as any event, characteristic, trait, or perspective that influenced—positively or negatively—the design of the students' projects. For example, in this study a perceived lack of requisite skills, insufficient time to complete the work, or inability to request help from peers were potential incidents that may not be directly observable. Therefore, I stipulated that the incident make "a contribution, either positively or negatively" to successfully completing their design projects (Gremler, 2004, p. 66). I provided examples of possible critical incidents to my participants, including gaining an idea from a companion on a particular part of the project, developing an attitude or work ethic that allowed the project to succeed, or becoming discouraged by a particularly negative piece of criticism. After selection, I trained participants to identify a "critical incident" using these criteria and asked them to record weekly those incidents that positively or negatively impacted their project. I did not inform my participants about the true nature of the research study until the third (reflective) interview. Until that time, I told

participants that I was studying their “design process.” [See interview protocols in Appendix B].

After defining the incidents to be studied, I collected students' written design journals, their “15/5” weekly journal assignments, and voice-recorded weekly memos. Each week, I obtained these voice memos by giving the students voice recorders and asking them to reflect for 15 minutes on three questions: 1) What happened this week with their project, focusing on moments of collaboration, creativity, or activity; 2) Who was involved in these incidents; and 3) Why were these incidents important (either positively or negatively)? I collected voice memos monthly, and transcribed them. For one participant who did not provide many voice memos, I conducted a second interview (one hour) to elicit her design story and to identify the incidents important to the development of her project. This interview was transcribed and combined with her voice memos and 15/5s to document her experiences.

After collecting their critical incidents, I disclosed the full intention of this study and conducted the final interview with students (lasting 90 minutes) near the end of the semester. During this interview, I queried for opinions and interpretations of the critical incidents of their design experiences. I also asked the students to reflect on the incidents and their Studio experiences. In all three interviews, the approach was semi-structured, allowing me to probe and explore emergent themes and ideas. I audio recorded and transcribed these interviews to document the participants’ own words and descriptions of their experiences.

Participant Observations

Finally, I observed all but one of the Studio course weekly meetings. During my visits, I observed whole-Studio sessions, project days, smaller class sessions, and EDIT 6210 team meetings. I recorded conversations and interactions involving study participants to identify examples of innovation and community building consistent with principles identified from the research literature. Because I assumed that some innovation would occur spontaneously and that collaborative events often occurred simultaneously for all students, my observations were not a critical source of data for this project. Instead, the observations provided additional understanding about the Studio, the events of the semester, and the students' projects in order to interpret participants' experiences as expressed in the interviews, voice memos, and design journals.

Communication Archives

I was given access to the Studio listserv in order to receive the email communications between and among instructors and students during the semester. This data source was supplementary to the interviews, surveys, and observations.

Table 3 breaks down which of these data collection methods apply to which of my research questions, along with the expected type of data from each data collection source.

Table 3.

Alignment between research questions and data sources.

Research Questions	Data Source	Data Yield
1. Do elements of a Community of Innovation emerge among members of an instructional design studio?	Student Interviews Class Observations Class Archival Data Critical Incidents	a. Contextual foundation for understanding students' experiences b. Students' design expertise, characteristics, and experience c. Account of the main events in the students' design processes.
2. If so, how do members of this community describe those elements?	3rd Student Interview Instructor Interviews	a. Students' interpretations of critical events in light of theories about communities of innovation b. Instructors' interpretations of the nature of Studio and its intended influence on students' innovation.

Qualitative Data Analysis Procedures

Because the goals of this study were to develop theory and to interpret the experiences of Studio participants, grounded theory and other intrepretivistic methodologies were relevant. Since the development of the original grounded theory ideas (Glaser & Strauss, 1967; Strauss & Corbin 1998), some researchers have argued that grounded theory methods can be used in flexible ways (Charmaz, 2002; Merriam, 1998). In my proposed study, I followed the trend of these researchers by applying grounded theory analysis techniques as tools, not strict procedures. In analyzing the data, I first examined the experiences of each case study as the unit of analysis, while also considering any potential broader themes for the Studio community at large.

I began analysis concurrently with data collection, as is typical for case study research (Merriam, 1998). I did this through persistent memoing, updating my research journal, and coding the transcripts as I received/completed them. Based on emergent findings, I moved from inductive, data-emergent analysis to deductive, reductionist thinking as I cycled between emerging ideas and developing these ideas into a coherent framework.

Specifically, to develop individual case study reports in Chapter 4, I considered the experience of each participant separately. I reviewed individual codes and themes, identified the most common themes mentioned in memos or interviews, and described how these themes were manifested differently for each participant. On occasions when a theme was mentioned less frequently but with more emphasis, I judged whether to report these themes based on their relevance to the individual's experience. Later analysis found that the chosen themes typically represented at least 15 codes. In my cross-case comparison for Chapter 5, I reported themes that were mentioned at least three times by every participant so that the evidence would represent all experiences. Themes discussed by some (but not all) participants were reported with less evidential support.

Data Reduction

A key first step in qualitative data analysis is to reduce the data to reflect context and breadth, but also sufficient depth to allow for meaningful findings. I reduced the data with the assistance of a computer program, HyperResearch. I began with main categories from my theoretical framework, research questions, and definitions of terms. Within these categories, I used constant comparison techniques to develop subcategories and additional main categories as warranted. After creating codes and coding a substantial

portion of the data, I analyzed the coding structure itself to identify overall patterns and overlapping areas . I then condensed and redefined my categories to consolidate what emerged from the data. I continued the process of coding and analyzing codes until all data were coded, and I then developed patterns to explain these participants' experiences. Finally, I sought representative examples and narratives from the data to best communicate the patterns. [See Appendix C for coding categories and definitions.]

Establishing Trustworthiness of Results

Credibility

Lincoln and Guba (1985) describe three methods for increasing credibility: prolonged engagement, persistent observation, and triangulation. I established depth of engagement within the setting by initiating observations as soon as the semester began and continuing until the final Studio showcase, observing all but one of the formal whole-group classes and many of the individual course workshops and meetings. In addition, my previous experience with Studio and my pilot observations and interviews helped establish my familiarity with the setting.

Lincoln and Guba also recommended that converging sources, methods, investigators, and theories be triangulated. I used multiple data sources and methods (observations, interviews, surveys, and archival data), and solicited input on my analysis and findings from my doctoral dissertation committee. In addition, I asked three peers familiar with Studio or the research literature related to this work to review my coding categories, apply them to a sample of data, and then discuss their findings with me. I also asked two peers with expertise in learning communities and/or creativity research to review my findings and conclusion chapters to determine if I supported my assertions

with appropriate evidence. When a peer raised a concern about the distinctions in some of my terminology, I specifically asked two of the peers reviewing my coding process to look at the definitions and applications of these two coding categories. Both reported, without prompting from me, the same understanding of the difference between the categories that I had, lending credibility to my coding structure. Finally, to address "the most crucial technique for establishing credibility" (Lincoln & Guba, 1985, p. 314), I employed member checking by asking interviewees to see and respond to their case studies represented in Chapter 4.

Transferability

To support transferability, the ability of others to transfer the findings of my study to their context, I provided thick descriptions of the culture, activities, and relationships within my research context via extensive quoting, descriptions of the participants and schools, and attention to pertinent details in the environment to enable this transferability. I sought the help of my committee and peer reviewers in ascertaining the level of detail needed.

Dependability

To create a coherent picture of the nature of the Studio experience, I documented my prolonged and persistent observations throughout the semester and triangulated observations, interviews, archives, and survey data. In addition, as an inquiry audit, I communicated my emerging methods and findings to members of my committee to obtain independent assessments of the reasonableness and logic of my research decisions. I also provided a description of how I created and applied my coding structure, providing examples of my coding categories in my final research report.

Confirmability

According to Lincoln and Guba (1985), a researcher establishes confirmability through the inquiry audit and a reflexive research journal that allows others to follow the researcher's logic. I kept a research journal throughout the writing of my comprehensive exams and developing my prospectus, and throughout the actual dissertation process, attempting to document my developing ideas, researcher memos, and decisions affecting the study.

CHAPTER 4

FINDINGS: PARTICIPANT CASE STUDIES

In this chapter, I present each participant's story—their background, evolvement of their design project, engagement within Studio, and experiences throughout the Fall 2008 semester. Each case study is presented separately; the most important themes for each individual are also summarized for each case. In the next chapter, I explore patterns across participants.

Case Study: Robin

Robin was completing her first semester in the Instructional Design & Development program (IDD) and reported, "I didn't know the word instructional design . . . I'd never heard of it before." Despite uncertainty about the program, she enrolled after completing a bachelor's degree in computer science and working as a high school technology teacher because of a desire to combine education and technology.

She also designed technology projects outside of work and school, particularly when they focused on personally interesting topics. For example, she frequently volunteered to produce newsletters and brochures for her or her husband's work, stating "because my husband is kind of like my guinea pig." For a birthday surprise, she also designed a photo slideshow with hundreds of images for her parents-in-law. If not for academic requirements, she indicated she would have transferred out of computer science because it did not allow the flexibility of working on intrinsically motivating projects.

The main reason she chose the IDD program was so she could work on technology-related projects with more flexibility and individual application, "[IDD] seems like I can pick any topic and apply the concepts to it."

Robin enrolled in IDD with a stated desire to work more collaboratively, describing her previous design background as being "the expert in the technology so I didn't ever collaborate" and her experiences at school as "We . . . worked independently." Only a few weeks into her IDD experience, she reported the difference:

> I'm really excited about the nature of the course where we learn something, [and] we get to collaborate a lot. . . . It's just really neat to have different . . . experts of tools, whether it's your teacher or your classmate or G.A. [graduate assistant] . . . they all know a little bit about something to help you. So, I'm really enjoying that piece of the course.

As she anticipated designing her EDIT 6190 project, Robin hoped for further collaboration opportunities. "I don't plan to be in a corner and do it by myself and, you know, shade my project. . . . You know, I'm all about having people . . . interact with my ideas."

This desire for idea sharing became apparent in Robin's Studio interactions. In the early weeks of the semester, she established a friendship with another EDIT 6190 student with Photoshop skills (a technology Robin wanted to learn) and asked questions and received feedback both within and out of Studio meetings. She also sought help from her instructor and graduate assistants related to technology issues. Whereas she had previously worked independently, she reflected in one voice memo that "I think in theory that's really not what's happening out there in the professional world, people are working in groups. People are better at one thing than another, and you don't have to know it all."

Robin began the semester with three project ideas: One that would be very practical for her work, one that would be meaningful to her family, and one that would be meaningful to herself as a mother. After deliberating, she selected the third idea because "I kind of always go back to this idea that I keep hearing in the Studio . . . pick a project that you like to do" and this project idea was "to create something that is meaningful and also a tribute to my daughter." She stated that creating a digital scrapbook was "the project that I have the most passion for."

However, this project intimidated Robin because "I will have to embrace the world of technology, and in my case, Photoshop. I have had this program, in multiple versions, on my computer for over five years. I am quite intimidated by its interface and its power." She expressed concern that that she was not sufficiently creative: "That might be also the hardest piece because . . . I don't have a creative bone in my body." However, the project was so personally valuable that she determined to "break that fear and . . . make something that will be meaningful."

After selecting her project, Robin dedicated the first weeks to learning the tools she would need (Photoshop and Dreamweaver). Especially during this time, she often described having flow, or optimal engagement experiences (20 coded statements). This was Robin's fourth highest coded category. For example, she said, "Photoshop has consumed my life a bit during these past few days. I can admit that I woke up in the middle of the night (twice!) and started clicking away on the program to see what I could create. . . . I have learned so much and have had so much fun doing so!" She attributed part of this time-consuming attraction to her personal desire to produce quality work, ("hacker ethic," coded 33 times—highest frequency code): "I was kind of working in that

zone yesterday and I woke up and I had spent two and a half hours just on Photoshop playing with a page to make it good, or appealing, to me."

She also said that for her, time learning Dreamweaver was "playing around" and "Photoshop tutorials on the web are a bit addicting." She joked, "As a true addict, I am making myself go on a 12-step program and stop spending most of my time learning new techniques." She suspected that she might be neglecting her project. "From here on," she concluded. "I am working specifically on my project." As she shifted her focus specifically to her project, she described enjoying learning ideas for creating digital scrapbook pages. When she located a series of digital scrapbook Web sites, she said, "I really got excited about and [was] just looking at creative ways to lay out my pages, creative ways to use color, so I'm really, really, really excited about finding that Web site."

Still, Robin struggled to identify the vision and design template for her project, and reported a "paralysis" for two weeks. In fact, the most frequent challenge mentioned in her data was decision-making, coded eight times. A turning point came during the first project day. While talking with her friend, Robin said she noticed a calendar on the wall and experienced an "aha moment, my epiphany." Things happened quickly for the next few moments as she scoured the Internet for calendar examples and discussed the idea with her peers. This opportunity was facilitated by the Studio schedule for that day (a "Project Day"), which had been left open for students to share ideas and work on their projects together. She reported after that session feeling "really excited" and that she "kind of had a breakthrough." Robin subsequently made the habit of always working at that same computer in Studio sessions. "It was like my safe corner. It was like my

creative corner." She also developed "a little collaborative group" with the nearby students. She reported that they "bounc[ed] ideas off," critiqued each others' work, and provided technical assistance on each others' projects. Robin reported that time to work on her projects next to her support group was important. When one Studio meeting was canceled, she said, "I didn't realize, I think, how much it was influencing my creativity . . . After those days, I kind of had some slow weeks . . . where I wasn't getting a lot of stuff done. And it was like, the Studio was where I go and plug in." At the end of the semester, she reflected, "my big creative works were probably done in the Studio. I did a lot of work in my office but that was after I'd had an idea."

Despite the initial "aha moment," Robin's project again stalled after a few weeks when she was unable to refine her calendar idea. As the deadline approached, and following peer feedback that her current design was not working, she reflected on an earlier workshop and her original plans to use a particular Dreamweaver template. After finally clarifying "the vision" for her project, development came more easily. Robin commented on having frequent, flow-like experiences while developing the Web site pages, even if the work was hard at times. For example, when working on her last page, she spent two hours studying a tutorial to learn the specific Photoshop technique needed. "I was learning new stuff on my last week," and "just like killing myself but . . . that was the page that I loved the most. . . . I would probably frame it... because I like it so much. It was important to me." That extra dedication paid off as Robin's peers awarded her project the Blue Sock Award.

Upon reflection, Robin reported that the Studio structure as designed by the instructors "encouraged the idea that you should look at other people's work and see what

they're doing and maybe help them if they're stumped [to] come up with some ideas." Robin mentioned sharing and receiving ideas from Studio peers 28 times, her second-highest coded category. This, along with the Internet (27 coded statements), represented her main source of inspiration. This sharing of ideas also developed her sense of community, along with "the fact that everybody was doing something different," and 15 of her statements indicated that she felt this community existed (fifth highest coded category). However, she noted feeling community mostly with her EDIT 6190 classmates, where she said she felt "pretty tight" but not with the remaining Studio participants. She also said that selecting intrinsically motivating projects promoted creativity and dedication: "For me, mine was personal. Like, I wanted my daughter to use it. I wanted it to be nice. I wanted it to be pretty."

In summary, the main themes representing Robin's experience were hacker ethic, ideas generated in interaction with Studio peers, ideas generated from the Internet, flow, and a sense of community.

Case Study: Boyd

Boyd was also enrolled in his first semester of the IDD program and EDIT 6190. He reported being attracted to this program because he was a school librarian but "didn't ever plan to be a librarian." He did want to remain in education, though, while exploring the useful applications of technology. As a librarian, he enjoyed using technologies—Microsoft Access, for example—to organize information. "I can get into a program . . . and mess around for hours until it works. I will just get lost in it." While he had prior familiarity with technology, Boyd was concerned about being successful in Studio because of his lack of web development expertise and perceived design ability. "I don't

have a creative bone in my body I don't think, maybe it's hidden somewhere." Though a weakness, he hoped to develop this ability. "The design thing is actually something else that appealed to me because I have zero creative capabilities. . . . Getting into a program that kind of teaches you some design principles—that really was a big plus as well."

Despite self-doubts about his creativity, Boyd reported that he had been engaged in prior collaborative, creative activities, particularly in home improvement. For example, he described efforts to build a unique deck and terraced garden in his backyard. In such projects, he first sought the expertise of others to brainstorm for "hours" about the possibilities. He then described staring at his empty backyard for hours, envisioning the finished deck. For Boyd, a mental image of the finished project was critical. "Knowing a goal, that's . . . just how I work. I know I can envision what I want and I know there's a way to do it, so it's almost like mentally stacking the bricks in my mind." According to Boyd, once he had formed the vision, he built the project, seeking help as needed.

Designing his backyard became a metaphor for Boyd's Studio participation. Because he reported himself as unprepared to be an instructional designer, he first sought help from others with expertise. "And it's the same concept of perhaps just finding someone . . . an expert, that you can kind of lean on in the initial stages and then get through the middle stuff to actually create your final product." One night, Boyd came to Studio on an optional night to "[Pick] whoever-is-around's brain for the most part" and seek advice from his instructor, teaching assistants, and other Studio members. He also expected to learn from experienced Studio members: "And then the other people who have gone through 6190 before like Celeste and Robert. But I'm not afraid to ask, and it seems to be the environment where that's accepted and encouraged."

After receiving advice on different possibilities, Boyd reported he mentally mapped out his project—an interactive, informational Web site on disc golf, which he identified as one of his passions. Boyd agreed with what the instructors had advised about the importance of selecting a personally meaningful project: “Something that you are personally invested in, I guess, is the right word. Even if it's work, you are kind of interested in seeing it happen.” Fourteen of Boyd’s statements were coded as representing this kind of personal investment in his project. After selecting his project and receiving ideas from Studio instructors on how to structure his Web site, Boyd took a disciplined, progressive approach to completing his project, developing his technology skills first and then methodically prototyping and revising his project.

During the process, Boyd routinely sought help from others and applied that feedback to improve his project. The code “ideas from other Studio members” applied 53 times to Boyd’s statements, more than twice that of any other code. In his design journal, Boyd remarked, “A lot of my decisions regarding project changes and contents have been born out of social episodes of criticism [desk critiques] and review [dress rehearsal].” Sharing the same instructor as Robin, he followed his instructor’s advice to seek out as many desk critiques as he could.

Boyd described how his design decisions were influenced by his interactions with others, ranging from “little suggestions about fonts and colors and things like that” to larger decisions about user interactions. A major design decision came early when Boyd, who originally indicated not planning to use Flash, remarked after a workshop, “this is kind of based on what [my instructor] showed us in his intermediate Flash workshop, but [I want to have] a Flash interactive of sorts where they could pick discs and pick different

kinds of throws, and it would all happen and they would see it demonstrated." About this same time, the Studio instructors held a discussion on creativity and the Creative Interaction Award. Seeing the projects that had previously earned the award inspired Boyd. "I really started thinking that I would like to . . . push myself especially and try to do something a little more interactive," he said. After these events, Boyd revised his technology tools contract to include Flash in order to add interaction to his project.

As Boyd's designs progressed, he received several desk critiques that he posted on his design journal Web site and incorporated into his design. Boyd indicated these desk critiques helped him by offering new ideas and, sometimes, affirming his existing ideas. He remarked:

> I received some really great feedback through desk crits, which led directly to changes in my Web site. . . . I have really enjoyed the desk crit process. . . . I have a hard time working in a vacuum. I need outside comments/critiques to help keep me on track. . . . So I find this component of the Studio vital.

Boyd reported that the frequent peer critiques were helpful, and that "looking back, [I] wish I'd maybe started that a little earlier—started getting feedback from people a little earlier. Because then that would have perhaps helped with a few steps." Boyd also became self-critical, reporting that "talking out loud to yourself [while completing voice memos] about the week . . . helps you work."

Like Robin, Boyd reported benefits from working alongside his peers. "I really seem to get a lot done up there in Studio because you're just devoted to that whereas at home I get off on all these crazy tangents." When developing his project or learning a prerequisite technology, Boyd reported becoming deeply involved and energized by the challenge of completing the task, an example of flow that his instructor had discussed with the class at the beginning of the semester. "You just get lost in that work . . . You get

lost in the flow. And so that does happen a lot it seems." He completed most of the development work ("a big avalanche" of three Web site pages) during one week. During that time, he first attempted to create web rollovers using a picture he had taken previously. After dedicating significant time to accomplishing this task, he "felt pretty proud of the thing." Boyd indicated that this "small accomplishment" energized him to complete the rest of the work. Another time while trying to learn Cascading Style Sheets, Boyd remarked, "I like digging into the code and . . . I would just get lost in that. Of course, my job duties suffered . . . [laughter]. So, that was one time when I got absorbed in that." Getting lost in the flow of his work was coded 13 times overall in Boyd's statements (tied for his fifth most common code).

For the Studio Showcase Rehearsal, Boyd strived to develop his project sufficiently to elicit the most feedback. "I think I put enough content in there," he said before the rehearsal. "And a little representative sample of everything that I want to do still so that people can give me feedback on a little bit of everything. That was kind of my hope." Rather than be distressed when others critiqued his work, he said,

> The entire process of showcasing my work and then walking around seeing the hard work of others was enjoyable. I also received a lot of good feedback and came away with some really good criticism, suggestions and changes to my site. Based on the feedback from the dress rehearsal, I now have a good game plan.

Design discussions energized Boyd to finish his project: "All this dress rehearsal feedback really kind of just gave me that last little bump, that little bit of adrenalin Sunday, and I spent a good five or six hours just powering through the little stuff." He completed the project two weeks before the end of the semester with only minor subsequent changes. He described his motivation as the positive peer pressure at the Showcase: "The concept that . . . This is what I've created and designed, and you're

going to show this to your peers in the outside world and everything. I think that's motivation enough."

Throughout the semester, 12 of Boyd's statements were coded as representing community within Studio (sixth-highest code). While Boyd did not often mention a sense of community during the semester, after the semester ended he noted that Studio was a community unlike those he experienced previously in his classes.

> It's supposed to be a creative community too not just a . . . means-to-an-end community like [when] you're trying to write a paper together. There's two . . . different types of community, I'd say. . . . If you're in this kind of creative community, then you're going to get together and just really gnash out some things that are going to require a little more higher thinking skills. . . . So, I think that's definitely there."

Boyd also said Studio was different from other educational experiences because, "The Studio class didn't feel like you were any less than another person because . . . maybe you didn't know Flash already," he said. "It lets you have your own goals not compared to somebody else."

In summary, Boyd most frequently mentioned receiving ideas from Studio peers, having desires to collaborate with these peers, learning through this peer critiquing process, and experiencing a hacker ethic, and flow, two codes that were later combined in cross-case analysis.

Case Study: Lori

Among the project participants, Lori reported the most extensive prior teaching experience. According to Lori, her most successful group learning/design experience occurred at a private school where she taught for seven years and worked closely with two other teachers. "I don't think I'll ever experience anything like that again. If I do I'll be really lucky. . . . I never felt more accomplished." Lori reported aspects of this

experience that contributed to success. They shared similar visions for how teaching should be done, they were open about sharing and adapting materials and ideas with each other, and they worked together enough to become unified in their goals and activities. “I mean, it was just like we were connected at the hip from the very get go.” Lori indicated that this collaboration not only made teaching enjoyable, but it made them more successful as teachers.

After this experience, Lori attended graduate school and became intrigued with using technology to improve education. She returned to teaching, this time in a public school, but “I don't know, it was really a letdown for me because I was looking for that camaraderie that I had at the private school.” She indicated that her creativity was stifled by public school regulations: “There were so many times that I was like ‘Gaa! I really miss teaching in the private school’ because of the freedom that I had for creating my own thing.” During her public school teaching, Lori became increasingly attracted to emerging Web social technologies, especially Second Life where she reported being very active. “It's just unbelievable,” she said, “It brought my world down to a really small size.” In addition, Lori connected with instructional designers through Twitter and other technologies, and she used these networks for brainstorming, obtaining feedback on projects, and seeking insight to design challenges.

In part because of a friend, Lori enrolled in the IDD program and completed EDIT 6190 in her first summer. She later regretted this decision, reporting there was not enough time in the summer to properly learn the technological skills she needed for EDIT 6200. “I wouldn't suggest for anyone to take it in the summer unless they were a second timer. . . . There's not enough days in the summer session to do a huge summer class like

that." Lori said she worried about her low technical skills because of her high standards for herself and because she took the task of becoming a skilled instructional designer very seriously: "I'm not here to just skim by. This is a very personal trip for me." Statements from Lori related to this kind of deeply personal attachment to her project were coded 19 times.

Lori reported that because of these personal expectations, she was especially motivated in Studio. In EDIT 6190 during the summer, she designed her Web site from scratch rather than relying on a template. In EDIT 6200, she sought help from others, although this was not mentioned as often as other themes (11 statements coded as indicating a desire for collaboration), both inside and outside of the Studio, but she said she did not want help with a programming fix unless the person explained *how* they fixed it. However, despite her reportedly positive collaborations at the private school and also in EDIT 6170 (a non-Studio class), Lori said she was hesitant to work with "just anybody" in EDIT 6200 because of a bad experience in a prior course where group members did not share her high expectations for their quality of work, causing more work for her. In addition, based on her EDIT 6190 summer experience, she indicated not wanting to collaborate with others because some Studio members, like herself, would lack the technical expertise to be helpful and others would be unavailable due to their full-time work: "I have to feel out the people and see what they are like. I mean, you can tell pretty early on if they are the kind of people that you can rely on or if you are going to have to go it alone."

Lori began the semester designing a project for web developer friend, but she reported changing clients when she and her friend disagreed on the project focus and how

instructional and interactive it should be. Lori indicated it should be more of both, and after four weeks, she chose a different client with previous successful Studio experience. Starting later than others, she said "I had to hit the ground running . . . with this project." As she initiated a new project, her instructor encouraged her to use a particular learning theory to guide her design and provided suggested deadlines for completing tasks. While this seemed to help Lori stay on task, she reported feeling rushed, which interfered with her ability to learn the skills or develop the ideas she felt she needed (coded 23 times in her statements, her third-most frequently coded category).

Soon after changing clients, Lori observed Jamie's team present their initial design prototype in a Studio large-group session. Because they shared the same client, Lori reported being particularly interested in their presentation and liking their idea for displaying material in frames as a "traveler's journal." After watching the presentation, she conceived a similar approach for her own project using Web site frames and an animated camp guide. She located free clipart available on the Internet for educational purposes. Lori tried to adapt this clipart, but eventually emailed the original artist and asked if he could redraw the images specifically for her project, since it was nonprofit and educational. When he agreed, she built her design around this animated camp guide. Thus, Lori's creative process involved asking for assistance (for artwork or computer code) and then improving upon or adding to this work from others. Before Studio, her most creative endeavor was her Second Life Web site, which she perceived as valuable because it built upon what other people had done. As a teacher, she stated that "There are no original ideas. I mean, you share ideas and you collaborate, and then you make it your own by tweaking it a certain way. . . . Ideas come from so many places."

Lori also used online and other out-of-Studio networks for emotional support and ideas (coded 21 times, fourth-highest category). She developed these relationships during the summer version of EDIT 6190 when she reported needing more help than her classmates could provide. For example, one time during the Studio semester she said, "I did have one thing where I couldn't figure something out. . . . I was just pulling my hair out . . . and so, I just put a question out to Twitter and . . . five people replied back within five minutes." Some of her Twitter friends—whom she had never met in person—became beta testers for her project.

After developing the initial design using artwork she found on the Internet, Lori reported focusing on project development. However, she said she was hampered by her lack of certain technology skills (a concern she mentioned 31 times, second highest category). Because of this, she asked for assistance from her Studio instructors, graduate assistants, and mentor, Carly, who was taking EDIT 6190 for a second time and had good web development abilities. In all, 15 statements indicated receiving technical training. Lori also asked her friend Cody for web design help. After he fixed problems in her Web site, Lori asked Carly to explain the changes. According to Lori, Carly's explanation was especially valuable: "I'm extremely grateful to Cody but more so to Carly because Carly's explanation of that whole bit of code just made a lot of things fall into place for me."

Because of her reported lack of technology skills and late switch in clients, Lori said she was rushed and overwhelmed, needing to finish the project after the semester concluded. While reflecting on her Studio experience, she reported being grateful for Carly's help ("We hadn't been in any classes with Carly before, so that was kind of really

neat to . . . have that experience with her"), but said she did not know her peers well enough, or thought they were too busy, or "felt guilty" asking EDIT 6210 students for help because "I didn't know them very well or . . . the ones I knew, I knew were just slammed."

Overall, Lori mentioned receiving ideas from her Studio peers 33 times, with the next most frequently coded themes being the challenges of lack of skills and lack of time, building and using a network of relationships from outside Studio, generating ideas through interactions outside of Studio, and mentoring for technical skill development.

Case Study: Jamie

Jamie was the most experienced participant, and graduated from Studio and the IDD program after the semester concluded. As an EDIT 6210 student, she was the only international participant (from Jamaica) and the only one in a group project. In her memos and interviews, she was also more reserved and independent, indicating a preference to work alone. She expressed a desire to find a job where she was only "involved in the development aspect, not so much design and analysis and front-end work" because "that allows you to be around your computer all the time."

Jamie initially came to the IDD program after completing undergraduate work in computer science. She said she chose this program so she could "use the computer without it being too technical." She also had a familial and personal background in education, but "didn't want to be in the classroom, so . . . I can get to teach but not like in traditional settings." In her previous schooling, she did not often work with others and considered the group experiences she had to be negative. In past groups, she reported that members divided the work, but then "[did] it incorrectly, so I just ended up at the end

having to do it all." However, she did report positive interactions in her previous Studio experiences. In one project, she chose to build an animated game because that was a passionate interest of hers. A desk critique from a Studio peer helped her form the vision for the game's goals and challenges. As she worked on that and other Studio projects, she reported receiving frequent helpful feedback from her roommate. In the end, she was honorably mentioned for the Studio Creative Interaction Award.

Despite these positive interactions, Jamie expressed concern that working in EDIT 6210 would be a difficult group experience. In fact, she had the lowest expressed desire for collaboration of all of the participants, with only one of her statements representing a desire to collaborate. During the first EDIT 6210 meeting, when the instructor asked for nominations for project manager, Jamie was silent (as were the other students). Eventually, the instructor nominated Jamie as one of the project managers. She accepted in part because she reported wanting to be "a part of everything," but she said she was worried about needing to motivate and "tell" people what they needed to do. She also indicated being reluctant to have a highly visible role, vowing at the beginning to not be the only one presenting the project at the final Showcase. "That's the one [thing] that I just didn't want to do," she said, a promise that she kept.

Jamie reported that she enjoyed her EDIT 6210 group experience more than expected. She mentioned in memos that "I'm really happy with what our group has been doing." According to Jamie, effective teamwork meant everyone in the group completed their tasks (40 coded statements concerned task completion and 21 statements concerned dividing work tasks within the group, her top two most frequently-coded categories). If the team members completed their tasks, she reported that they were successfully

collaborating: “Everybody contributed really well to the project this week.” “Nobody slacked off so it was a good week both for the project. . . . We worked well together collaborating great as a team.”

According to Jamie, innovation is inherently an individual exercise. “I think most of the things that we were creative with though was just . . . us working as individuals. . . . It’s just like within yourself, just different things that you felt would be creative.” She further stated: “I don’t think you can really help someone be creative. I think it’s either you are or you’re not.” However, while Jamie said in her memos that creativity in her team occurred through individual work, she often identified ideas that were generated through more collaborative activities. In all, 20 of her statements represented ideas gained in interaction with other Studio members (third-highest category), usually during their team meetings during Studio class sessions. These statements were usually brief allusions such as “Sarah and I, and we bounced ideas off of each other,” or “that was the usual collaboration that we normally do have where we meet and discuss each others' findings,” but she rarely elaborated in her memos on the significance of these interactions and their impact on the project.

During interviews, it emerged that deeper collaboration occasionally occurred that Jamie did not recognize. For example, she said that “I think most of the major decisions we kind of made it as a team.” Sometimes during these discussions her instructor or client participated as part of the team offering ideas. One example was an important brainstorming session where the team developed the project’s framework. Without content from their client, the team discussed possible design frameworks for the content once they received it. After one person suggested using a metaphor of a Russian 101 class

(their project was a tutorial for Russian summer camp attendees), the discussion evolved to using a book metaphor, to finally settling on a traveler's journal including video and written reflections from past travelers. "Everybody was just throwing different ideas out," Jamie said about that night's discussion. While the team had been hoping to receive the project's content before the night, in the end it was liberating to work without content, 'Which is kind of different when you have the content and you have to stick within the bounds. . . . We could run anywhere with it."

Later in the semester, other important ideas were developed through group discussions. Once, after receiving more video than they had anticipated, Jamie and one of her teammates decided to incorporate additional video into the project. The video was difficult to embed, though, and their EDIT 6210 instructor provided the key idea for embedding the video. Jamie also mentioned receiving feedback on her team's progress and then making improvements based on this feedback. She said, "we got a lot of good feedback at dress rehearsal" and "we all had an input on each task."

After establishing the design framework and developing the content, Jamie took on the task of designing the graphical interface for the project. "I must say this is my favorite part of system design!" She added, "When I was working on the various animations . . . there were moments when I would spend hours on it and not realize that it was actually hours that I was spending on it." While working on the screen design, she gathered ideas from Internet Web sites (eight coded statements), incorporated the ideas into her design, and then presented prototypes to her team for feedback. She also worked briefly on the animations with one of the EDIT 6200 consultants.

Despite these interactions with others, Jamie reported, “We worked on a lot of this stuff individually. . . . We never really worked on anything altogether as a whole.” And while she said that desk critiques were important to designing within Studio, she did not mention them as frequently as the other participants. The story of her semester was in many ways a check against the other case studies to determine how emerging patterns of collaborative innovation were applicable across participants’ experiences.

In her memos and interviews, Jamie most frequently mentioned focusing on task completion, divided labor-styles of collaboration, and generating ideas through Studio interactions. Most other COI categories were not coded frequently enough to be considered dominant themes.

CHAPTER 5

FINDINGS: CROSS-CASE COMPARISONS

Although individuals reported different experiences in Studio, several common themes emerged (Figure 5). Six patterns were found multiple times across participants, and were thus considered thematic: 1) collaboration, 2) ideas generated in interactions with others, 3) Flow, or engagement during design (including the subcategory of hacker ethic), 4) sense of community, 5) learning through critiquing other designs, and 6) autonomy or project entrepreneurship.

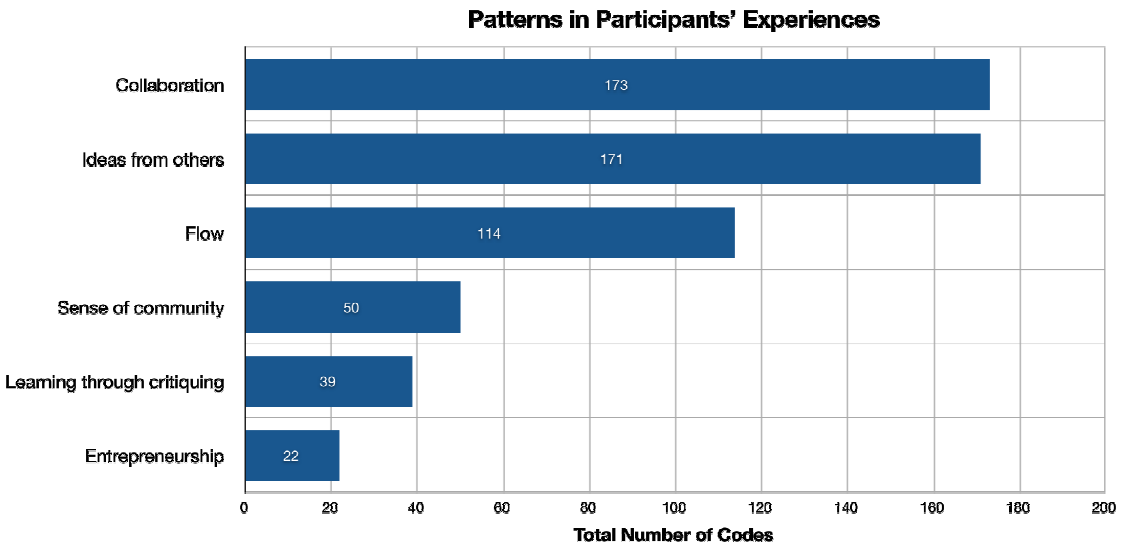

Figure 5. Patterns emerging across study participants.

Collaboration

All four participants reported that collaboration was crucial to developing their projects, although they defined collaboration differently and benefited from different

kinds of collaborative relationships. “Collaboration,” defined as repeated interactions focused on achieving a goal such as developing a project component or learning new skills, was evident in 173 comments. Comments were further organized into four subcategories: General collaborative patterns, being influenced by interactions with others, desires to collaborate, and mentoring for skill development and design. (Figure 6). These were the only common patterns across all four participants.

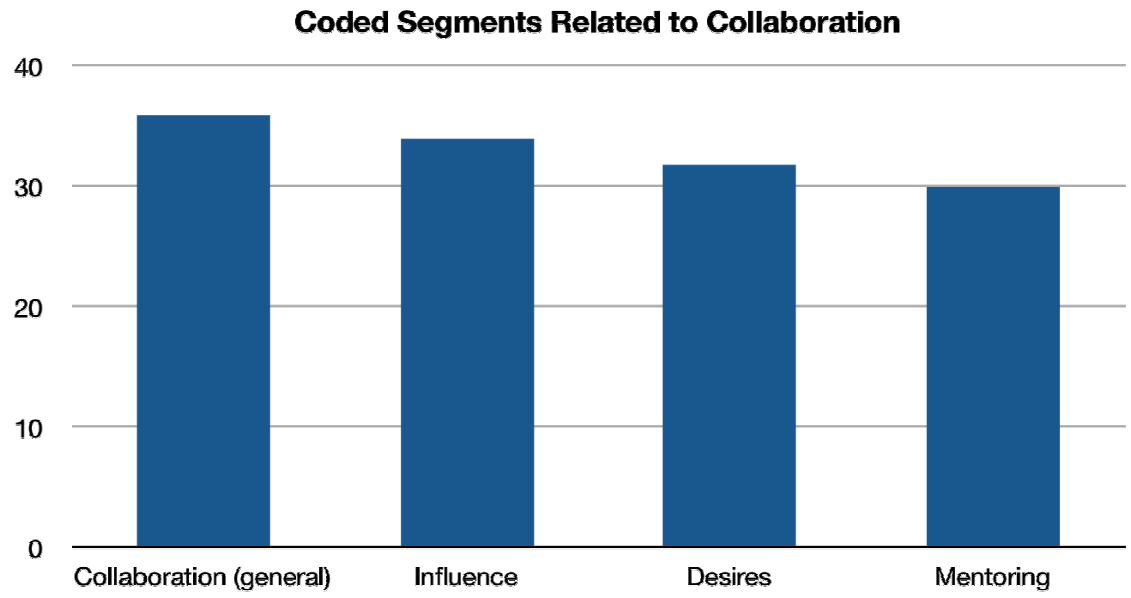

Figure 6. Collaboration patterns and numbers of coded segments.

Individual Collaboration Experiences

Each participant experienced and defined collaboration differently. Understanding how each participant perceived their interactions helps to distinguish between and among specific kinds of collaborations. Robin collaborated with EDIT 6190 peers during Studio class sessions and after their EDIT 6170 class (a non-Studio course). These collaborations revolved around project design ideas, including how to structure and

organize the main Web site template and minor decisions related to final appearance and usability. “It’s always good to bounce ideas off of people and to listen to other comments,” she said. Robin also sought assistance from family and friends, mostly while selecting the project’s content. She collaborated face-to-face, and most frequently reported being influenced by her peers in minor ways (9) although she occasionally noted mentoring (5), or more intense efforts to develop her creativity, project, or technical skills.

Boyd reported the strongest desires to collaborate: “I’m hoping to get a little feedback . . . about what may be the best approach.” Another time, he stated, “I’ve been messing around with it a little on my own, but . . . maybe someone else has the answer for me on this.” Boyd sought assistance from Studio peers and instructors often for both learning the technologies and developing ideas for his project.

Lori stated that traveling to Studio only when required limited her in-Studio collaboration. “I feel a little removed because I'm not near school and . . . literally the drive just about kills me to go there.” She also reported feeling “guilty” about asking her peers for assistance because “the ones I knew . . . were just slammed. . . . I’m not gonna start putting that kind of pressure on my friends that I know are just up to their eyeballs in everything.” Therefore, Lori did not collaborate often with Studio members. She expressed desires to collaborate and reported important interactions, including a prototype meeting with her friend and their instructor and working closely with her client to develop ideas. She reported being influenced by others in her design (12) and collaborating face-to-face and at a distance, and also reported a strong mentoring relationship with a mentor assigned to her by the instructors. Her mentor dedicated

significant time helping Lori to learn Flash and Dreamweaver and debug and improve her project (15 statements related to skill mentoring). In addition, Lori collaborated with friends outside of Studio to gather ideas, learn technical skills, and beta test her project. These friends included instructional designers, web developers, and teachers.

Jamie was the only participant working in a group, and thus interaction was imperative. As the project manager, she organized the group's work, where her disposition towards individual work was evident. The team followed an organized structure of meeting on Thursday nights to brainstorm ideas and make assignments; working independently during the week; and, when needed, meeting on Sunday evenings (synchronously online through technology provided by their instructor) to share work and provide feedback. She indicated that this structure was successful: "I am so excited that our group is able to produce great quality work independently and . . . come together as needed and work as a team." While this approach emphasized mostly individual work, the weekly team meetings provided opportunities to develop goals and ideas as a group.

> Say you're going to design a page and . . . we will all look at it and say, 'Well, it would be nice if you added this, took this away' kind of thing. So, like, even though it seems . . . we're working individually, it was just . . . to develop the initial framework so you have something to discuss [in the group].

Another time she mentioned, "Inside of our group . . . everybody worked together. . . . Everybody just had equal input." In her memos, Jamie rarely noted being influenced by others (only 4 statements) or being mentored (1), but during interviews described some of the team's most significant moments as collaborations. For example, when they developed the content and graphical design framework for their project, their client participated in the discussion. Another time, when struggling to understand how to incorporate video into the project, their instructor offered the solution.

Face-to-face versus online collaboration. Except for Lori, who collaborated with friends inside and outside of Studio through Web technologies such as Twitter, Skype, and email, collaborations were primarily face-to-face. Boyd described one example when he, Robin, and another Studio peer met after their EDIT 6170 class, set their projects up on three computers, and rotated offering advice:

> I like the process of the desk crit regardless, but when you're there in person and you can actually talk to somebody and they can point at things and you can get real, interactive feedback, it is really helpful.

Because he preferred collaborating face-to-face, Boyd valued opportunities where students worked on projects within the same classroom space. He explained:

> I didn't really correspond that much [through] email. . . . It was all really face-to-face as far as the design decisions and creativity goes. . . . It's just easier to do it that way because when we have two things in front of you it's just like a conversation.

In addition, Boyd's EDIT 6190 instructor required official desk critiques to be done in person.

Although Jamie's EDIT 6210 group met in person and online during the semester, she indicated that group collaboration was best when they met together physically. "Pretty much all the major decisions we made were made [in person] together." She later explained:

> Most times when you're working on something on your own and you're stuck with something . . . you have to wait to get an answer, but if you're working with somebody right there, you can just go over and get input. . . . I think it does help.

Jamie reported that the Studio policy requiring in-person desk critiques was important. "I think that's a good idea . . . because you're actually sitting there with the person, and you can actually elaborate on what you're actually thinking."

Influence From Others

The code "influence from others" did not represent major collaborations but rather interactions with a minor impact by pulling participants away or reinforcing a particular decision. This was coded 34 times. For example, Boyd explained that his desk critiques often did not provide new ideas but motivated him to continue in his chosen direction. "It helps make sense of what I've been doing and make sure I'm on the right path," he said. He also said, "a lot of times . . . I was thinking about doing that anyway. Somebody else just validated that I probably should go that direction." Similarly, Jamie said about her project's main screen, which she did not like at the moment: "I sent the design to the rest of the team and they seemed to like it a lot, so maybe I just need to take a break from it to see its true beauty." She decided to keep that design.

Robin reported that peers influenced the technologies she eventually used after talking to a friend and graduate assistant who encouraged her to learn Photoshop:

> A classmate of mine said, 'This is a powerful tool, and it's not as hard as you think'. . . . And [the graduate assistant] said, 'Photoshop . . . is the one that professionals are using' and that kind of had some impact . . . because then I decided, 'OK, I'm going to go back to doing Photoshop."

Lori reported others—particularly her client—influenced her layout and design choices, and Jamie said her client influenced their group's decision to use journal entries for every lesson.

Additionally, Boyd and Lori reported being influenced by others in determining how much work was expected. Boyd stated, "I think what really prompts all that is the . . . subtle sense of competitiveness. . . . You can see what people are doing around you." For example, when he attended the Showcase Rehearsal he said, "Pretty impressive across the board. . . . I still feel like I'm in a good spot right now, and I feel like [my

project] is pretty much showcase ready." However, a brief comment from the researcher about the workload of others worried Boyd that perhaps he was not busy enough: "I'm almost getting a little worried. . . . You said, we should be in the thick of the design, but I don't know. Maybe . . . my project's not up to par." Lori used comments from her beta testers to gauge whether her project was ready: "If two out of six people still don't think that the directions are clear enough, then it needs changing."

Desires for Collaboration

Statements that indicated seeking or wanting feedback, help, or ideas from others was coded as a desire for collaboration. Overall, 32 statements represented desires for collaboration, mostly made by Boyd (19) and Lori (11). Boyd often commented about "wanting" feedback on specific portions of his project and "hoping" to find help at Studio for design ideas and learning technical skills. Lori sought interactions with others while learning the software technologies, indicating that she wanted to check the online skills inventory provided by the instructors ("where people state what they're really skilled with") so she could tap that expertise. She also reported wanting additional feedback on her project development and frustration that she did not receive sufficient collaboration. For example, she voiced distress after an EDIT 6200 class where she presented her prototype but lacked enough time to receive feedback. Later in the semester she added, "If there is [anything wrong with my design], no one's telling me about it, and they need to speak up if I'm doing major things improperly. I'd like to know now." Robin indicated frequent collaboration with others and appreciation for that interaction, and Jamie reported that when she showed prototypes to her teammates and they approved her work

but she wanted more. “I would be like, no, dude, what should I change?” She also asked her friend outside of Studio for feedback.

Mentoring

Statements representing more dedicated, consistent, and one-on-one collaboration were coded as mentoring (30 statements). All participants reported some degree of mentoring, usually to support their technical skill development. Jamie recalled her instructor’s support in embedding video. Robin described the Photoshop mentoring provided by a Studio friend: “When I first started using Photoshop, I went to her a lot.” In return, Robin helped her friend to learn Dreamweaver. Boyd likewise received one-on-one technical support from Studio instructors and graduate assistants, particularly when few students were available: “going up to the Studio this week even though there wasn't class . . . gave a little more one-on-one time not only between myself and the instructors, but also . . . with my classmates.”

Among participants, Lori reported the highest degree of mentoring as she developed technical skills. Although Studio instructors assign all EDIT 6190 and 6200 students mentors, Robin and Boyd reported little help from them. Lori, in contrast, had a dedicated mentor with strong technical skills. Lori reported being “really, really excited [about] my mentor . . . because . . . her work quality is just amazing. . . . I got a tremendous amount of help from [her].” Lori considered her mentor’s feedback to be invaluable because “she's been through it [before].” Lori was also mentored outside of Studio: “I had a lot of trouble with my layout, until I got help . . . through my mentor and a friend who is a web designer.” She reported similar support from her instructor and a graduate assistant.

Generating Ideas Through Interaction

When a participant reported a new idea for their project, the idea was coded as either originating from themselves, others, or materials such as textbooks or tutorials. Although this was self-reported data, it was used to tentatively identify the perceived origins of their ideas. In general, participants reported receiving ideas from other Studio members (134 coded statements, see Figure 7), and from connections outside of Studio (37 statements). Participants also drew ideas from assigned textbooks (8 statements) and from searching on the Internet (41 statements).

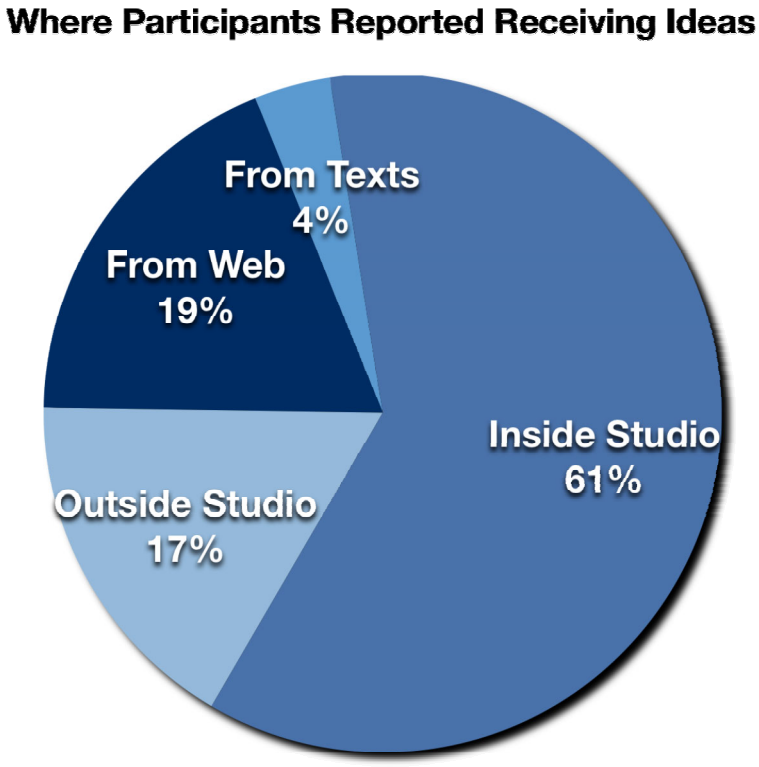

Figure 7. Summary of where participants reported receiving ideas.

Ideas From Studio Members

Students frequently mentioned receiving ideas from their peers, instructors, and clients within the Studio community, representing 61% of the total number of codes. Some ideas were related to technical issues and learning new technologies. Lori, for example, learned from another Studio member how to convert a Word document to a Web page. Boyd learned from a graduate assistant how to create a Dreamweaver template for his project.

Most ideas were related to minor design changes, usability issues, and aesthetic improvements. Robin eventually changed the entire template for her project because Boyd, in a desk critique, questioned the viability of her previous design. She reported, "People were looking past the visual and saying, well, you know, whose audience? Who will be able to use this? So, I really enjoyed that type of critique."

In return, Robin and others offered ideas to Boyd about adding interactive elements to his Web site and improving his font and color choices. Boyd noted,

> I received some really great feedback, . . . which led directly to changes in . . . colors, background, content, and also [other] great ideas that I'm going to work on this weekend. . . . I think that every comment has enhanced both the design and usability of my site.

Because of the changes based on ideas from his peers, Boyd revised "version 3.0" of his Web site and said again that, "The changes that I made were really based completely on desk crits." Boyd posted many of the desk critiques in his online design journal. Interestingly, while he and others reported that feedback provided face-to-face as required by the instructors was related to design, audience, organization, and other big issues, Boyd's written desk critique comments received online focused on small technical and design issues, such as simple usability errors.

Jamie received ideas from peers about her project's appearance and the placement of pictures and animations, and Lori spoke about receiving advice to make her animated guide "less goofy." In addition, Lori accessed a Web site she found on her Studio friend's design journal that prompted an idea for making her animated guide more interactive.

Participants also received ideas from peers that yielded improvements to their entire project design. Robin explained that when working on her own, it was "minor stuff" but when she went to Studio "[I] knew I was going to get probably an idea." She described being able to brainstorm ideas regarding her own and others' projects:

> You would throw out a pebble and like ripples other people would . . . come back and say, "Well, what about this?" . . . Somebody's going to have an opinion about something. They . . . don't just think it looks nice. They're going to talk about it a . . . a little bit more in depth.

Robin noted that this made Studio "more creative for me." Similarly, Lori identified major direction shifts for her project through ideas generated during collaborative discussions with her friend and also her Studio instructor. In addition to the minor design improvements, Boyd also indicated receiving important design ideas from peers for the content and structure of his project. He reflected:

> [Studio] participants begin to see that self-directed learning is not about "going it alone," but instead about making choices . . . [from] social learning activities with peers and instructors. A lot of my decisions regarding project changes and contents have been born out of social episodes of criticism [desk critiques] and review [dress rehearsal].

Ideas From Outside Studio

To varying degrees, participants also drew on inspiration from friends, family, and even strangers outside of Studio, representing 17% of the ideas mentioned. For Robin and Boyd, the feedback was relatively minor. Robin reported gaining ideas about the content for her project; Boyd received advice on color choices and other design issues

and technical advice from a friend who had taken EDIT 6190 in the past. Jamie recalled receiving "a lot of input from friends just to find out like how does this look? What do you think? Is this needed?" In addition, Jamie and her team gained ideas from their content providers—the students attending Russian summer camps. One time, Jamie said that they were recording videos for a section of the project, and one video portrayed a student telling a humorous story about language mistranslations. While this may not have seemed like a useful piece of information, Jamie explained, "We hadn't intended to use video for the communication section but . . . now we're going to use that for the [introduction to the] communication section."

Lori received the most ideas from her out-of-Studio network. She often asked for assistance from individuals with specific expertise, including a neighbor in information technology and friends with expertise in instructional design and web development, to overcome technical and design hurdles. She also sought advice from people on the Internet she had never met in person. For example, one time she said she "was just pulling my hair out" over a technical hurdle and

> So, I just put a question out to Twitter . . . and like five people replied back within five minutes. And one guy was just like, add me to your Skype, I'll walk you exactly through what you need to do. And sure enough it was fixed in like 10 minutes.

She also solicited beta testers on Twitter and received some detailed and helpful feedback.

Ideas From The Internet

Participants reported gaining ideas from the Internet 41 times in their memos and journals, representing 19% of the ideas reported. Robin reported "online investigating" and "inspirational research" to refine her original idea to do digital scrapbooking ("I went

online and just so happened to fall upon . . . a leading designer in the ‘digital scrapbooking’ movement. . . . I was hooked!”). She also used the Internet as the primary method for learning Photoshop, especially through online tutorials. “You can think of any idea or look and go on the web and find a Photoshop tutorial to learn how to do it.” She also relied on a Web site for “ideas for using brushes in Photoshop to make your whole page look different. . . . they show how many of their users can create totally different pages with the same layout.” Speaking specifically of a different digital scrapbook site, Robin found that these online resources helped to “jumpstart [her] creativity.”

When Jamie initiated her group’s main template design, she first searched for ideas on Web sites with similar designs to what they envisioned and that “were just plain cool.” She planned to identify 10 Web sites and “take elements from each of them, incorporate them with the ideas of the team, and form our own unique design!” After completing the project, she said, “the site that we have is just stuff we took from a bunch of other sites.” Similarly, Boyd began his design by mentally envisioning his project before seeking examples on the Internet so he would not be influenced prematurely. Then he gathered ideas from sites similar to his own to create his project’s framework. Boyd summarized this theme by saying, “Obviously the web is just chock full of ideas.”

Flow

Flow was coded as situations when participants reported being completely engaged to the point of losing consciousness of their surroundings and time, in part because they felt competent to complete the task, understood the bounds and rules of the activity, and found it personally enjoyable. Participants mostly reported experiences indicative of individual flow (30 statements), although they sometimes discussed group

flow moments (12). Hacker ethic, a proposed subset of flow, was also coded 72 times and added to the Flow category. Combined, this category was the third most prevalent theme across participants.

Robin reported engaging in flow often as she worked on her projects. She reflected,

> I was kind of working *in that zone* yesterday, and I woke up and I had spent two and a half hours just on Photoshop *playing* with a page to make it *make good, or appealing* to me. [Italics added to emphasize phrases that describe flow.]

During a project work day, Robin exclaimed, "I could see myself get sucked into playing with this for a while," while another time she remarked not only having fun but learning. "I have learned so much and have had so much fun doing so!" This was because she said "Photoshop tutorials on the web are a bit addicting, . . . [I can go] overboard learning fun and interesting Photoshop techniques." She reported similar experiences with Dreamweaver and web design.

Boyd also reported flow-like experiences while learning the technologies: "You get lost in the flow . . . and so that does happen a lot it seems," he said in his final interview. Boyd described himself as working "intensely" prior to his performance review and able to accomplish more during Studio class time because he was more devoted there, perhaps because of the instructor's emphasis on having many work days free of distractions or activities with himself serving more as a consultant. Reflecting on learning computer coding, Boyd said that

> I'm a dork like that. I like digging into the code and . . . learning what effects what and so *I would just get lost in that*. Of course, my job duties suffered because of that but . . . (laughter) . . . that was one time when *I got absorbed in that* [italics added].

He also recalled flow instances while learning a different coding language and while developing the Web pages and content as he finished an "avalanche" of work during one week riding the "adrenaline" from Showcase Rehearsal. In interviews, Lori and Jamie indicated they had flow experiences as well. Jamie said,

> I think for me it did [happen]. . . . I was working on the various animations. . . . There were moments when *I would spend hours on it and not realize that it was actually hours* that I was spending on it. So, there were . . . quite a few times that I experienced that [italics added].

Similarly, Lori said,

> It probably happens to me a lot more than it happens to some others because I'm pretty much at it all day. I don't have to go to a different job—this is it. So . . . *all of a sudden, you look up at the clock and you're like, oh, I missed lunch*. It's almost dinner time.

Jamie, a member of an EDIT 6210 team with reportedly good camaraderie, experienced some situations of group flow. Early in the semester, when they had not yet received the content from the client, the group discussed design possibilities without regard to specific content. Mary suggested a course-like approach to teach potential Russian camp counselors, calling it "Russian 101." Another team member improvised this idea and suggested a book-like design, which spurred Jamie to recall previous Studio projects and Web sites that employed book-like approaches. She suggested a journal to illustrate the journey of previous students which they ultimately implemented. By listening attentively and building from each other's ideas, group flow yielded the eventual design and much of the project content.

While not working in an assigned team, Robin and Boyd also reported group flow as they gave or received desk crits. Robin identified moments where the conversation

engaged multiple people in solving a design problem: “it was just other people’s ideas that kept on bouncing and bouncing and bouncing and bouncing.”

Hacker ethic, as distinguished from flow although related to it, was coded when statements described the participants’ work as interesting, involving high levels of enthusiasm, playful, or completed because of a desire for quality or satisfaction rather than a grade. All four participants described their projects accordingly, although Jamie least so (6 coded statements compared with an average of 22 statements for each of the other three). Robin and Boyd discussed being highly interested in their projects due to the freedom to choose their own project and referenced their instructor’s advice to choose projects based on their “passion,” “entertainment,” or personal importance and “not just for a grade.” Thus, among three possible projects, Robin selected one related to her role as mother because it was the personally meaningful: “I hope to create something that is meaningful and also a tribute to my daughter,” she said. Her desire to do this project helped her overcome her technology intimidations:

> To create digital scrapbooks, I will have to embrace . . . Photoshop. I have had this program, in multiple versions, on my computer for over five years. I am quite intimidated by its interface and its power. I am ready now to break that fear . . . to make something . . . meaningful.

Interestingly, as Robin became so driven to master Photoshop she lost sleep, she tackled advanced features outside of her learning contract, and reported being preoccupied with the software. “Photoshop has consumed my life. . . . I can admit that I woke up in the middle of the night (twice!) and started clicking away on the program to see what I could create.” Even at the end of the semester, Robin was enjoying the work so much that she dedicated many hours in the waning days to learn a new Photoshop skill while producing her best page of the whole site. “I was learning new stuff on my last

week," she said. "Cause I had thought it would look cool . . . because that was the page that I loved the most."

Whereas Robin's immersed herself in mastering the technology, Lori reported being excited about learning new technologies even though she was not fond of her project topic—summer camp. "I was showing this to my Mom and Dad . . . and they said, 'You hated camp.' . . . [but] it's not about camp. . . . I'm making technology work in an instructional fashion. That's where I get off." Lori went beyond what was required for her project, including learning Flash, developing a splash page, and involving varied design elements. "After careful consideration, I have decided to create more work for myself!" This immersion occurred several times during the semester.

Boyd described being excited about his subject material (a personal hobby) and learning the technologies, reporting, "I'm considering doing some video. Even though that wasn't part of my contract, I think it would just kind of help round out the site." He also noted, "getting caught in the tiniest of details" in his quest for high quality.

Jamie rarely described her project with enthusiasm. She was asked—and agreed reluctantly —to be the team's project manager. However, when she began working on the project's screen design, which was her assigned task in the group, enthusiasm became evident in her memos. "This makes me very excited and I just cannot wait to see what we will come up with." When designing the screen template, Jamie described the desire for quality (making it look "more professional") and excitement to see the finished project ("I can't wait to see the progress") consistent with a hacker ethic.

Sense of Community

Sense of community was coded a total of 50 times (fourth most prevalent). Participants indicated being emotionally or psychologically connected with, trusting, receiving support and encouragement from, and feeling friendly with their Studio peers. [Note: Although collaboration could be another indication of the strength of a community, I coded collaborative events separately to allow specific analysis of those interactions.]

Robin and Boyd noted a greater sense of community than Jamie and Lori. As Robin explained, "The Studio created a safe environment of camaraderie that allowed you to open up your projects for review and criticism and not feel anxious about being shut down." Robin described being able to relate to other Studio members and "talk and vent with other people who are going through the same process." She described how Studio "encouraged the idea [that you] should look at other people's work and see what they're doing and maybe help them if they're stumped to come up with some ideas."

However, Robin qualified her statements by reporting the community existed within only one course—her EDIT 6190 course—but not between the different Studio sections. She was the only participant to indicate this. "I don't feel like it was there between all three classes as a unit. . . . The first 15 minutes, you know, we would get together but we would still kind of be huddled together at our spots." Robin often met with her EDIT 6190 peers outside of class to share desk critiques and ideas. In addition, she emphasized the personal importance of coming to Studio to "plug in" to ideas in her "creative corner."

Boyd, another member of EDIT 6190, also reported a sense of Studio community that went beyond his specific section. “Everybody knows what everybody else is going through and everybody else knows that we can rely on each other for help. That’s understood almost implicitly from the beginning.” Boyd noted that the Studio community as designed by the instructors was particularly able to support innovative thinking. “It forces people . . . like myself . . . to step out of the box a little and start thinking in different ways about how to do things.” In Studio, Boyd noted the trust needed for effective design feedback, stating “It's hard to separate yourself from the artifact”, but

> once you become comfortable with that process and can separate some of the emotion from it, then I think you realize there is a greater community of people involved even though this is a self-organized learning environment. The "we're all in it together" mentality begins to take shape, and that community becomes a readily available resource of support.

Lori and Jamie each reported feelings about the Studio community, although their actions at times seemingly contradicted their perceptions. Lori, for example, reported her experience in EDIT 6190 in the summer as “cliquey.” She indicated this negative start to her Studio experience, coupled with her long commute (“the drive just about kills me”) and concern over bothering other students deterred her from seeking help from help. Similarly, Jamie remarked that while she perceived being part of the Studio community in the past, “With a group project it’s kind of like you’re detached from everything else that’s going on in the Studio because you’re . . . working within your group.” Consequently, she said, “We didn’t really work as closely with our consultants as we wanted to. . . . Outside of our group we didn’t really have much impact from anyone else.” Although both reported this lack of community, Lori and Jamie each sought and

received help that proved critical to their projects. Thus, it appears that their sense of community may have been stronger in practice than they believed.

Interestingly, the participants did not often mention the instructors when discussing the Studio community, although they sometimes mentioned going to instructors for technical or design advice. The instructors played a key role in establishing the Studio community by organizing social events, design discussions, and open time for giving feedback, but perhaps because the instructors' chosen roles were to develop the community without being authoritarian or obvious, this was not something that the participants commonly mentioned.

Learning Through Critiquing

Learning through critiquing was coded when participants indicated learning or gaining insights from the peer feedback process or from evaluating other artifacts, and it was coded 39 times (fifth-most prevalent theme across participants). For example, Lori mentioned that she and a friend sat in on each others' prototyping meetings with their instructor. During the discussion of her friend's prototype, Lori contributed advice that caused her to reflect on her own project: "In just some of the things I suggested to her I was like wait a minute, I could be doing that for my project." She further observed, "so much more happens when you can actually sit and talk about your project."

This learning for both parties (those giving and receiving the critique) was often stimulated through the discussion of the design during a desk critique. Robyn and Boyd engaged in interactive discussions with each other and another EDIT 6190 member. Later, Boyd reflected that learning in Studio was effective because, "We are learning by making, interacting, evaluating, etc. We are not just listening to someone lecture every

week and digesting that information. We are creating our own products and helping others with their process as well. A very dynamic system." Boyd said he looked forward to the Showcase Rehearsal and the Showcase itself so he could engage in design discussions. Robyn wrote in her design journal that she planned "to search through colleagues' pages as well as other Web sites to try to figure out the design of my page." She then quoted Nelson and Stolterman (2002), "It is also possible to develop design skills by critiquing existing designs" (p. 217).

Entrepreneurship and Autonomy

All participants indicated that Studio enabled them to become innovative by allowing autonomy in selecting and designing projects. Boyd remarked, "It [Studio] lets you have your own goals not compared to somebody else" and "they really give you free reign."

> You have control over the tools you're going to use . . . and the learning design and learning theory. . . . I mean, you have creative control over a lot of that. So, really the only thing that can impede you . . . would just be your own limitations.

Robin agreed that Studio promoted autonomy and fostered creativity: "The fact that everybody was working on something totally different allowed you to . . . be creative with what you were doing." Jamie explained that because her client did not have clear expectations for the content and structure of the project, her team "had the liberty to basically do what we wanted, it helped us. . . . So I guess it does foster creativity in that way." Robin selected her project (digital scrapbook pages) because she wanted to document her daughter's first two years, and she noted feeling a loss of control with traditional scrapbook supplies:

> As soon as I put an item onto that page, I felt as if I had lost control. What if later, I wanted to move the picture, the text? . . . I couldn't decide on the layout because I wanted to have the flexibility of changing it.

Lori described autonomy helping her professional growth. "I am very interested in treating this project like it is a client for whom I'm contracted with and created a full project management plan or outline." Boyd stated that the Studio instructors provided a "safety net" for students to fail and receive help if needed, but it was "up to you between point A and point B to use that time wisely to create." However, Boyd ("I've spent a great deal of time mulling over the design"), Lori ("[I'm] in a state of confusion"), and Robin ("paralysis caused by a lack of plan") also mentioned struggling with individual autonomy due to a lack of vision for how to produce their project.

In summary, common experiences of all four participants included collaboration patterns, ideas generated through interactions with others, flow and hacker ethic, learning through critiquing, and entrepreneurship. These patterns were reported through participant voice memos, journals, and interviews, as well as researcher observations, and have implications for how the community structure can influence innovation.

CHAPTER 6

DISCUSSION

This study was an exploratory investigation into the nature of a potential Community of Innovation (COI) among graduate instructional designers participating in a unique lab structure that emphasized design innovation and community building between three different courses. This setting was used as a potential representation of a COI because of the expressed intents of the instructors to design the courses according to some COI elements such as flow, entrepreneurship, and collaboration.

The COI framework was originally developed by comparing theoretical frameworks found in the literature on social learning/work and psychological creativity, and extracting common elements. The resulting constructs thought to influence community innovation included dynamic and improvised expertise, shifting roles, learning by creating, fluid knowledge, group flow, entrepreneurship, symmetrical expertise, hacker ethic, member diversity, and group reflection. Many of these elements had been researched as independent constructs, but had not been explored as part of a framework on innovation within a community. Other elements lacked a research foundation and relied on theory. The purpose of this study was to understand whether these elements were evident in this community of graduate student designers, how the elements were described in relation to each other, and their perceived impact on innovation. In this chapter, I first describe the COI elements in the context of this study;

explore new themes for the framework from the data; discuss COI elements that were not found in this study; and then share study limitations and implications.

Flow and Hacker Ethic

Flow and Hacker Ethic, elements from the proposed COI model, received the most supporting evidence in this study. Csikszentmihályi (1990b) described flow as "optimal experience" or the situation when during work or play people feel completely engaged to the point of losing consciousness of their surroundings and time, in part because they feel competent to complete the task, understand the bounds and rules of the activity, and find it personally enjoyable. Csikszentmihályi's former student expanded the concept of flow to include groups engaging in optimal collaborative experiences (Sawyer, 2008).

In comparison, Himanen and colleagues (2001) described the hacker work ethic as working on projects that are *interesting*, doing so with high levels of *enthusiasm*, and even finding work to be *playful*. From the literature and this research, I interpret flow as an experience that happens to people, whereas a hacker ethic is something innate to a person that the person brings to an experience. Data in this study supported this distinction, but participants often indicated that both existed simultaneously. This provided evidence that these two elements are connected, with hacker ethic existing as a requirement for flow. In order for flow to occur, data indicated that the students needed to exhibit a hacker ethic-style of motivation and have an environment structured to encourage flow.

One obstacle to flow in educational settings is focusing on task completion because of grades, which can divert emphasis away from innovation and discourage a

hacker ethic approach to learning. Benton and Giavagnoli (2006) wrote that COIs needed freedom from mandated deadlines, goals, or imposed leaders because these communities focus on innovation over efficiency. In higher education, where courses are marked by semester deadlines and graded work, flow can be hampered. The context for this study was selected because the instructors allowed students to choose their projects and many deadlines. Still, participants recorded many instances of focusing only on task completion, instead of innovation (67 statements). Promoting student autonomy and encouraging hacker over grade motivation, or changing grade structures, might help to encourage more flow and innovation in educational communities.

Entrepreneurship

Entrepreneurship, an element from the original COI model, was the next most often coded element. Entrepreneurship in a COI is the ability of members to be flexible in first adapting their work and ideas to changing problems and opportunities (Banahan & Playfoot, 2004) and then implementing these ideas to add value and novelty to an organization (Coakes & Smith, 2007). A key finding was the necessity of the environment allowing community members control over their work. Even during interactions with clients with predetermined needs, this proved important as one group's innovativeness was attributed to the control their client gave them over the project. Enabling this personal control, however, also engendered a mental paralysis among some participants as they struggled to create the vision for the projects, presenting a potential barrier to innovation. Participants found that models, theories, and ideas from other Studio members and instructors helped them overcome this mental block. Thus, it appears that the ideal design of a COI would scaffold members' entrepreneurial spirit by

allowing control over their work; ideas, options, and support as they developed the preliminary vision; and encouragement as they develop and implement their ideas.

Dynamic Expertise

The COI element, Dynamic Expertise, also generated limited supporting evidence. Typically, researchers have characterized expertise as becoming "outstanding" at accomplishing a particular task (see, for example, Ericsson & Smith, 1991). Hakkarainen et al. (2004) noted that many studies on expertise have been cross-sectional, measuring expertise by presenting problems that were challenging for novices, but easy for experts. Consequently, the data appeared to indicate that expertise involved the ability to solve some problems routinely. However, in dynamic and fluid organizations like COIs, expertise, and the problems experts need to solve, are ever-changing. Expertise involves never being too comfortable with one's abilities but progressively pushing to the edge of one's competence to solve new and challenging problems. COI expertise includes the ability to improvise new solutions from the ideas of others or from past experience; in other words to "be able to continuously expand one's current cognitive competencies" (Hakkarainen et al, 2004, p. 37).

In the current study, Robin indicated an inclination towards dynamic, adaptable expertise. She entered Studio with some design and technology skills (Dreamweaver and PowerPoint, for example), but the nature of her project required that she gain expertise in new areas that she later demonstrated in an award-winning project. The remaining participants, however, only presented limited evidence for this theme.

Nature of Community

This study informed understanding of three aspects of the community structure in a COI: Collaborative idea generation, psychological safety, and observation/improvisation. In Studio, the COI instructors' chosen roles were to implicitly facilitate the social structures to allow community to emerge rather than to explicitly control or dictate. For at least two participants, collaboration was critical for generating ideas during pivotal points in the projects. Robin, for example, identified her "aha" moment when she discussed her project with Studio peers or participated in a Studio workshop, and Jamie reported that her team's main design decisions were generated as a group during team meetings. The ability to share ideas and collaborate effectively seemed to depend on the psychological safety within the community, which Rodgers (1954) indicated fostered creativity. For Rodgers, psychological safety is acceptance of the individual, lack of external evaluation, and empathetic understanding. In my study, the participants reported feeling safe in sharing and critiquing project prototypes and ideas because these critiques were perceived as constructive and non-judgmental, perhaps because of the instructors' coaching in how to give effective feedback. This sense of safety was critical because all participants except Jamie (who perhaps was more confident because she was in her final Studio course) indicated they lacked confidence in their technical and creative abilities. This psychological safety is related to Sawyer's (2008) definition of group flow and innovation, which he said required frequent failure. By creating communities where participants feel safe in exploring, sharing, collaborating, and failing, innovation within COIs is more likely to emerge.

Findings also indicated that being able to observe and improvise others' ideas impacted innovation. Participants frequently reported observing others and then improvising to create their projects. For instance, Lori based her design on Jamie's project, who had developed her idea from websites. Robin and Boyd reported similar sources for some of their ideas. This points to the importance of enabling opportunities for community members to observe each others' work, but perhaps more importantly to bring in ideas from outside sources. Otherwise innovation may stagnate as members improvise and imitate each other.

Finally, participants rarely mentioned interacting with instructors except for technical assistance or design advice. However, observations, interviews with instructors, and the Studio handbook suggest that the instructors intended Studio to facilitate collaborative idea sharing and psychological safety. This was also evident from instructors' comments during large-group sessions. Two of the three instructors repeatedly emphasized the importance of peer critiques, mentoring, and collaboration. On another occasion, two instructors emphasized prototyping and sharing of early prototypes within class sessions. In this community, the role for the instructor seemed to be to explicitly design the COI, but implicitly guide student innovation through activities, structured peer collaboration, and feedback.

Several aspects of the instructors' personal pedagogical theories and practices appeared to influence the participants' experiences. For example, Robin and Boyd frequently mentioned desires to pick projects they were personally passionate about so that they could experience flow, a concept emphasized by their particular instructor. Similarly, the participants' desires to seek peers with particular skills may have been

motivated by instructor's emphasis on the online skill inventory, where students described their skill sets. Effective peer critiquing may have been prompted by whole-group discussions on how to give effective feedback. In these and similar ways, the instructors, though not explicitly controlling class activities and not being identified specifically by Studio participants, appeared to influence the development of the community.

In articulating the Communities of Practice framework, Wenger (1998) proposed that the *community* aspect of the framework consisted of mutual engagement, joint enterprise, and shared repertoire. A similar framework articulating the community aspect of COIs needs to be refined, but the four characteristics (collaborative idea generation, psychological safety, observation and improvisation, and facilitator instructor roles) discussed in this section outline a few first principles.

Learning Through Design Criticism

Though not included in the initial COI framework, participants often reported learning through design criticism. This involved both receiving ideas from critiques on individual work and by critiquing the work of others. In the community of practice model, learning purportedly occurs through engaging in activity within the community—the knowledge is embedded in the community's actions (Wenger, 1998). Perhaps some knowledge about innovation and design is embedded in the critiquing process within a supportive community. By learning to critique designs, COI members can develop knowledge "about" design in addition to just knowing "how" to design (Nelson & Stolterman, 2003).

Idea Prototyping

Participants discussed the importance of prototyping ideas to facilitate idea generation through observation and improvisation. However, the evidence for including this element in the COI framework is still tentative (13 coded statements in this study). This concept is supported by models of rapid prototyping, which is an approach to design that emphasizes a "rapid, iterative series of tryout and revision cycles . . . until an acceptable version is created" (Baek, Cagiltay, Boling & Frick, 2008, p. 660). Often, rapid prototyping involves users in testing the product, but this study indicated that it was also necessary for engaging members of a COI in developing innovative ideas. Participants suggested that prototyping might be most influential when it begins early in the design process and when sufficient to facilitate one-on-one or small-group discussions about the prototype.

Reexamining the Formative COI Framework

Not all of the theorized COI elements were evident in the data. Participants did not report (with regularity) several proposed elements: Developing fluid knowledge and expertise that could be adapted to other contexts; feeling that expertise was symmetrical within the community; reflecting as a community; shifting interpersonal roles within the community; or benefiting from any cultural, educational, skill, or other type of diversity. There are many possible explanations for why some of these elements were not supported by the data, including my coding definitions. For example, I defined community reflection as focused on learning from previous successes or failures, in order to separate these discussions from other group conversations about current design decisions. Thus my definition may have eliminated what other researchers characterized as "group

reflection." This could also be the case with other definitions, suggesting alternative explanations for why some elements were not supported in this study including limitations of the data collection methods and participants' abilities to recall and describe their perceptions and experiences in ways that corresponded with my tentative framework elements.

However, based on the findings that were supported by the data, the COI framework can be tentatively revised to differentiate original elements that were strongly and weakly supported by evidence, new elements supported by the data, and those original elements that were not supported by the evidence in this research (see Figure 8). This distinction is helpful for designing and researching COIs, as it creates priorities for emphasizing specific elements in a given community.

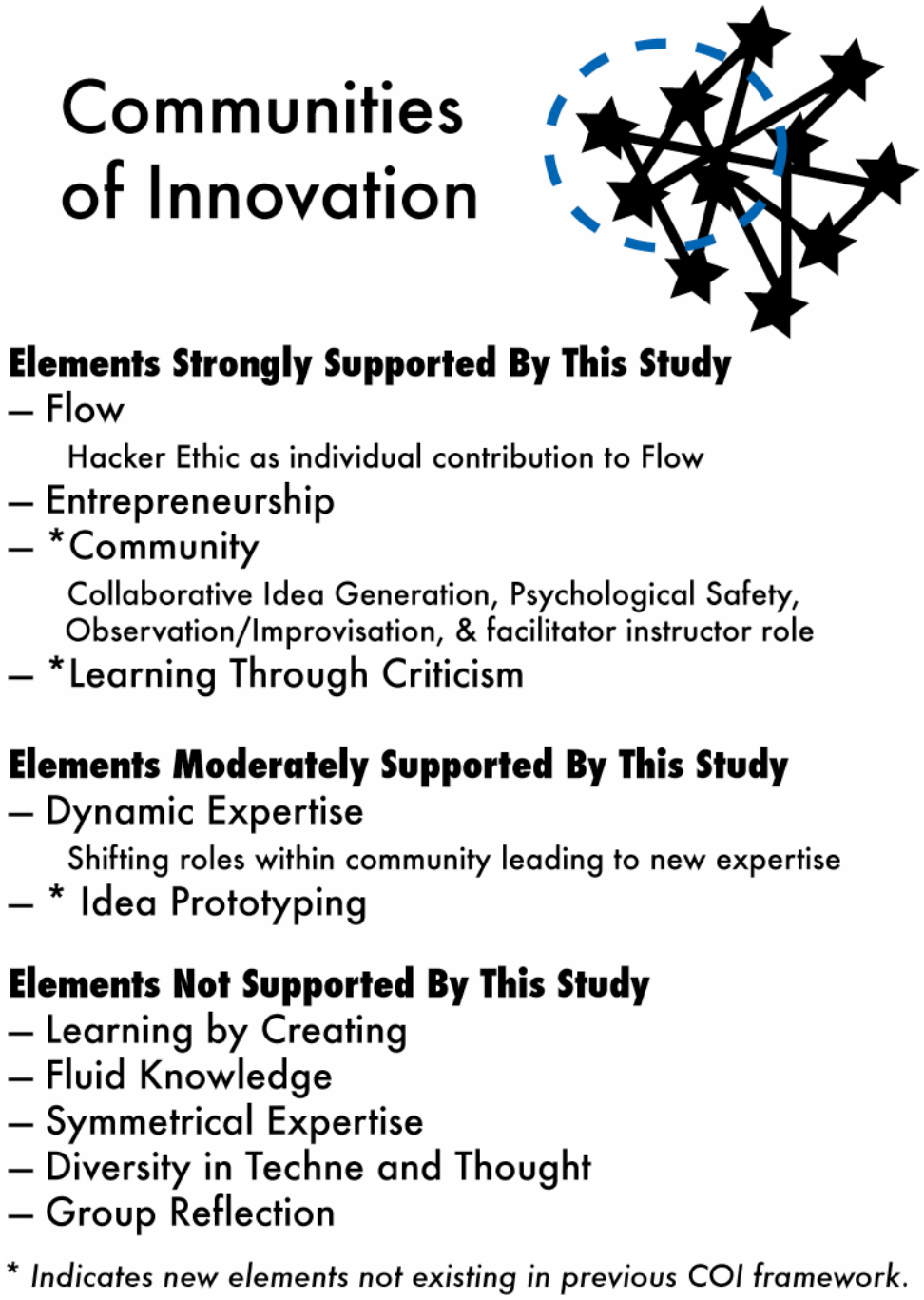

Figure 8. Reexamined Communities of Innovation framework.

Challenges to Implementing a COI

From this study, several challenges to implementing a Community of Innovation in an educational setting were evident: Lack of time and focusing solely on tasks, lack of prerequisite skills, and superficial collaboration outside of a tight peer group.

Lack of Time and Focusing on Tasks Instead of Innovation

A major challenge to innovation, according to the data, was a lack of sufficient time. In addition, course requirements led the participants to focus on simply completing tasks instead of considering the most innovative or effective way to produce their projects. This problem was sometimes compounded by delays in receiving subject materials from clients. Time pressures likely limited participation in the Studio community and opportunities to pursue innovative ideas.

Lack of Prerequisite Technology Skills

Another impediment for the students was their lack of technology skills, particularly for Boyd and Lori who had innovative ideas but could not develop them due to limited technical skills. Thus, while Hakkarainen et al. (2004) noted the importance of dynamic expertise that is adaptable to changing problems, there appears to be a need also for domain-specific expertise as a prerequisite to innovative collaboration and improvisation.

Superficial Collaboration

Participants reported receiving ideas, social support, and feedback from peers, but this support was usually superficial unless it came from a member of their close peer group. The clearest example was Lori, who described working closely with a dedicated and skilled mentor, but reported almost no collaborations with anyone else. Robin and

Boyd did not have dedicated mentors but instead formed a group with studio friends that provided quality feedback and support. Like Lori, however, they collaborated little with anyone else. Jamie worked closely with her team members, but reported little interactions outside of her team. Thus, COI support and collaboration may impact innovation only among members of local, helpful peer groups within the community. If so, connecting community members with "innovation champions" (Coakes & Smith, 2007) or developing expert networks (Hakkarainen et al., 2004) may prove especially important.

Design Implications

The findings in this study indicate potential implications for designing COIs, particularly in educational settings, and for improving courses organized after the Studio model. These implications are preliminary and limited in their potential for other settings, as they are based on the experiences of only four participants within the unique Studio context. I have organized these implications according to the elements of the COI framework that were strongly supported by data in this study. I also provide recommendations for implementing the Studio.

Flow

This study identified flow, and its subset hacker ethic, as a key element to promoting innovation within a community. Csikszentmihályi (1990b) said that flow is best encouraged when there are clear, attainable, but challenging goals; complete concentration; direct and immediate feedback; personal control over the task; and an intrinsically motivating task. Sawyer (2008) added that for group flow to occur, there needs to be a shared goal, close or deep listening to each other, blending of individual egos, equal participation, members' familiarity with each other, constant communication,

elaboration of each others' ideas, and learning from failure. Designers of COIs could enable these conditions through various approaches including:

1. Scaffolding COI members to develop their project goals early in the process. In this study, participants reported a creative paralysis until developing their vision for their project.
2. Encouraging more side-by-side, synchronous working. Deep listening seemed to be more likely to occur in Studio when members felt synchronously "present" with each other, whether through required project/class sessions (in the case of Robin and Boyd), face-to-face team meetings (Jamie), or through Internet tools that created the appearance of being "present" together at the same time, such as Twitter and Skype (Lori).

Entrepreneurship

Having a sense of autonomy or entrepreneurship proved important for innovation in this study. This kind of structure is difficult to achieve in an educational setting where standards must be met, grades given, and novices taught skills for the first time. Some structure is important, especially for newer students who might only be given autonomy over smaller tasks, but could be removed as students develop, allowing more opportunity to select projects, goals, and activities.

Community and Learning Through Criticism

Researchers have made many design recommendations for developing psychological sense of community among students. To develop a community focused on shared innovation, this study suggests a few additional recommendations. Participants found that encouraging students to constructively critique each others' work allowed for

ideas to be generated collaboratively. Requiring students to conduct these critiques, but allowing them the freedom to complete them when they felt prepared to do so within limits, seemed most effective. These design discussions were also most effective when participants felt safe in both giving and receiving honest feedback.

All of the participants felt that their best collaborations came with tighter peer groups within the larger Studio community, indicating that designing small group work is important. Finally, while students reported, it was also important to be made aware of ideas from the larger community that could be observed and then improvised on. Thus, designers should find ways for exemplary ideas, resources, and projects to be made available to community members. When shared through the Internet, however, the technology must make it easy to find and share resources. Possibilities might include a database of exemplars categorized by keywords, or the use of a community Twitter feed (or a similar technology) that allows members to quickly post short ideas or links to each other.

Studio Recommendations

This study also yielded recommendations for implementing Studio.

1. *Provide Community-building Activities Early in the Semester*. Robin especially recommended that more be done to "unite the classes" early in the semester, as she reported a sense of community only within her EDIT 6190 class and not with the other two Studio groups. She added, "It would be neat . . . to get to know people more in their backgrounds . . . . to know who the subject matter experts are in the class." Strengthening the relationships between the members of the different classes might improve mentoring and

desk critiques. In addition, Boyd wished he had sought out feedback earlier in his design process, which might be applicable for most Studio members.

2. *Facilitate sharing of individual expertise*. One participant desired to know the skill various Studio members had so she could ask for specific advice. Ironically, the Studio provides this already with the online skills inventory, but it seems this inventory was not referenced after the first few days. The skills inventory might be more effective if it maintained information from past and continuing participants (so they only need to update changes), included thumbnail photos for easy identification (or was tied directly to their Studio profiles), and was easy to find and use. Awareness of community members' strengths should increase the sense of familiarity recommended by Sawyer (2008) and promote effective collaborations.
3. *Improved mentoring*. Another recommendation is to adapt the mentoring process so mentors are assigned hours rather than specific persons. By encouraging mentors to post their skill sets listed in the inventory, any Studio member needing help with a particular problem could contact the mentor and request opportunities to meet and exchange targeted information. In this way, very skilled mentors such as Lori's could support a broader range of students during her "mentoring hours." Students with specific and unusual talents, such as Robin and Boyd, benefited from advice from a friend whose expertise was typography. This skill and expertise could be shared across community members to improve several project's overall typography. However, relatively few people knew about this student's talent and thus did not benefit from

these skills and expertise. Mentors and mentees might not develop strong personal relationships as a result of spending less time together, and less skilled mentors might not be called on for assistance as often. However, the benefit across the entire community might become greater as expertise becomes more widely distributed across studio members. In addition, since mentors currently focus heavily on teaching technical knowledge, innovation within the community might improve if mentors were encouraged to also teach design strategies and creative thinking.

Study Limitations

Several limitations are inherent in this type of research. In some instances, I attempted to address the concern during the study. However, other issues and concerns were particular to this research study and setting. Because this study was exploratory and interpretive in nature, transferability is limited. In addition, caution must be taken in extrapolating the findings of this study relative to the Studio context to the theoretical COI framework. The Studio was selected for this study because the instructors purported to design the courses based on the COI proposed elements, and because creative designs were identified as desired end products. However, not all of the proposed COI elements were intentionally included in the development of Studio, and thus Studio may not represent all elements of a COI. Future replications of this research in additional settings would strengthen the power of these findings. There are other limitations related to the theoretical constructs, the epistemological foundations, and the research methodology.

Theoretical Limitations

One limitation is the elusiveness of the constructs being studied, including innovation, which was difficult to define and identify. This study focused on the process of designing a project as an approximation of the innovation process, but innovation also becomes evident after an idea is implemented. Thus, claims about the "innovativeness" of the ideas as they were being generated and refined proved difficult. Similar issues existed in defining and operationalizing constructs such as dynamic expertise, knowledge, flow, hacker ethic, community, and others. Often, it proved difficult to identify instances of these constructs in the data. This is perhaps why some theorized COI elements were not supported. Finally, it was difficult to distinguish the influence of individual characteristics and group contributions on innovation, as well as subtle interpersonal effects. This was particularly challenging in identifying the effect of the instructors on the students' innovativeness, as the instructors (by design) often worked together and guided class activities from the background. The instructors very likely contributed to innovation within the community, but this was rarely evident in the reported or observed data.

Epistemological Limitations

The challenge of mixed methods research, even within a single paradigm (such as the naturalistic one) is to maintain the integrity of each method while capitalizing on the benefits of each to address a particular research question. This study mixed two qualitative methods that drew from different epistemological foundations. Typically, the critical incident technique is considered post-positivistic in nature, while phenomenology (the paradigm for the interview methods used) has been associated with constructivism/interpretivism. These methods often imply different approaches to

collecting and analyzing data and produce different outputs and reports. Despite apparent differences, complementary approaches (especially involving Critical Incident Technique) have recently been used (see, for example, Butterfield et al., 2005). I attempted to capitalize on the perspective each might contribute to my research via both case study and cross-case analysis. Although I feel the two methods were complementary and produced richer data, combining the two methods raised challenges in analysis, including how to code psychological and emotional constructs as incidents and bracket researcher biases sufficiently for the phenomenological interviews.

Methodological Limitations

This study focused primarily on the experiences of the students, not the instructors, and thus cannot report strong findings relative to the instructors' roles. Also, while the students all developed design projects, there was no actual metric or process for measuring the actual innovativeness of their work, limiting how well we can link the findings about their design processes to their level of innovation.

Additionally, transferability of the findings is limited by the minimal diversity in the participant sample. Of the four case studies, three were women and three were Caucasian Americans, and all participants were relatively young (under 40). The limited diversity resulted in part because other recruited participants did not provide adequate or appropriate data (did not complete their memos or asked to be removed from the study due to personal challenges). Two participants spoke English as a second language, and it is possible that this influenced their ability or comfort in reflecting verbally in English. Thus, methods are needed to better accommodate differences in native language and reflective inclinations. Finally, for this exploratory study I purposively recruited

participants who would be most likely to exhibit characteristics of successful members of COIs. The findings may have varied if I had selected participants less inclined to collaborate or possess less design background. These individuals might not engage the Studio community or optimize their personal and group effort.

Also, self-reports were used extensively to capture first-person accounts of participants' experiences during Studio and because it often proved difficult to observe innovation occurring in class. On occasion while observing one student, I later learned another participant had a breakthrough design moment at a different location that I was not able to observe. Because of this, I used the students themselves as recorders of their innovative moments. However, they often struggled to recognize innovative or other significant moments during their design process. Much of the self-report data was a retelling of project development procedures and details, such as what tasks were completed each week. Only during the final interviews was I able to elicit details of their more innovative ideas. In addition, students occasionally provided contradictory self-reports or information that was not consistent with their observed interactions or interview statements.

In still other situations, it appeared that students did not understand fully what they were expected to report, perhaps due to the abstractness of the constructs. Perhaps my decision to limit what the students knew about my research purpose initially confused participants as to the kinds of evidence I sought. To remedy limited understanding of the constructs, I adapted the weekly memo questions for a few weeks to clarify the students' task without revealing the purpose of my study. I also sought to define the constructs clearly and openly during the final interview, when it would no longer influence their

behavior. These procedures helped, but it remained difficult to balance the amount of information provided with scaffolding to observe students' demonstrating the constructs without biasing their performance or reflections.

Implications for Future Research

The conceptualization of COIs described in this dissertation is formative. The study was an initial attempt to clarify and operationalize some of the COI attributes. Future iterations of this research could be improved by studying more completely the whole community in this and other settings to establish the transferability of findings. This would include researching the instructors' individual impacts on the nature of the community and its innovation, collecting data from more, or all, members of the community to get a sense of whether the findings are representative of the community, sections within the community, or of only individual members. Also, future versions of this research would benefit from collecting CIT data on participants, then conducting an analysis of their final products to determine their level of innovativeness (perhaps by expert review), and then comparing the data collected on the experiences of those who were innovative and those who were not.

In addition to these future research improvements, the findings from this study uncovered additional unanswered questions that could be studied through a variety of methods.

What is the Nature of Group Flow and How Can It Be Developed?

Flow was common across participants' experiences, but was usually manifested as individual rather than group flow. Sawyer (2008) has written that group flow is a precursor to group innovation (what he calls group genius). Future research is warranted

to investigate this claim and delineate the differences between individual and group flow, articulate the nature of individual and group flow, and examine what influences group flow.

Four research questions require further study:

1. What is the nature of group flow?
2. Is group flow composed of individuals engaged in individual flow, or is it more collaborative?
3. What environmental factors (structure, scaffolding, instruction, setting, etc.) encourage group flow?
4. Can group flow be experienced within larger communities or only smaller groups?

To address these questions, conversation analysis—a methodology designed to rigorously capture routine, everyday activities occurring in naturalistic settings in a manner that is reproducible and defensible (Psathas, 1995)—might be advanced. Sawyer (2008) used this conversation analysis to study group flow and group genius. This methodology typically involves deliberate analysis of transcripts, but it could be extended to include video analysis. By video recording groups engaged in flow, a researcher could apply conversation analysis approaches to the verbal and nonverbal interactions and create a more vivid understanding of the events. This detail could identify specific patterns in the interactions and environment that promote group flow and help document concretely when group flow is occurring.

How do COI Designers Balance Structure and Scaffolding with Autonomy?

In this study, autonomy and entrepreneurship were key characteristics of COIs. Yet, this freedom created challenges for participants as they struggled to identify the vision for their projects. Future research is needed to investigate how to achieve a balance between structure and scaffolding, especially for novices, and the autonomy needed to promote innovation. Possible research questions include:

1. How much structure most effectively supports novice, and more expert, members of a COI without limiting their creativity?
2. What kind of scaffolding supports innovation?
3. When can scaffolding be removed to allow for full autonomy?

Researchers might employ quasi-experimental studies with control and experimental groups to account for varying levels of scaffolding and structure. Results could be compared according to expert judgments of the innovativeness of the final products, or by utilizing a measure of creative potential such as the Torrance Test for Creative Thinking, (TTCT) (Kim, 2007) or a measure of divergent thinking (Runco, 1993). Complementary methods could also be used to provide qualitative evidence on the nature of the scaffolding found to be most effective, and how participants perceived, experienced, and benefited from this scaffolding.

Nature of Community Within A COI

This study proposed a COI social structure, including how participants collaboratively generated ideas, perceived psychological safety within the community, and observed and improvised from ideas shared. Research is needed to articulate the nature of the community within a COI and how this differs from other kinds of

communities, such as learning communities and communities of practice. Possible research questions to consider include:

What is the relationship between of tight-knit peer groups within COIs and the COI as a whole?

1. How do these inner innovative groups form and interact?
2. What is the importance of, and interactions between, "innovation champions" (Coakes & Smith, 2007), creative persons, and less creative persons within communities?
3. How much innovation is developed within community structures, smaller innovative groups, and outside-community networks?

These questions could be studied via social network analysis (Wasserman & Faust, 1994) to quantify the social capital of relationships making up COIs. Social network analysis quantifies the strength of communicative links between different persons, thus developing an overall picture of the collaborative patterns and key persons within communities. This methodology could help to identify and detail patterns of collaboration, interaction, and knowledge flow in innovation communities (Dahlander & Wallin, 2006).

How is Knowledge and Expertise Acquired in a COI?

This study provided tentative findings related to how innovation develops through the peer critiquing process and that how dynamic expertise influences innovation. However, research is needed to verify these findings and extend our understanding of these principles. Specifically, future researchers could ask questions such as:

1. How is dynamic expertise developed? How does it influence innovation?

2. Do members need to develop static expertise before dynamic expertise?
3. How can peer critiquing be facilitated to improve knowledge development?
4. What is the nature of the knowledge gained through critiquing versus knowledge gained through other avenues?

Several approaches may prove necessary to address these questions. Case study methods could prove valuable for documenting how dynamic expertise is developed, relying on a combination of critical incident recall and close researcher observation with a small participant sample. Video analysis may also be helpful in capturing the nuances of expertise development. Conversation analysis could again be useful in microanalyzing the discourse occurring in peer critiquing and comparing this with a measure of the members' knowledge gains.

What is the Value of COIs?

A significant, and largely unanswered, question concerns whether COIs stimulate more innovation than other social structures. Because innovation is typically identified over time whereas this study was conducted during a single semester, this question could not be answered in this research. Future research questions in this area may include:

1. What kinds of communities produce the most innovative ideas?
2. Are COI-generated ideas more innovative than individual-generated ones?

Again, a mixed-methods research agenda may be most appropriate to answering these questions. Researchers could use historical approaches by first identifying major innovative ideas and working backwards to analyze archival data concerning the social structure surrounding the innovation. This approach is similar to how Simonton (1999) and others studied individual creativity of historical geniuses. Another approach would be

for experts to review the products generated by a COI and other kinds of communities to develop a reliable instrument for analyzing the innovative potential of group ideas. Similar to the TTCT, the process might yield measures for assessing fluency, originality, elaboration, abstraction, and resistance to closure for group rather than Individual ideas.

Conclusions

In this study, I employed a formative Communities of Innovation framework, an adaptation of theories about communities of learning/practice and creativity research, to describe the innovative potential of adult groups. Within this framework, I used qualitative case study methods and phenomenological interviewing with Critical Incident Technique to identify factors impacting a student's ability to design a technology-based project within a community atmosphere. Findings included evidence for some aspects of the proposed COI model, moderate support for others, and no evidence supporting other proposed components. In addition, it proved important for groups to establish a strong atmosphere of psychological safety, where participants feel that there is a safety net for them to fail while trying new ideas. Further, it proved important to encourage observation of (and improvising from) others' models, design prototyping to elicit feedback from peers within the community, and knowledge gained through engaging in design criticism.

Several challenges to establishing an effective COI in an educational environment were evident including semester time constraints, students focusing on tasks instead of innovation, limited prerequisite skills for developing and prototyping innovative ideas, collaborating only with members of a peer group, difficulty collaborating through the Internet when physically separated, and establishing the initial project vision. The

findings also indicated directions for future research using a variety of different methods to better understand the nature of COIs and how to effectively develop them.

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APPENDIX A: SUBJECTIVITIES STATEMENT

My main relationship to Studio is as a former graduate teaching assistant for one semester in EDIT 6190 (Spring 2006). During that semester, I worked with the course instructor by teaching portions of technology workshops, assisting students in learning the technologies and in completing their projects, and evaluating their performance. I also participated in weekly instructor meetings with the instructors at that time, which included the current EDIT 6200 instructor. In Fall 2008, a new faculty member and former colleague of mine in the Instructional Technology doctoral program and mentor in the area of creativity research taught EDIT 6210. Graduate assistants during this semester were also colleagues of mine.

All of the students that I taught as a graduate teaching assistant have left Studio. Thus, my prior exposure to Studio should not prejudice my perspective towards the students, allowing me to learn about their contexts and experiences with new eyes. As for my relations with the instructors, because my study will focus on the experiences of the students, and does not evaluate the overall effects of Studio, this should also not pose a problem for my research. However, the lead instructor for Studio was also a committee member for this dissertation, which could have led me to consider the results more positively than I otherwise would have. To compensate for this, I asked peers to review the reasonableness of my coding and submitted my case studies to the participants for their clarification on my interpretation.

Perhaps the most significant challenge for me as a researcher in this setting is my theoretical framework. All researchers have theoretical lenses through which they view their research subjects, so this is not unusual. In my case, I believe that the most significant kind of learning is learning to be innovative, and I believe that the most significant kinds of innovation occur within groups or social networks. I also believe that most innovation—when we peel back the layers—can be understood as a collaboration, even if not in our traditional understanding of the word. Thus, I hypothesized that I should see elements of shared, collaborative innovation within the Studio during this study. Again, I instituted the use of peer debriefing and member checking, as well as peer reviewing of my chapters to guard against this distortion. Finally, I attempted to understand how my theoretical lens might affect my data collection and analysis, and reflected, through researcher memos and journals, on how I could minimize this effect on my conclusions.

APPENDIX B: DATA COLLECTION PROTOCOLS

First Student Interview

Introduction: Remind the participants that this study will involve 2-3 interviews, one at the beginning of the semester, one at the end, and possibly one in the middle. This is the first interview. Explain that the purpose of this interview is to understand the students' histories with instructional design so I can better understand their experiences this semester. Ask them to try and be as detailed as they can in their answers and to use this as an opportunity to "tell their story" as completely as possible. All of this helps me to understand you better. Because of this, I will not ask many questions, but instead, we'll just be talking about your story as a designer as a way to get to know each other better.

1. Lead-in question: How did you come to be an instructional designer or to be enrolled in the instructional design studio?

Probe for the following, if they do not explain these aspects on their own accord:

a. How did you learn about this field/course?

b. What interested you about it?

c. Who interested you in it?

d. What kind of a design background do you have? Tell me about some of your previous design experiences.

e. What is your background in education? Tell me how you came to be a teacher (if they were). What was that like? What kind of a school did you work in? What kind of a school did you attend?

f. What would you consider your design theory or educational theory to be? Why? How did you come to believe this?

g. Have you ever had design-like experiences in your previous jobs? Tell me about how it prepared you for what you do now.

2. How would you describe your typical working relationship with others? When you work on a project with others, what kind of role do you play?

Probe for:

a. Can you tell me about a time you worked with others on a project of some kind? What happened?

b. What kind of relationship did you establish with these partners? What led to this relationship?

c. What made your collaboration successful or not successful?

d. Did you ever feel that you got into a great "zone" with your companions where you just really worked well together? What happened? What was it like?

e. What challenges have you had working with others on projects? Can you tell me about one of these times?

3. When you work on a project, how much do you rely on/work with others? What about people outside of the group or organization, such as friends or family? Can you give me an example of how this has been on a previous project?

4. Have you ever had a project that you enjoyed working on so much that it was more fun than work? Why was this? Tell me about this project and what you did? Were others involved on it with you?

5. Can you tell me about a project that you thought was your most creative work? This might be anything from composing a song, to writing a story, to designing a Web site, to coming up with a really great lesson plan. Tell me about what happened, and how you developed this project.

Probe for:

a. What made it creative in your opinion?

b. How much did you work with others to develop this?

c. What was it like to work on this?

d. What did you learn by working on it?

e. What made this different from working on other projects?

6. What do you anticipate will be the value of others in the studio, as related to your own project?

Probe for:

a. Will you work much with others? In what ways?

b. Do you anticipate that your relationship with others will impact your work at all? Why?

c. What kinds of interactions do you hope to have with others in the course?

7. If you have been in studio before, what do you think about it? What has been your experience in the past?

Probe for:

a. What are some of the positives and negatives of the studio experience? Can you give me an example or story for why you feel this way?

b. How well do you know others within the studio? Have you worked with them before? Can you tell me about that?

c. What do you anticipate the challenges to be this coming semester? Why will that be difficult?

d. What do you hope to learn and accomplish this semester?

8. Do you know what your project will be about? Can you tell me how you came to choose that project? Why is it something you want to do?

(Optional) Second Student Interview

Introduction: Explain to the participants that this is the second interview. The first one asked about their background, this one asks about their experiences in studio, and the final interview will ask about their opinions and reflections. Thus, in this interview we are not seeking to interpret your experience, we only want to know what happened in as much detail as possible.

1. Tell me, in as much detail as you can remember, the story of how you developed your project this semester.

Probe for:

a. How did you choose your project?

b. How did you meet/work with your client?

c. [Switch] What challenges did you face in developing your project? Can you tell me about what happened with one of these challenges? When did it occur, and what did you do?

d. [Switch] What helped you in your project? Can you tell me about how that happened?

e. How did studio impact your project work? When did it help (why was this?) and when did it not (why was this?).

f. What motivated you in your project? Can you give an example of when you felt this way?

g. What were some of the things you had to learn to do your project or to make it successful? Can you tell me about one of these? What happened?

2. Who did you work with or seek help from this semester? Please think about people both within studio as well as outside of studio. For each of these people, tell me about what happened as you worked together.

Probe for:

a. What was your relationship with this person before?

b. What is your relationship with them now?

c. Why did you work with this particular person?

d. How did you communicate with this person as you worked together?

3. When, during this semester, did you feel most creative? Please tell me about that time.

Probe for:

a. What were you doing, working on?

b. When in the day/semester was this?

c. What prompted this creativity?

d. Did anyone work with you at this time or on this piece of your project?

e. Why do you think this was a creative moment for you?

f. What happened afterwards? How did it impact your project?

Third Student Interview

Introduction and debriefing statement: Thank you for participating in my study up to this point. This will be our last interview together. Up to this point, I have described this study as research into the nature of design processes within Studio. In reality, I am interested in the nature of collaborative innovation, or creativity, during design, and that the purpose of this final interview is to try and interpret their design experiences accordingly. I did not tell you before that I was interested in collaborative innovation because I did not want that to predispose you to say things in your voice memos or 15/5 assignments that may not really be true. Now, in this final interview, we are going to try and make meaning of your experiences together and think about how any creative or innovative moments from this past semester may have occurred in collaboration with others.

1. As you think back to your experiences in studio this semester, what aspects of your experience do you think enabled creativity or innovation?

2. What aspects impeded creativity or innovation?

3. How did others within studio impact the creativity of your project?

4. How did studio (the activities, places, instruction, etc.) impact the creativity of your project?

5. How strong or weak did you think the "community" in studio was? Community here is defined as the feeling members within studio had of being connected to each other, supportive, trusting and trustworthy, and sharing of the same vision and goals.

6. Can you share a story to explain why you think this community did or did not exist?

7. Now I'm going to ask you about several things that I am interested in. Can you share with me whether you think this did or did not exist within studio this semester? To what degree? More importantly, can you think of an example or story to exemplify why this did or did not exist?

a. A sense of entrepreneurship or autonomy for the students?

b. Intrinsic motivation and enjoyment in completing the project

c. Intense focus and being "in the zone" while working on the project

d. Extending and learning new skills.

e. Learning new interpersonal or team roles. For example, maybe in the past you have served as a team leader, or as the relationship builder, or as the project manager, or as the programmer, or as the content matter expert etc. on projects before but this time might have needed to learn a new role?

f. Diversity in experiences, skills, expertise, knowledge, and personalities

g. Reliance on outside networks (such as friends, colleagues, or peers from outside studio or your specific project team or studio course)

h. Learning new knowledge through designing/creating your project

i. Web communications about the projects or collaborations
j. A focus on creativity and innovative work
K. DEEP LISTENING TO OTHERS ABOUT YOUR PROJECT
L. IMPROVISING UPON OTHERS' IDEAS WHEN DOING YOUR PROJECT.

8. We just talked about the degree to which some of these elements existed. Can you now share with me how much you think these elements impacted the creativity of your project? Why or why not?

a. a sense of entrepreneurship or autonomy
b. intrinsic motivation
c. intense focus and being "in the zone"
d. extending and learning new skills
e. learning new interpersonal roles
f. diversity within your team, group, or course
g. reliance on outside networks
h. learning new knowledge
i. communicating through Web technologies
j. a focus in studio on creativity and innovation
K. DEEP LISTENING TO OTHERS ABOUT YOUR PROJECT
L. IMPROVISING UPON OTHERS' IDEAS WHEN DOING YOUR PROJECT.

9. The studio has an award for creative interaction. What does this mean to you? How much (if at all) did you think about this award or what it meant while you were working on your project?

10. When did you typically work on your project? Share with me what the situation was like, who was there, and what you typically did (any rituals?)

11. What advice do you have for others who are being asked to develop something new, creative, or innovative? How can they benefit from others' inputs? How can creativity be improved through collaboration or communities?

Faculty Interview

Introduction: In using Critical Incident Technique, Twelker (2003) believes it is important to first talk to someone who can help you establish the general aims of the incidents in question. In this interview, I hope you can help me understand the aims, purposes, and strategies of the studio courses.

1. What are your overall goals for studio? What would be the mission statement for the studio courses?

2. What goals do you have in relation to developing creativity and innovation? What course structures do you have in place to aid this?

3. What goals do you have for the development of community within studio? What course structures do you have in place to aid this?

4. In previous studio semesters, have you ever felt that a creative community was developed, where there were elements of a community of learners that supported each other in being creative? If so, please explain what this was like.

5. Do you think that the studio aids in developing any of the following? If so, please explain what aspects of studio aid in this:

a. a sense of entrepreneurship or student autonomy
b. intrinsic motivation
c. intense focus and being in the "zone" (flow)
d. extending and learning new skills
e. learning new interpersonal roles
f. learning or benefiting from the diversity within the studio, teams, or courses
g. reliance on outside networks
h. learning new knowledge
i. communicating and collaborating through Web technologies
j. An overall goal or focus among students on creativity and innovation

6. You have a creative interaction award. What do you plan to do to teach students about the elements of creative interaction this semester?

7. If I were to try and see examples of creative collaboration, or of communities of students that focused on being innovative, where would I look and what would I try to observe?

Observation Protocol

a. a sense of entrepreneurship/autonomy
b. intrinsic motivation
c. intense focus/being in the "zone" (flow)
d. extending and learning new skills
e. learning new interpersonal roles
f. diversity within Studio/teams/courses

Time	Events

APPENDIX C: CODING CATEGORIES, DEFINITIONS, AND EXAMPLES

Table 5.

Coding categories, themes, and definitions.

Category	Theme	Subtheme	Definition	Example
Affect			Codes related to emotional factors influencing the participants	
	Emotional Community		A feeling of belonging, trust, support, and community that is mostly emotional	"… kind of talk and vent with other people who are going through the same process."
	Hacker Ethic		Intrinsic motivation driving a person to go beyond requirements because of their desire to produce a high quality project, whether or not they are compensated	"My project will be a tribute to my first born. I hope to create something that is meaningful and also a tribute to my daughter."
	Psychological Safety		From Rogers (1954).	"The "we're all in it together" mentality begins to take shape and that community becomes a readily available resource of

				support."
	Positive		A general positive expressed feeling	"I'm really, really excited."
	Negative		A general negative expressed feeling	"Everything that possibly could have went wrong did."
Collaboration			Interaction between persons that directly impacts a students' project	
	Desires for collaboration		The student looks for and seeks collaboration on the project	"I have solicited some help from my mentor."
	Distributed		Collaboration occurring over distance technologies	"I worked on the phone with [client] a little bit to establish some questions that I have about the content."
	Face to face		Most of the collaboration in class seemed to occur face to face, this code represents those collaborations that seemed to particularly benefit from being face to face	"If you're working with somebody right there you can just go over and get an input right then"
	Influence from others		Not direct collaboration, but interactions with someone else that indirectly impacts a students' project	"So, that just kind of validated the idea that I had."
	Mentoring		Mentoring is one-on-one guidance by someone who is considered more expert	
		Creativity	Mentoring someone's creative thinking	"I had a very creative friend go with me to Michael's Craft Store, buy all of the supplies that I needed and sat me down to show me some techniques."

		Skill	Mentoring someone's development of technical skills	"And she's like, no, you know, make an external CSS code and then all you have to do is make another family. . . . It totally makes sense now."
	Networked	Outside community	Students using personal networks outside of Studio for ideas and support	"I also spoke to a former colleague."
	Lack of		Students indicating a lack of collaboration on projects	"I don't feel like [community] was there between all three classes as a unit."
Creativity			The creative thinking process	
	Improvising		Improving on or building off of models or ideas of others	"A lot of the projects this semester are kind of in frames um, you know, that make it look like a stand alone frame. (ok, yeah) you know, like, I mean, we all sort of saw each other's prototypes and like we all kind of liked that."
	Problem finding		Being able to identify problems or opportunities for a creative decision	"I need to somehow get those pages linked together."
	Prototyping		Prototyping projects to propel creativity	"I need to follow the mentality that it may not be perfect, but it is ok to start designing with the intention of editing and improving along the way."

	Vision		Working from or developing a mental map or vision of the project.	"I kind of knew what I wanted so … I guess I've always wanted to do it where it looks like something else that actually exists in the real world."
Design Story			Elements of the participants' design stories.	
	Challenges		Challenges participants faced	
		Clients	Challenges with a client, or with receiving content from a client	"And we kind of had a … a little bit of a philosophical difference about that. But that's fine. She's the client."
		Creative self confidence	Low self-confidence in their ability to be creative.	"The expression of my creativity is very hard for me."
		Decisions	Struggling to make decisions or find vision for their project	"Paralysis caused by a lack of a plan or insight is something that I need to avoid."
		Emotional/ psychological	Negative emotions and thoughts that impeded their design	"Whether I could do it or whether I could finish it. That was my issue."
		Project management	Struggling with project management	"I need to create a calendar for this project."
		Skills	Low technology skills	"I wanted to find out from him if there was an easy way to put some forms onto the Web site. . . . And I

				don't even really understand what I'm needing enough to give him all the details."
		Technical	Technical problems unrelated to the skill level of the designer	"I ran into some major issues this week with space on my 'myweb' server."
		Time	A lack of time	"I think that perhaps it will be something more than what I can incorporate with my skills and time."
	Consultants		Use of consultants in the design	"I hope we can get a lot accomplished in tonight's meeting so that we can . . . assign [tasks] to our 6200 consultants before it is too late!
	Design Decisions		Decisions on the design that weren't quite enough to be called a creative moment	"I also set the background of the text to be white and then green text . . ."
Expertise			Development of computer or design expertise	
	Asymmetrical		Hierarchical or asymmetrical distribution of expertise	"They were very just low level basic computer skill questions. And I'm like, I'm just not going to be able to turn to them for help."
	Dynamic		Gaining new expertise in an unfamiliar area to solve a problem, create or innovate, or accomplish a desired task. Being able to adapt previous expertise to fit new situations.	"The main bulk of my learning came with the Photoshop program. Before a few weeks ago, the only thing that I knew how to do

			in Photoshop was open a file."
	Symmetrical	Flat distribution of expertise	"The studio class didn't feel like you were any less than another person because of the fact that maybe you didn't know Flash already or . . . because you can design your own game plan."
Flow		Apparent examples of Csikszentmihályi's (1990) Flow Theory	
	Group	Examples of group flow based on Sawyers' (2008) guidelines	"You'd come up with an idea and everybody would just jump on it and bounce back."
	Individual	Examples of individual flow	"So, there were moments when I would spend hours on it and not realize that."
Focus on completion		Focusing on completing tasks and earning grades	"I need to finish the development of my Web site and prepare for dress rehearsal."
Incident		Critical incidents in their experience	
	Idea from self	Developing an idea independently	"I think most of the things that we were creative with though was just . . . us working as individuals"
	Ideas from the internet	Finding ideas on the Web	"I went online and just so happened to fall upon

				Jessica Sprague's Web site . . ."
	Ideas from outside Studio		Receiving ideas from outside Studio	"I met with a neighbor a little earlier this week, who is more in the information technology field, and talked to him about web design."
	Ideas from Studio		Ideas from other Studio members or people considered part of Studio such as clients and instructors	"I had some really great ideas from both Steve and Sarah."
	Ideas from texts		Ideas gained from reading a textbook.	"I have been really focusing on really reading the *Design Index* and trying to get some ideas about colors, and content, and things like that."
	Creative moments		Ah-hah moments, or moments where creative thinking was required	"I just kind of had my ah hah moment, my epiphany."
Knowledge	Fluid		Knowledge adaptable to new domains	
	Learning	From reading	Learning design or technical knowledge from texts	"I think it was in the multimedia for learning book, about don't start designing too early because a lot of this is such a mental process."
	Learning	Tutorial	Learning from tutorials or workshops	"I spent a while on the Internet looking at tutorials on some components of flash."
	Learning	By creating	Learning from creating a product or idea	"We are learning by making, interacting,

				evaluating, etc."
	Learning	By critiquing	Learning from desk critiques	"In just some of the things I suggested to her I was like wait a minute, I could be doing that for my project."
	Learning	By observation	Learning by observing others	"I began observing the group dynamics."
Organization			Codes related to the organization of the community	
	Control & Entrepreneurship		Students feeling like they control an have ownership over at least a portion of a project	"It's up to the designers what they need so I guess it does foster creativity."
	Diversity		Diversity in techne, ideas, or backgrounds	"Everybody brought a certain level of skills as well."
Reflection			Reflecting on previous successes and failures	
	Individual		Individual reflection	"It's talking out loud to yourself about the week and then it helps you work through."
	Group		Group reflection	"Steve, Sarah, just after another class, and we jut sat down and did desk crits."