TECHNOLOGY, TALK, AND TIME: PATTERNS OF

GROUP COMMUNICATION AND IDENTITY

by

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ABSTRACT

The effective use of technology is increasingly important in many fields where online and digital communication, collaboration, and production have become more prevalent. Although it is clear that many higher education students come into the classroom with skills involved with consuming technology, they often are much less capable of producing technology, such as editing videos or creating websites. Recently, many K-12 and higher education institutions have been redesigning instructional methods to better meet the needs of students in today's work environment through teaching collaborative, authentic technology tasks.

Relatively few studies have examined the role of student communication practices in technology classrooms that involve collaboration and authentic tasks, so this dissertation describes a multiple-semester, comparative case study of student communication patterns and themes. Operating as an engaged observer, I monitored an advanced Web design course during three semesters to better understand how students' communication practice influence their collaboration on authentic tasks.

Through participant observation, in-depth interviews, gathering student documents, and transcription of group talk, I was able to use Situated Learning theory to examine the way students talk about their activities and proceed through a 16-week learning period. An inductive analysis revealed several discursive patterns and practices including how using technology influenced their communication practices and their

development (or not) as a community of practice. These patterns are also discussed in light of their enabling and constraining qualities and the extent to which they echo discourses within other technology classrooms. Particular focus is given to the development and process of student learning teams, categorized into stages, from Individualism, Coalescing, Maturing and Identity formation, to Production and Transformation. Finally, Situated Learning theory's and small group communication's notions of discourse is extended within the technical sphere, as students both use and create new technologies, to become Community of Practice Development theory (CPDT).

TABLE OF CONTENTS

LIST OF FIGURES

Figures

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CHAPTER 1

INTRODUCTION

Learning to use technology effectively is important in many fields because it has become pervasive throughout people's lives and work. Technology has become a centerpiece of the U.S. economy due to its proficiency in controlling customer records, tracking shipment of goods, and maintaining communication of workers across the country and around the world. This demand has created a large computer market in which companies such as Apple invest millions of dollars in developing new technologies that are faster and smaller, such as the iPad and smaller mobile devices. Technology has improved the productivity of workers, scientists, teachers, and students; thanks to the high speed processing of these devices people can carry out mammoth calculations, write extensive documents, and make powerful presentations quickly and easily. The power of these machines also allows people to use social networking sites to stay in touch with loved ones and friends. Because technology is such an integral part of people's personal and work-related lives, part of being an educated person in the 21st century is developing an appropriate level of fluency and flexibility with the technologies that have come to define who they are and how they work and connect with others (Blaine, 2012; Ydstie, 2011).

As technologies become more advanced, they have replaced many blue-collar

jobs and white-collar tasks (Blumberg, 2012; Michael, Natraj, & Van Reenen, 2010). Because computers have replaced many jobs, workers require training in how to use computers in their jobs to improve productivity and output. For example, a talented art director can use the Adobe program InDesign® to quickly create more graphics than the output resulting from pencil and paper renderings. Similarly, an accountant can spend more time thinking of ways to make and save money by using Excel® to save effort doing automated calculations rather than using a paper spreadsheet and adding machines to laboriously balance numbers.

College students need a quality education in technology so they can be competitive in the evolving job market while demonstrating greater productivity and output with computers; workers need highly complex computer skills to meet the needs of business, education, scholarship, and medicine (Turkle, 2011; Ydstie, 2011). However, learning to master these skills is not an easy task within college courses focused on many types of technology, including software or Web programming (Lim, Lee, & Hung, 2008; Loraas & Diaz, 2011; Mandefrot, 2001; Xie, 2007). Many students report having difficulty grasping technology skills and transferring those skills from classroom to work (see Beckett & Hyland, 2011; Cummings & Teng, 2003; Leiter, Day, Harvie, & Shaughnessy, 2007). Brown et al. (1989) and Sweet and Michaelsen (2011) posit that transferring learning from one setting to another can be difficult because knowledge acquisition is linked to the activity, context, and culture of the classroom in which it is developed and used.

These scholars recommend teaching difficult and complex topics, such as technology, using team and project based assignments in the context of authentic activity

(see Milligan, 2012; Palsole, 2012). Authentic activity is defined as a task or project similar to something that a worker in the field of study would accomplish on the job (Lave & Wenger, 1990). Such an activity is meant to teach students the practices, routines, rituals, convention and histories of a craft. According to Lave and Wenger (1990), the math-learning research community has explored such apprenticeship learning. Through situated learning, students are believed to learn math by doing what mathematicians do, that is, by engaging in the structured findings and argumentation typical of good mathematical practice. They emphasize the situated character of problem solving while focusing on learning while doing.

Situated learning theory was developed to explain the knowledge and skills gained in apprenticeships and how those are transferred to new situations. Lave and Wenger (1990) argue that transferable knowledge is not gained through abstract and decontextualized concepts from a teacher to students; instead, learning is a social construction situated in a specific context. When viewed as a situated activity, learners participate in communities of practitioners, and the acquisition of knowledge and skills requires that newcomers move toward full participation in the "sociocultural practices of a community, in a process deemed 'legitimate peripheral participation'" (Lave & Wenger, 1990, p. 29).

Using Situated Learning theory as a guide, college instructors teaching various subjects, including technology, are beginning to use team-based learning with authentic tasks and projects similar to those in which experts engage. Michaelsen et al. (Michaelsen, Knight, & Fink, 2004; Sweet & Michaelsen, 2011) reported using hands-on training of authentic tasks with team-based learning where students worked

collaboratively on assigned problem-based tasks and projects. Such collaborative work was meant to promote active learning and situated apprenticeship. Through collaboration, student interaction promoted engagement with the content and critical thinking about evidence derived from the various perspectives of team members. Students succeeded in apprenticing in authentic activities while having maximized their ability to learn on their own and teach one another. The team-based learning literature, which describes authentic and group instructional methods, concentrates on the how-to and positive aspects of such learning. However, informal observations and communication scholarship's findings of reticence and individualism indicate that some groups fail in their collective endeavor resulting in individuals carrying out the majority of work.

Team-based and collaborative learning scholarship does not often address such nonproductive and problematic issues. Much of the research that it hinges on is based on face-to-face communication, without considering student agency and technology's influence. As a result, many higher education technology instructors are using collaborative methods without understanding the pitfalls and potential nonproductive outcomes (Milligan, 2012; Palsole, 2012). Anderson, Reder, and Simon (1996) argued that group learning should be carefully and thoughtfully implemented because it has been shown to be less than a panacea for effective instruction.

Technology instructors have less information for implementing collaborative learning because the team-based and collaborative learning literatures does not provide a thorough and descriptive account of productive and nonproductive communication behaviors that occur in these authentic settings. It does not illuminate how, in the case of technology as content and context, students collaborate (or not) in long-term groups that

shift from one form of communication (face-to-face) to another (technology), the ways in which technology creates a distraction or support to group identity and process, and the communicative patterns that allow individuals to navigate these tensions that must occur for them to achieve the reported cohesion and successful learning.

In addition, scholarship has extensively studied small-group activity and face-to-face communication (Kuhn & Poole, 2000; Poole, Holmes, Watson, & DeSanctis, 1993; Webb, Nemer, & Ing, 2006), but interaction among student teams working on authentic technology tasks are not well researched (see Drury, Kay, & Losberg, 2003; Fellers, 1996; Leahy & Twomey, 2005) because most classroom studies take a positivist orientation, which primarily depends on student self-report surveys (Burroughs, 2007; Schrodt et al., 2008; Wei & Wang, 2010; Zhang & Oetzel, 2006; Zhang, Oetzel, Gao, Wilcox, & Takai, 2007).

The research proposed here is meant to respond to the problems of efficacious technology pedagogy and contribute to small-group communication scholarship by engaging in a qualitative case study of team-based communication and learning in an advanced Web design classroom. To achieve these ends, the researcher gathered data from classroom observations, transcriptions of student groups' weekly meetings, emails, interviews at semester's end, and collective documents. An inductive, comparative case study analysis was carried out to reveal communication patterns and themes as students worked together over a full semester to create a complex website for a business client. This project joins long-standing scholarly conversations in small-group communication to further our understanding of discourses and discursive patterns in a college technology classroom.

Overview of the Research Project

The next chapter describes the literature relevant to the findings and final theoretical model. Because this study discusses communication of students within a team-based technology education environment, the literature review bridges the two scholarship areas of small-group communication and team-based education. The bridge is needed because the education literature is focused on the positive aspects of using team-based learning. The communication literature describes the changes that a group must go through before achieving quality decision-making and the possible pitfalls that sometimes occur including reticence, distraction, and individualism.

In Chapter 3, I provide a detailed theoretical framework using Situated Learning theory. This theory posits that certain groups that work together are related in their modes of learning. Situated learning theory assumes that knowledge is conceived as a social process in which individuals participate in mutual learning at different levels that depend on a student's authority in the group, i.e., whether a person is more or less experienced with the target content. This is how a novice learns from the more experienced members that comprise a "community of practice." Student groups that achieve a community of practice level of discourse also negotiate their own group identity as they engage in participation and nonparticipation. Once students identify with a community of practice, they can begin to engage in learning together. Because I have chosen to focus on discourses in collaborative learning, Situated Learning theory provides an analytical lens of finding the social negotiation of meaning, needed to describe the communication patterns of learning teams.

In Chapter 4, I discuss the methodological framework as well as the practical

approach that I used in this study. I include a discussion of the classroom and the participants and my reasons for choosing this classroom. I also explain the process I used to collect and manage the data and the steps I took in analyzing the data. Important to this project, I explain the interpretive and reflexive approach that I employed and how this approach was critical to understanding a holistic view of team-based learning in a college classroom.

The next two chapters are my analysis of the collected data. Chapters 5 and 6 are chapters that describe main themes discovered during analysis. These chapters are rather technical and many definitions can be found in the glossary in Appendix A. Chapter 5 discusses how technology influenced each group's communication and development. The social and entertaining aspects of "Always ON" technologies almost certainly delayed full group participation, and when the groups began experiencing mistakes and misunderstandings, two groups did not deal with these issues which resulted in becoming individualized and using technology as a weapon to ensure it. However, such nonproductive behaviors were not the norm for four groups as they became more accountable toward one another and worked through difficult behaviors. These students used technology to enable their full participation in their groups and eventual collaboration.

Furthermore, Chapter 6 describes these teams over time using communication group development theory as they worked on four assignments that both acted as milestones to the final client project and to their group development. Early in the semester, none of the groups acted collectively on the first assignment. Instead, all the students acted individually on the first assignment. All groups came to a collective

accountability after their initial deliverable, yet how they dealt with (or not) the resulting mistakes and misunderstandings determined whether they succeeded in moving to a maturing stage during the second or third assignments. For those groups that regressed to individualism due to inability to work together, their use of technology resulted in damaging their relationships so they chose to not work collectively on the final assignment. In contrast, four groups did work through difficulties and grew into a full community of practice. Their work had transformed into a space where they began thinking and speaking as if their identity included the group and their collective task.

In the final analysis chapter, Chapter 7, I further analyze the communication practices employed by students. I call attention to the productive and nonproductive ways that students communicate about the difficulties involved with their work and the negotiation and conflict practices employed while making decisions. Finally, I provide an interpretive analysis of these students' negotiation of meaning when dealing with computers, resulting in an extension of Situated Learning theory within technology contexts. I call this model the Community of Practice Development theory (CPDT). The purpose of this theory is to help demystify the process of technology-based communities of practice in and out of the classroom.

CHAPTER 2

LITERATURE REVIEW

This research is meant to discover and describe patterns of communication within student groups working to learn and create authentic website projects. Six groups were observed and their talk was recorded over 13 or 14 weeks. Each group was tasked with creating a new website meant to address the needs of a community client. How and why these groups developed (or not) into a functioning team and what this meant for their authentic project is the purpose of this dissertation. Findings found herein are based on decades of scholarship, including that of education's team-based learning and small-group communication.

Although small-group learning has been well researched within communication studies, it has not been well covered within technology classrooms and the non-productive outcomes have not been well discussed in education scholarship about team-based learning. Because we know that context and discipline affect pedagogy and learning (J. S. Brown et al., 1989; Lave & Wenger, 1990; Wenger, 1998; Wenger, McDermott, & Snyder, 2002), it is reasonable to be curious about how the unique context of a technology classroom might yield new insights about small-group communication behaviors, including how the difficulty of task and social/entertainment uses might interfere or help with collaborative learning. The research reported here contributes to

and bridges small-group communication and education's team-based learning research by describing what happens when students use technology to collaborate and to acquire technology based learning outcomes. It also contributes to both areas of scholarship by discovering and describing communication behaviors that may not be manifest in less technology dependent settings and in relation to more abstract and conceptual learning outcomes. This project will also contribute to our understanding of group development within team-based learning in technology classrooms, while lending a greater understanding of all teams working on software projects including those in the professional sphere.

This chapter is meant to describe the relevant literature that contributes to this study. Because this research specifically describes communication of students within a team-based technology education environment, this literature review must bridge the two areas of small-group communication and team-based education scholarship to better explain what we already know. The bridge of both research arenas is required because education's team-based learning literature is primarily focused on the how-to and productive aspects of using it as an instructional method. Small-group communication scholarship describes the linear group growth and development into identity that is sometimes punctuated with nonproductive behaviors such as reticence and distraction. Both fields of scholarship are later required to help explain the resulting model found in Chapter 7.

The resulting flow of this chapter first describes technology education and the problems that have moved it into utilizing team-based instructional methods. I then describe team-based and collaborative learning literature with its prescriptive

instructional advice and accolades for the learning method. The chapter then moves into a recounting of linear group development and identity formation from communication literature. Finally, I illuminate the relevant literature about problems that became issues within the groups of this study, including reticence, technology distraction and individualism.

Technology Education

Technology education came about to answer the need to educate the workforce to better use the computers that were beginning to appear on every desk during the 1980s. During this time, computer skills were taught as a predefined procedural path that was broken down into a teacher-led development sequence, consisting of a number of related areas of activity (Johnsey, 1995). The idea of a fixed sequence of technology instruction to individual students came out of research from the 1980s (A. V. Kelly, 1987; Rowlands & Holland, 1989; P. Williams & Jinks, 1986), because technology was not widely viewed as problematic and difficult to learn (H. Middleton, 2008). Burton (1986) argued that a linear approach in technology instruction was necessary because it is logical and systematic in nature, and learning is best when the teacher identifies a need or problem with a predefined set of steps leading to a solution. According to this argument, the teacher should be in complete control of the "materials, techniques, skills, and knowledge to be learned" (Burton, 1986, p. 243).

These fixed procedural methods of teaching technology have dominated the literature of several certification agencies such as Apple and the Institute of Electrical and Electronics Engineers (see Frantz, 2008; Karlin, 2006; Spencer, 2009; Weynand, 2009). As a result, many higher education instructors have the goal of getting students certified

by using the methods laid out in this literature. Because college technology courses are normally taught over a semester, each area of activity, as laid out in the certification manuals, is taught in isolation across different days of instruction. Fritz (1996) observed students in these classes as more directly focused on daily activities and less aware of the broader implications of their learning. Other college technology instruction utilizes instructor-led lectures on the philosophy and methods of technology; however, Sun (2011) observed students in classes such as these and reported that they experienced difficulty and little motivation in learning and problem solving because they had no practical experience with understanding those concepts. Instead, many students turned to the more interesting, personal information on their mobile devices (S. D. Smith & Caruso, 2010).

A more recent attempt at teaching technology skills is meant to leverage the often mythologized ease that our students now have with technology. In contrast to older technology users, these so called "millennial" students' lifestyles have been heavily influenced by the now constant presence of computers in schools and homes. According to Dahlstrom's (2012) survey of 100,000 undergraduate students, they bring their own technological devices to college, and the technology is both prolific and diverse. For example, she found that 86% of students own a laptop computer, 27% own a tablet and/or e-reader, and 62% have a smartphone, and these devices are often brought into class and used to achieve their academic outcomes. Prensky (2001) labeled these students "digital natives," "new millennium learners," "the Net generation," and "the gamer generation." These students are supposed to be able to process multiple bits of information quickly and easily while switching between concepts and tasks as presented on the screen.

Because students are thought to think and process technological information differently and easily, technology instruction has attempted to take advantage of the seeming ease of learning new computer skills (see Spencer, 2009; Weynand, 2009).

Contrary to assumptions about millennium learners, however, some scholars argue that these students do not have the technology fluency being ascribed to them. Bennett and Matton (2010) report that the idea of "digital natives" is flawed because there is no identifiable generation of people who are easily able to use all technology. Moreover, qualitative research provides some insights into the technological choices college students make, suggesting that technology is used for particular, highly contextualized activities such as personal communication, entertainment, and social interaction (Pedró, 2009; Sánchez, Salinas, Contreras, & Meyer, 2011), and seldom for tasks commonly included in technology courses or for work related functions. According to Bennett and Maton (2010), fewer students than anticipated were capable of using technology for content creation activities such as designing websites, graphics, audio, or video. Therefore, instructional assumptions about the technological fluency of current college level students may be unfounded; indeed, it is quite likely that many learners do not have the skills needed to easily learn the coding and complex computer skills required to fully participate in a technology dependent 21st-century world.

Several scholars have explained that initial encounters with technology are difficult, often because students do not have the knowledge stores required to understand the complexity of the interface and solve technical problems (Gillet, Ngoc, & Rekik, 2005; Kavakli & Gero, 2003; Mandefrot, 2001). Such early problems can signal a greater risk of failure, resulting in student frustration and fear of using technology (Loraas &

Diaz, 2011). Gilly (2012) described these experiences as "terrible frustration period[s]" that result in high stress and inability to cope. Such stress can result in negative emotions, such as anxiety, anger, and depression (Greenglass, 2002).

The complexity and vast amount of information involved specifically in Web design and development can be overwhelming to students. Learning that any particular task can be accomplished in many different ways, and various types of computer code can be used in different ways to solve the same problem can lead to a sense of learned helplessness (Chang, 2004). Because of the many methods that can be employed to solve a technical problem, software and Web design lacks well-established theories and axioms (Haynes, 2002). Through this vast complexity, students demonstrate a lack of structural thinking (Merten, Schafer, & Bursner, 2012) and they often underestimate the time required to analyze the problem and then code a solution (Brazier, 2000). To further complicate the situation, the number of devices within technology has exploded, including an expansion of the languages required to design applications and websites for those machines (Feng & Chen, 2011).

Students, who are taught complex computer skills in a linear fashion with concepts in isolation, often demonstrate lower learning outcomes. The resulting stress from difficulty in learning technology also results in a lack of motivation to learn; such low motivation has been associated with lower grade point averages and retention rates (Haines, Norris, & Kashy, 1996). Kolar, Sabatini, and Fink (2002) demonstrated that students in a traditional lecture-based technology course had lower learning outcome attainment than those in another class teaching the same concepts but taking advantage of notebook computers while using collaboration and authentic tasks during class time.

Similarly, students in traditional technology classrooms have been observed learning less through a lack of motivation due to student anonymity, difficulty in getting help from the instructor, and lack of in-class engagement (R. Kay, 2007; Palsole, 2012).

Learners sometimes experienced anxiety and shyness to the point of being less successful in the class (da Silveira & Scavarda-do-Carmo, 1999). Yet, even these shy students talked to one another outside of class, and Fritz (1996) found that low achieving students used communication to create a culture of low performance. These students were unsatisfied with their work, and their conversations served to maintain a low confidence in their technology abilities. These students rarely extended themselves to do their best, and they perceived their instructor as not expecting much from them. They often found the projects to be boring while also too complex and difficult to finish. Students sometimes respond to the complexity of difficult course concepts and resulting stress through plagiarism and other dishonest behaviors. Jian et al. (2008) surveyed 233 technology students in classes requiring individual work and reported that respondents dealt with difficult classroom content by discussing problems with other students and using the Internet to find solutions, behaviors that were viewed as cheating and plagiarism by the instructors.

Collaborative Learning in Technology Education

In order to address the difficulty of computer skills, K-16 technology instruction has been in transition toward a learner-centered approach for the past decade, across various agencies in the U.S. (Newberry, 2001; Sanders, 2001), United Kingdom (McCormick & Davidson, 1996), and Australia (Fritz, 1996). These agencies have worked to update their standards (ITEA, 2000), curriculum (QCA, 1999), and technology

syllabi (QSA, 2002; QSCC, 2000) to better meet the needs of technology learners. These various reforms are meant to modify the traditional, workshop-based tendency that focuses on hand and machine skills (see Young-Hawkins & Mouzes, 1991) to a more learner-centered training within authentic situations. They posited that learner-centered, collaborative technology training in secondary and higher education promotes the active construction of meaning while encouraging problem solving and decision-making (QSA, 2007). This approach involves recall, application, analysis, synthesis, prediction, and evaluation; these are outcomes that Bloom and others (L. W. Anderson et al., 2000) have argued contribute to effective cognitive learning.

Recent research shows positive learning outcomes and transferability of skills in technology classrooms characterized by collaboration and problem solving. Collaborative learning is not a new idea in education (Dewey, 1916), but until recently it has only been used by a few technology instructors for limited purposes, such as reports or a short term tasks (Slavin, 1995). However, research in cooperative and team-based learning has identified collaborative methods that can be used effectively across all grade levels and topics, from math to reading to technology education (Michaelsen & Sweet, 2008; Sweet & Michaelsen, 2011). According to Slavin (1995), group learning has increasingly been used as teachers' main way of organizing classrooms for instruction.

There are many reasons why collaborative learning is becoming mainstreamed into many higher education classrooms. One reason is the large research base supporting the use of cooperative learning to increase student achievement, as well as outcomes such as improved intragroup relations (Bullis & Bach, 1989; Dwyer et al., 2004; Martin & Myers, 2006; Milligan, 2012) and acceptance and help for novice learners (Handley,

Clark, Fincham, & Sturdy, 2007; Vickers, 2010). Educational theorists in the constructivist camp assume that collaboration is a critical feature of an effective learning environment. Bruner (1989) argued that, "learning in most settings is the communal activity, a sharing of the culture" (p. 127). Collaboration among these theorists is more than a matter of asking students to work together in short-term groups to share information. Instead, true collaboration enables insights and solutions to arise synergistically that would not otherwise come about (J. S. Brown et al., 1989). In other words, no single member has the ability to independently generate an effective solution, but students working together have the necessary knowledge and skills.

As an example, Walmsley (2013) compared traditional versus collaborative classes and found that better learning outcomes attainment resulted from greater responsibility in the design and coding process. Students interacted as they worked together to identify and research problems when successfully integrating sustainability in technology design (H. Middleton, 2008). Lee et al. (2013) reported that students' collaboration in technology learning was an important factor in increasing knowledge outcomes because they shared information and gained confidence in the task. Collaboration helped these students to better process complex tasks, despite the difficulty of the technology (F. Kirschner, Paas, & Kirschner, 2011). Collaboration promoted acquisition of technical and proactive coping skills, including the ability to identify and use information and access social resources to help reach learning goals (Greenglass, 2002; Schwarzer & Taubert, 2002). Gilly et al. (2012) argued that proactive coping converts the stress of technical risks and threats to coping with challenges; such skills could speed and deepen learning and adoption of technology.

Another reason for collaborative learning is a growing realization that college students need to learn to think critically, to solve problems, and to integrate and apply knowledge and skills. Through collaborative learning methods, students have provided an excellent means to these ends. Examples throughout literature have demonstrated that students working together often have that "Aha!" experience that builds deep understanding. As an example, Ernst and Clark (2011) looked at preservice teachers using various technologies to communicate as they developed a greater understanding on the learning task. They found that the flexibility of technologies allowing for group communication allowed for a higher level of shared group knowledge that extended beyond the class assignment, thereby facilitating learning transfer. As students worked to create shared knowledge, they were observed progressing in team development; technology was seen to help facilitate their learning outcomes and team progress, but the specific type of technology did not matter. What was crucial was that students were easily able to receive and send messages with whatever technology they chose to use. Yet, what does appear important is that students used technology in a strategic manner such that it facilitated their increased learning through functionality, interaction, and community (Charlton, Devlin, & Drummond, 2009).

Furthermore, when collaboration and learning technology is done correctly, students are able to situate their learning and enable better understanding. Project-based learning within groups working with a client has been found to situate learning and help students understand the interconnectedness of multiple topics across the semester (Y. H. Lee et al., 2013). Kwok and Tan (2004) observed that project-based learning encourages groups to search for information, find and interrogate facts, exchange observations, and

collaborate with their peers. Bereiter (1997) expressed the benefit of communities as, "the situated learning that does occur is learning how to function in a community of practice whose work is work with knowledge" (p. 298). He argued that the transferability of this learning to work outside of the classroom is chancy if it is no more than simply using knowledge; instead, learners must create or be instructed in how to add value to it. Such value no longer bounds knowledge to the situations in which it was constituted. It is knowledge that has been transformed into objects that can be used in an unlimited variety of situations.

Wenger (2002) viewed such learning as participation in a community, where student group members engage in activities, conversations, reflections, and other forms of participation in the learning of the community. Wenger argued that participation should be balanced with reification. This is where students produce physical and conceptual artifacts—words, tools, stories, and documents—that reflect their shared experience and around which they organize meaning and knowledge. For example, Scardamalia and Bereiter (1994) described a learning community with over 10 years of research, known as the CSILE or Computer-Supported Intentional Learning Environment. CSILE provided a means for students to engage in knowledge building within a learning community. They were given the opportunity to focus on a problem of interest and began to build a communal database of information about the problem. The students posed questions, made hypotheses, suggested solutions, and contributed information from outside sources and "experts," either as text or graphics. All of these activities occurred online as students added information to the database. In this manner, learners were engaged in the discourse of a subject matter in a scholarly manner, and they often self-corrected their work

because all others in the class were able to see it.

The learning community also provided an opportunity for reflection and peer review, and Scardamalia and Bereiter posited that the online atmosphere was superior in getting all students to contribute. They stated, "[C]onversation tends to favor the ideas of the most vocal…and most intentional students. In CSILE, each student is responsible for contributing to the discourse" (Scardamalia & Bereiter, 1994, p. 279). This statement is interesting because it involves students who worked together over an entire semester. It is not clear from this research whether the long-term collaboration, expectations of interacting as a part of the grade, or online presence contributed to all students contributing to the conversations.

Another positive reason for collaborative technology learning is that successful students in Fritz's (1996) technology course reported that their difficult tasks were enjoyable and easier to complete due to interaction and help from fellow group members. These students had the most confidence and did most of the research and problem solving collaboratively, while having the fewest objections to planning and design activities. Students also stated that the skills they learned were transferable, including group work, initiative, management, and independence in technology design and use.

Finally, collaboration enhances learning in spaces with heterogeneity and diversity. Slavin (1995) observed that group learning has been utilized in highly homogeneous classes, such as for gifted or special education, yet small-group instruction is especially needed in classes with the wide range of performance levels. Cooperative learning can help make diversity a resource, not a problem. Cunningham (1992) posited that dialogue in a social setting is required for students to understand one another's

views. Listening, or reading privately, is not sufficient to challenge the individual's thinking. Instead, negotiation and productive conflict allow student groups to improve decision quality while avoiding premature and potentially erroneous consensus (Macy & Neal, 1995). Hearing a variety of other perspectives helps learners to judge the quality of their own solutions and to perhaps learn more effective strategies for problem solving (Driscoll, 2005). Divergent views and productive conflict can also promote a negotiation practice leading toward a better solution (D. M. Brown, 2013). Slavin (1995) asserted that the relationship outcomes from group learning have benefits for students of different ethnic backgrounds and mainstream special education students, another critical reason for using cooperative learning.

Clearly, the benefits of collaborative learning in technology are many and varied. However, team-based learning is complex and not always easy and positive. Almost 100 years of research into small group communication helps to explain further what occurs with education scholarship about team-based learning, including time needed for development and identity, with some explanation of problems exhibited in such assemblies. What follows is a review of the relevant theories of linear group development and identity formation that can lead to the types of enhanced learning outcomes as described above. This information is then followed by literature describing several pitfalls and problems sometimes experienced by such groups.

<u>Small Group Communication Research</u>

Communication scholars have long studied the characteristics involved in successful groupwork. Much of that scholarship was in line with a positivistic viewpoint that emphasizes control and precision while favoring the laboratory experiment over

more naturalistic data collection strategies. These researchers found that learner-centered training and collaboration does not come easy; instead, it requires time and development of several communication behaviors, including identity forming, helping, negotiating, and group process.

Group process is the term used to describe the increasingly complex stages that groups go through before they can achieve high-quality decisions and outcomes. Berkowitz (1974) asserted that group development "refers to the fact that group process undergoes modification which enables the group to have more alternative ways to solve problems" (p. 311). Ridgeway (1993) and Bennis and Shepard (1956) defined development as the focus on the group's need for improved communication patterns. The definition that best fits this dissertation was provided by Sarri and Galinsky (1974). They defined group development as "changes through time in the internal structures, processes, and culture of the group" (p. 72). As outlined by these scholars, group development involves changes within three different dimensions. First, the social dimension concerns the organization of the group's structure and patterns of participant roles and structures. Second, the activity dimension focuses on the group's activities, tasks, and operated processes. Finally, group communication involves norms, values, and a shared group purpose.

Ever since the publication of Bales and Strodtbeck's (1951) work examining phases in collaborative problem-solving, the study of group development has exploded into hundreds of theories (G. Smith, 2001). In organizing this vast body of research, an effort was made to place the various models and frameworks into three classifications: linear progressive models, models influenced by linear models, and nonsequential models

(Mennecke, Hoffer, & Wynne, 1992). Linear progressive models are the focus of this dissertation, and they are those that explain an increasing amount of maturity and performance over time.

The linear models are perhaps the best-known type of development model. These models assume that groups develop in a definite linear fashion from one phase or stage to another (e.g. Bennis & Shepard, 1956; Caple, 1978; Charrier, 1974; Heinen & Jacobson, 1976; Kormanski & Mozenter, 1987; Lacoursiere, 1980; Maples, 1988; Mills, 1964; Sarri & Galinsky, 1974; Tuckman, 1965; Tuckman & Jensen, 1977). Charrier (1974), an employee of Proctor and Gamble, wrote a summary of group development based on earlier laboratory work. The original document was written to help group managers at his company better understand the dynamics of group work. Tuckman (1965; 1977) used a meta-analytical method to contrast and combine results from the previous 30 years of controlled laboratory studies of small groups. Such linear phase models are commonly stated as "forming, storming, norming, and performing," and they are considered to be sequential in time because transitioning to succeeding stages implies that a group is becoming more developed or mature. Both Charrier and Tuckman described similar and distinct stages that groups must go through in a linear fashion to achieve maximum effectiveness, including (1) formation and orientation (politeness), (2) catharsis and learning how to work together (hostility and confrontation), (3) normalizing (focus, action, and testing), (4) performing (purposive and efficient), and (5) adjourning.

Linear progressive models have developed from varied research approaches. However, face-to-face observation has been the predominant approach (Bennis & Shepard, 1956; Lacoursiere, 1980; Maples, 1988; Mills, 1964). The activities within these

groups was diverse, including college students (Bennis & Shepard, 1956; Mills, 1964) and medical and psychiatric patients working in groups to deal with different addictions or special needs (Lacoursiere, 1980; Sarri & Galinsky, 1974). Several of these researchers injected their own personal experiences and insights from working with groups as facilitators, participants, or instructors (Braaten, 1974; Caple, 1978; Lacoursiere, 1980). The next most common method of model development has been from meta-analyses of existing group progression literature that overwhelmingly depended on survey method. Exemplar studies include Tuckman (1965), Heinen and Jacobson (1976), and Kormanski and Mozenter (1987). Despite the variety of research methods, the developmental stages in linear sequence models exhibit many similarities. These similarities, and several subtle differences, will be discussed in the next sections.

Forming Stage

In nearly all linear models, the first stage is an unspecified length of time in which group members come together to become acquainted with one another and orient themselves to the task to be performed. Several important events mark this stage. One important process is "boundary testing" in which members actively attempt to define the task while working to establish a group identity (Bennis & Shepard, 1956; Braaten, 1974; Caple, 1978; Heinen & Jacobson, 1976; Kormanski & Mozenter, 1987; Tuckman, 1965; Tuckman & Jensen, 1977). This identity begins to form based on communicating the knowledge and skills (or lack thereof) that each person brings to the group. When defining the nature of the group and its task, members openly share information related to the problem or task (Bales & Strodtbeck, 1951). Shared information is then used to define group and boundaries, while increasing the group's knowledge of task requirements and

demands. With this shared understanding, the group proceeds to establish goals and design working relationships that will allow it to begin work on its task (Bradford, 1978; Hare, 1973). Members begin to familiarize themselves with each other (Bradford, 1978; Drexler, Sibbet, & Forrester, 1991; Schutz, 2014; Srivastva & Barrett, 1988).

During this time period, the familiarity with each other may be kept at a "superficial level" (Srivastva & Barrett, 1988, p. 99), such as names, birthplace, age, maritial status, number of children, and educational and professional backgrounds. Any deeper familiarity that may result from subsequent meetings is important in determining the working relationships necessary to building trust required to effectively carry out the task. This level of familiarity also helps to control the level of anxiety experienced by new group members. Knowledge acquired through deeper familiarity also permits each individual to find his or her unique identity within the group.

Individual anxiety and disillusionment are two other characteristics of this stage (Bennis & Shepard, 1956; Caple, 1978; Kormanski & Mozenter, 1987; Maples, 1988; Mills, 1964). The anxiety results in part from meeting new people, being in a new setting, and having a vague understanding of what to accomplish. All group members must also find a way to overcome prejudices and problems. In order to deal with the social anxiety, members often resort to acceptable norms of behaviors they have used in similar settings (Bennis & Shepard, 1956; Maples, 1988).

According to Bradford (1978), each time a group meets it must revisit and adjust the ideas and decisions that had been previously decided upon. Members can continue to bring in new ideas because individuals live outside of the group and can bring new possibilities and problems in each successive meeting. During this stage, members are

concerned with clarifying its purpose and understanding the skills and resources needed to complete the task. Group members spend time evaluating the available information obtained through search and solicitation of ideas and opinions (Bales & Strodtbeck, 1951). Groups become more knowledgeable about what skills are related to the group's purpose, and members begin to display these skills for others (Hare, 1973). As they begin to understand more of others in the group, they begin to form dyadic relationships based on the similarities that have been shared and displayed (Srivastva & Barrett, 1988).

Conflict and Unrest Stage

As members clarify their purpose, they soon realize that the problem becomes real (Bradford, 1978; Drexler et al., 1991; Hare, 1973). As a result, they must often restructure their patterns, roles, and relationships to meet their increased understanding. For some groups, this task may be more time consuming and difficult; this may represent Bradford's (1978) stage of "confrontation of a difficult problem" or a major challenge to the group's initial understanding of its purpose and task.

Conflict arises for a number of reasons. One reason is that in the process of becoming acquainted people have discovered others in the group are similar and they may identify with them. When this occurs, the group can be pulled into factions and they may fight among themselves for power and leadership. Contention may also arise from a polarization between individuals differing on being "task oriented" or "people oriented" (Caple, 1978). The theorists argue that people must find a way to balance group task needs with individual emotional needs. Finally, conflict may arise because members fight to maintain their own individuality rather than be swallowed up by the group, because individuals may be unwilling to forgo individual recognition and rewards (Tuckman,

1965).

Stage of Group Identity and Norm Formation

Assuming that a group can get through the conflict and unrest phase, linear progressive models indicate that groups enter a stage in which they begin to display cohesion and group identity. Groups begin to solidify group work patterns, relationships, and the structural arrangements allowing for completion of the task. Within this effort, group relationships and social structure evolve to help the group better pursue its goals (Hare, 1973). Of primary importance is that the group arrive at a decision on how to proceed in accomplishing the work (Hare, 1973). Bales and Strodtbeck (1951) observed that group members at this stage push for a decision, and so doing will support the ideas of some members while neglecting those of others. According to Srivastva et al. (1988), groups begin to place value on support, trust, affection, authority, and influence. They note that this can be a time of conflict as dyads and cliques fight for power and recognition. However, this conflict can have positive results as it may facilitate successful accomplishment of the group's task.

During the negotiation that occurs during conflict events, many groups resolve their differences and give more effort and energy directed toward engaging and accomplishing the group's assigned task (Tuckman, 1965). According to Caple (1978), members pass from a polarized atmosphere into a period in which members evaluate the present needs of the group and past performance. This evaluation results in the group better understanding why norms are needed, and group members then work to build additional cohesion. Mills (1964) explained that during this time "the group seeks to define and legislate what it should be" (p. 245). Bennis and Shepard (1956) argued that

this is the most crucial and fragile phase of the group because it suddenly shifts its whole base of action. They note that in some groups, progression may not even occur because they may have become so splintered and divided that they are unable to bridge existing differences and develop a group identity and normative system.

Stage of Production

The final stage is a time of intense productivity and effectiveness (Wheelan & Kesselring, 2005). Group members have resolved many of the issues of the previous stages, so they can focus most of their energy on goal achievement and task completion. As such, the group has established a "state of complex interdependency" (Srivastva & Barrett, 1988, p. 106). The interdependency is based on the differentiated roles of each member in accomplishing each component of the task or goal. Because the group has become actively involved in task completion, how it conducts itself will determine its success or failure.

Once group cohesion has been established and rules have been further clarified and defined, members begin to actively produce or perform their assigned tasks. Tuckman (1965) and Braaten (1974) posited that this is a period when previously established rules become more flexible, pliable, and functional. By this time, the group's culture has developed effective responses to internal and external stresses (1974). Groups also eagerly and mutually explore and resolve problems (Caple, 1978).

According to Wheelan (2005), groups that function at higher stages of development are more productive. Known as social facilitation, the presence of others has a positive effect on the performance of others. For instance, undergraduate student groups functioning at higher stages of group development earned higher grade point averages

than teams at lower stages (Wheelan & Lisk, 2000). Financial teams functioning at higher

levels generated more revenue in less time, and they were rated more positively from

customer service reviews (Wheelan, Murphy, Tsumura, & Kline, 1998). High school

students, whose faculty groups functioned at higher stages of development, performed

better on statewide standardized tests (Wheelan & Kesselring, 2005; Wheelan & Tilin,

1999).

  As was found with the learning teams studied for this dissertation, many scholars

have found that groups develop through a fairly linear set of increasingly complex stages

before they can achieve high-quality decisions and outcomes. Members experience

changes through time in social structure, activity toward the task, and communication

about their purpose. Groups change from forming to experiencing conflict to eventually

developing an identity and ability to produce. Recently, an interest in identity formation

has developed among many fields of scholarship, and how identity forms within

successful group development has been of interest among both communication and

situated learning researchers (Fritz, 1996; Glazer, Hannafin, & Song, 2005; Lave &

Wenger, 1990). What follows is a review of the identity literature relevant to this study.

<div align="center">Identity</div>

  Group identification is defined by in-group favoritism and discrimination against

the out-group (Tajfel & Turner, 1986). Group members identify with the group when

they see themselves as members of the same social category, share some emotional

involvement within a common definition of themselves, and achieve some amount of

social consensus about the group and their membership in it. While contributing unique

skills to their group, students have the possibility of gaining an identity through shared

membership (Hardin & Higgins, 1996). Children gain the knowledge of their cultures and how to behave through family membership. Students learn the structure and behavior required in the business of web design through interaction with fellow designers and the business client. Through interaction with others, members can create, learn, and sustain the reality of group identity.

However, group identity does not come easily. It is a process involving extensive interaction in which students learn how to work together effectively. Through many experiences working and talking together, student groups may begin to develop a group identity. The transformational period when individuals begin to move toward a group identity can be characterized by a lack of unity (C. M. Anderson, Riddle, & Martin, 1999; S. Johnson, Suriya, Yoon, & Berrett, 2002; Tuckman, 1965) as they further develop a group identity (Wenger, 1998; Wenger et al., 2002). Students sometimes exhibit difficult communication behaviors that are not conducive to team productivity (Dobos, 1996; Richmond, 2009). This difficulty is often demonstrated through different levels of information sharing as students attempt to make decisions and work on tasks (Ellis & Fisher, 1994; Kuhn & Poole, 2000; McCarthey & McMahon, 1992; T. Reimer, Reimer, & Czienskowski, 2010). Additionally, students begin to negotiate and make decisions that sometimes involve conflict (Leahy & Twomey, 2005), because this interaction can be affected by different personality characteristics (Franz & Larry, 2002), group norms (Postmes, Spears, Lee, & Novak, 2005), and discussion procedures (A. D. Galinsky & Kray, 2004; Hollingshead, 1996). Their talk toward identity and collaboration can also be affected by several internal factors, including gender issues and newcomer biases.

If group members overcome the difficult communication behaviors and learn how

to work together effectively, their group identity can continue to develop and grow (Lave & Wenger, 1990; Wenger, 1998; Wenger, White, & Smith, 2009; Wenger et al., 2002). Their acts of negotiation and decision-making are what give each student the narratives and roles that develop to form a group identity. According to Gilly, Celsi, and Schau (2012), students who feel like a legitimate member of a group and identify with it find the confidence to have strong proactive coping skills. Such proactive coping skills are directed at setting goals and achieving personal growth. Individuals who cope proactively see risks, demands, and opportunities in the future, but they do not appraise these as threats, harm, or loss. Rather, they perceive difficult situations as challenges.

Glazer, Hannafin, and Song (2005) studied identity formation through apprenticeship. These scholars followed K-12 teachers involved in a collaborative apprenticeship to learn how to integrate technology in their instructional practices. This interactive and extended class was meant to improve technology instruction. Teachers were often taught technology in quick workshops in which they did not learn the skills well enough to transfer into their own classroom. A new instructional method was devised that used peer-teachers over many weeks to help students learn how to effectively use technology in their classrooms, because learning is facilitated through a community of practice where experts teach through modeling, collaboration, and coaching (Lave & Wenger, 1990). Often, these moments would occur through shared time when teachers were able to discuss their teaching practices (Glazer et al., 2005). Teachers learned how to integrate technology eventually identified with a community of practice in which the learners became the mentors and were able to model their technology usage for others just beginning the course. These new experts had moved to

full participation in a community that practiced technology usage in their day-to-day instruction. As demonstrated by Glazer et al., the relationships formed through group development and identity formation have been found to improve learning outcomes through greater coping and confidence building. For example, successful students in Fritz's (1996) technology course reported that their difficult tasks were enjoyable and easier to complete due to interaction and help from fellow group members. These students had the most confidence and did most of the research and problem solving collaboratively, while having the fewest objections to planning and design activities. They reported that the skills they learned were transferable, including group work, initiative, management, and independence in technology design and use. The proactive coping seen in Fritz's study became goal management instead of risk management (Greenglass, 2002). Stronger proactive coping skills cause individuals to persist despite obstacles (Cervone, 1989). Such persistence has the potential to help students through the difficulties of learning and using technology. Gilly et al. (2012) argued that proactive coping converts the stress of technical risks and threats to coping with challenges; such skills could speed and deepen learning and adoption of technology. Collaboration promotes acquisition of technical and proactive coping skills, including the ability to identify and use information and access social resources to help reach learning goals (Greenglass, 2002; Schwarzer & Taubert, 2002).

Technical and proactive coping often comes about due to help from other group members that can often influence comfort level and solidarity. However, not all help is equal or always wanted. Webb, Nember, and Ing (2006) found two different qualities of help among students. If a student already understands the material, offered help is

unlikely to benefit. When a student does need help, its effectiveness depends on several conditions, including (1) the help must be relevant to the misunderstanding or lack of understanding; (2) it must be elaborated to the point that corresponds to the level of help needed; (3) it must be shared close to the time needed; (4) the receiving student must understand the explanation; and (5) the recipient must use the explanation to solve the problem. Therefore, good listening skills are also required if help is to be delivered and understood as intended and not misunderstood (Haslett & Ruebush, 1999). However, if help is not understood or has low elaboration, the receiving student will not be able to correct his or her problem. In fact, Webb et al. found that receiving only the answer could be harmful to learning outcomes. Yet for those groups that do demonstrate effective communication and information sharing patterns, they are seen as superior to the average in terms of the quality and effectiveness of decisions made or actions taken (Haslett & Ruebush, 1999; Propp, 1999).

According to Wenger (1998), the process of forming an identity defines what matters to group members, but these actions do not also determine an ability to negotiate these meanings. Therefore, an important aspect of identity is a group member's ability to negotiate these meanings. Many students can become invested in group relationships that do not allow much input on decisions and tasks. Conversely, those who take charge do not necessarily develop more identification with a group.

Negotiation is the ability and legitimacy to contribute to, take responsibility for, and shape the identity meanings that matter within a group (Wenger, 1998). Negotiability allows members to create meanings applicable to new situations, to join in the collaboration of others, to make sense of events, and to affirm group memberships. The

ability to negotiate is defined by the social configuration and each member's position in the group. It is therefore important that students socialize into a state in which they are able to negotiate because they have developed an identity, or "groupness," that allows for effective collaboration.

Socialization requires that dominant members listen to and allow for quieter members to participate in their socialization and interactions. Students often instinctually recognize this need for socialization and participation from all members. For example, Paulus (2007) studied online small-group interactions of 16 graduate students taking a teaching and learning course. The course lasted 12 weeks in which students were assigned in semester-long groups to complete multiple 2-week units involving learning tasks. The tasks were meant to synthesize and apply course concepts. Because the researchers needed to easily capture students' online communication, groups could use any communication mode available in the university's course management system, such as email, asynchronous discussion forums, or synchronous chat.

Upon analyzing the online interaction of student groups across the semester, the researchers found three socialization moves, including politeness, group cohesion, and socialize/play. Of all the themes found during analysis, politeness was the most frequent type of social move (49%). Such a result may have occurred because closing statements were coded as politeness rather than group cohesion, but they were often also evident as group cohesion. For instance, excerpts from one group included both polite and beginning cohesive statements:

> Arthur: I'm looking forward to this assignment!
> Libby: I look forward to working with you all and getting to know you more.
> Ron: I look forward to a smooth and enjoyable unit.

Lola: …looking forward to start our team project. (p. 237)

Such politeness strategies were statements made early in the group process for creating relationships among participants. These statements began to ground students in acceptable ways of interacting and in legitimized membership in the same community. Thirty-eight percent of statements were classified as cohesive, those who addressed responsibility to the group and members' responsiveness. These statements were often encouraging, including comments such as "good job" when giving feedback on group member performance.

They also made comments meant to volunteer for action, express opinions about the task, or solicit opinions from others. Statements mitigating group performance, comprised of comments such as "just my 2 cents worth" (p. 237) were meant to clarify or refocus the entire group on the task. For example, one student initiated a discussion about the group's task and ended her email with a concern for the group process and asking for ideas from group members.

> …I was thinking that the person who does three should also combine the parts of the document into one whole. I know that Ron is out of town until Thursday—so this is just to get us started as soon as he gets back. If either of you have another idea of how to go about the assignment share it—this is just what I saw—doesn't make it the only way :). (Paulus, 2007, p. 237)

These mitigating comments also evaluated opinions or suggestions or asked others to follow through on responsibilities they were already given. Such are the types of statements that both legitimize the sender's membership in the group and draws in the others to participate in responsibility of the task. The balance between individual contributions and group responsibility was a regular feature of these conversations.

Furthermore, Paulus found the least common theme, but important to their identity was socializing at 13%. Small talk was used as a method of creating and

maintaining relationships. One group exchanged some off task discussion about one group member's pregnancy in which personal needs are seen to impact her ability to do group work.

> Sariah: So…the bambino is coming soon (I'm assuming that's why you are distracted). I think I'd be jumping out of my skin if I were in your shoes (your feet haven't swollen too much have they—you can still wear shoes right?). :-)"
>
> Libby: I've been very lucky—no feet swelling and I've only gained weight (although 30 pounds!) on my belly button (from the back I don't look pregnant). (p. 237)

Although these types of interactions are less common, they are no less important in the development of groupness. For it is the relationship building that results in cohesion and groupness (identity) that allows group members to develop solidarity, satisfaction, effective decision-making, orientations to the task, form social-emotional roles, and deliberate with negotiation (Edwards & Harwood, 2003; A. Y. Wang, 1994).

Only after a group has developed a relationship and changed how they make decisions and work together can they achieve an identity that leads to high quality task production. However, the literature has revealed that problems exist that can delay or inhibit group identity development. Problems and issues that appeared within this dissertation are detailed in the following text.

<div align="center">Problems with Classroom Group Work and Collaboration</div>

Clearly, collaborative learning has demonstrated several beneficial learning outcomes. However, not all groups reach identity and the higher stages of group development (Gabarro, 1987). Some groups remain lodged in, or regress to, earlier stages of development thereby never developing an identity. These groups were less productive

and had less influence over members' behaviors and attitudes (Wheelan & Kesselring, 2005). As an example, Wheelan and Lisk (2000) studied communication students using technology to communicate and found that over 62 weeks collaborating students exhibited group progress that could be compared to a linear sequence model. In general, most groups developed across time in a manner consistent with linear group development, reaching a stage where students exhibited abilities to negotiate and perform high quality work. However, three groups did not progress, because they remained stuck in or regressed to a stage of dysfunctional cohesion or conflict. Their dysfunction was the result of not discussing their goals or expressing continued tension in the group.

Communication scholarship has found that collaboration only comes about after time and development of a group identity. Only then will a group get to the point where they can effectively negotiate and make decisions about their collective task. To further complicate the situation, certain group communication pitfalls have been researched that also influenced the groups of this study. Included in these problematic behaviors that can delay or inhibit group development are individual reticence to participate, social loafing, and technology distraction and addiction. These issues that can lead to lower productivity are explained next.

<div align="center">Reticence</div>

Some students arrive to the classroom already having a communication style of interpersonal dominance, because they are adept with social skills. Socially skilled people are more capable than their reticent counterparts of expressing themselves verbally and nonverbally, of controlling their presentations to give a favorable impression, and of conveying confidence, friendliness, poise, and similarly favorable attributes (Burgoon &

Dunbar, 2000). These are among the same communication behaviors exhibited by dominant individuals while not necessarily aggressive, overbearing, domineering, and controlling. Johnson, Johnson, and Smith (2006) assert that these dominant individuals are necessary to the success of the learning group, because their social skills enable promotive interaction that encourages and facilitates others' efforts to complete tasks in order to reach the group's goals.

In contrast, some students naturally show reticence or inability to contribute to a group's discussion. Reticence is the idea that a person is unwilling or unable to communicate due to abnormal level of fears or anxiety associated with another person or persons (Rosenfeld, Grant, & McCroskey, 1995). Burgoon and Hale (1983) reported apprehensive or reticent group members as unwilling to communicate due to personality traits such as introversion, low self-esteem, and alienation. She concluded that reticent individuals contribute less and seek less information from other group members. These individuals may find supplying information threatening because it involves group interaction, and they may feel threatened because they may have to respond to inquiries about their input. Because these group members talk less, groups made up of primarily reticent members will interact less and receive fewer learning benefits. Placing reticent students in a group and telling them to collaborate does not guarantee they are capable. Considering evidence of reticence, dominant members must be taught to listen to and include quieter teammates, and they must become motivated to embrace participation of reticent students if the group is to become productive. The entire premise of group dynamics is based on the idea that social skills are key to team productivity.

As an example, Waite et al. (2004) found that computer science college students

assigned to work collaboratively initially exhibited an inability and reticence to work with fellow students. They preferred to work alone, because they wanted to bear the sole responsibility and get all the credit for their work. They also wanted to work alone because they did not want to deal with potential interpersonal problems and pull along "less competent" students. This is important because, like the students in this study, they considered every coding assignment to be a product (Button & Sharrock, 1996) and an opportunity to demonstrate to the professor they can get the "right" answer and be rewarded with a good grade. In an effort to work alone, students cast a calculated risk to procrastinate their work so others could not contribute or refused to give technical and emotional support to group members. They rationalized such behaviors through statements such as "if I help them, they won't get the benefit of working it out for themselves." Both behaviors were damaging to collaboration and created problems with student success because they had either overrated their competence or underestimated the magnitude of the task.

Once the instructors understood these issues, they intervened through an improved pedagogy by asking students to work collaboratively on a problem sufficient to overcome their apathy in working with others and gaining experience enough to better understand the process of group work. Although students initially resisted the team-based work due to their culture of individualism, they eventually accepted collaboration that led to better performance and increased student satisfaction.

Johnson and F. Johnson (1991) report that because so many students exhibit reticent behaviors and a lack of social skills, they should be taught how to use behaviors that encourage interaction. Group members must be taught the small-group and

interpersonal skills they need to work effectively with each other. In collaborative learning groups, students are required to learn academic subject matter (taskwork) and also the interpersonal and small-group skills required to function as part of a team (teamwork). Collaboration is inherently more complex than individualistic learning because students have to simultaneously engage in taskwork and teamwork. If teamwork skills are not learned, then taskwork cannot be completed. Furthermore, if group members are inept at teamwork, their taskwork will tend toward the substandard.

One specific type of reticence, leading to potential dysfunctionality in the group, exists within the computer science arena. Rosenberg (2008) argues that a social bias exists against women in engineering and computer science. Spertus (1991) taught computer science at a higher education institution and has studied this issue for years. She wrote about this problem in a manner that highlights the problem of a cultural bias against women.

> Because math and computer programming came easily to me and to many other women who have had the opportunities, women clearly are not inherently unable to do well in them. Instead, girls and women are choosing, consciously or subconsciously, not to go into or stay in computer science. While one cannot rule out the possibility of some innate neurological or psychological differences that would make women less (or more) likely to excel in computer science, I found that the cultural biases against women's pursuing such careers are so large that, even if inherent differences exist, they would not explain the entire gap. (p. 1)

Historically, several group communication scholars have also showed that gender issues also influence how group members talk to one another (Davies, 1994). Men are identified more often as task leaders, and women are seen more often as relationship leaders of groups (Gouran & Fisher, 1984). Therefore, women may be expected to provide supportive communication to newcomers. Men may be expected to provide functional information about task and role performance. Men often have difficulty with women as

task leaders, and both men and women report less affinity for having women as leaders (Yerby, 1975). These biases could influence newcomers' openness to socialization processes in groups of female leaders. As group members seek to reduce uncertainty about their community and its members, such practices may prevent assimilation of all members in the group's identity by leaving some members feeling like outsiders (Hess, 1993).

<p style="text-align:center">Technology Addiction</p>

In addition to the classic nonproductive effects on group interaction caused by reticence, this study also found that technology distraction and even addiction at least delayed each group's development. This issue often arose because students in higher education classrooms bring in their own wireless technologies that threaten to distract student attention and impact learning (Fried, 2008). Mobile phones are considered distracting because of problems with ringing during class, cheating, or multitasking. The camera on these devices can also raise privacy issues. Laptops and classroom computers are also seen as impacting learning because of unmuted sounds and multitasking (e.g., email, instant messaging, Facebook and Pinterest updating, and online video watching). Computers also create a wall between the student and instructor.

The unique social functions of smartphones and online networking sites allow perpetual connectivity. Because students have the opportunity to remain always online and connected with friends and family, scholars have worried that some may become affected by an addiction to accessing these resources (Cardak, 2013; Ehrenberg, Juckes, White, & Walsh, 2008; R. L. Huang et al., 2009; Niculović, Živković, Manasijević, & Štrbac, 2012). Addiction is defined as a person's feeling of necessity for something, such

as another person, substance, Internet, etc., in order to sustain his/her existence as desired. DSM IV codes contain the phrase "very strong need or compulsion towards taking a substance" for addiction (APA, 1994). The concept of Internet addiction was first coined by Goldberg (1996), and the subsequent DSM IV addiction criteria defined it as "very strong desire or urge for using the Internet."

Cardak (2013) posits that there are noticeable differences between normal Internet usage and addictive use. Normal users use this technology for their daily needs within reason, they can control themselves while using it, and show standard behaviors when not using it (Kesici & Sahin, 2009; K. S. Young & Rogers, 1998). In contrast, addictive users of the Internet have excessive mental activity about it (Koc, 2011), feel the necessity for using it in an increased proportion (Lee and Shin, 2004); fail in their attempts to control or reduce their usage (Widyanto and Griffiths, 2007), feel uneasiness, exhaustion or anger when their connection is decreased or cut off (Peterson et al, 2009), exhibit tendencies toward poor abilities to adapt to one's environment (Ehrenberg, 2008), have problems with family, friends, work, and school (Cardak, 2013).

Several scholars have attempted to ascertain just how many higher education students exhibit such addictive behaviors. Huang, Lu, and Lu (2009) surveyed 4400 Chinese university students regarding their Internet addictive behaviors. They found that almost 10% of the students showed addictive behaviors by reporting heavy Internet use habits, poor academic achievement, and lack of love from their families. Niculović, Živković, Manasijević, and Štrbac (2012) surveyed 270 European university students and the results showed that approximately 40% of the students had at least initial symptoms of addiction, because they reported high levels of four dimensions of Internet behavior:

"Online preoccupation," "Lack of self-control," "Neglect work," and "Neglect social real-life."

Clearly, Internet addiction is a problem among the students in our classrooms, but Turkle (2011) views this issue as so much bigger. She interviewed hundreds of university students and many others. What she found was that people now want to be alone in public spaces with their personal devices and networks. At business meetings, family gatherings, and classroom spaces it is good to come together physically but it is more important to stay tethered to the network. For example, a 13-year-old who hates the phone and voice mail feels that texting offers just the right amount of access. For her, texting places peoples not too close, not too far, but at just the right distance. Turkle found that within a decade, what used to be seen as odd behavior with MIT students "Always ON," is now the norm for all of us. Everyone has a cell phone and everyone is always attached to the network. Students live full time on the Net, newly free in some ways while being newly yoked in others.

Furthermore, Turkle (2011) described the computer as an active agent that helps create students' identities. The computer has become more than a tool for the hundreds of students she interviewed. This is true of our students within technology classrooms. For example, one of my students described her connection with all her technology devices as she wrote a paper for an assignment on Cyber Literacy:

> Kids consume so much media today that it is hard for them to focus on just one thing at a time. Take me for example; when trying to write this paper in class I had my laptop on, the computer on, and my phone on the desk. Now as I'm writing this paper at home I still have my phone out on the desk and I'm texting my friends and checking Facebook while at the same time writing this paper. (Hatch, 2013)

This student demonstrates that our learners carry multiple devices with them that

enable them to express multiple aspects of themselves and different identities, even as they exist within a space meant for learning and collaborative work. Turkle found that technology is seductive in that it offers the illusion of companionship without the demands of friendship, and our college students desire to always be connected to their friends and information through their many devices. Students' "networked life allows [them] to hide from each other, even as [they] are tethered to each other." They would "rather text than talk" (Turkle, 2011, p. 1). She witnessed people who wanted to be alone in public spaces with their personal devices and networks. Although we have turned to technology to make us more efficient at work, we also want it to make us more efficient in our private lives. Students, too, feel a need to always stay connected. "Always ON" is the new norm for their lifestyles. Most college students have a cell phone, and they are always attached to the network. Students live full time on the Net—always yoked to cyber-relationships even when in class.

<div align="center">Individualized Culture of Classroom Interaction</div>

In addition to problems of technology distraction, collaborative and team-based learning can also be impacted because students are acculturated to working individually and not initially comfortable with group work. The research on collaboration has rarely addressed the issue of individualism that can impact collaborative learning success (Bradshaw & Stasson, 1998; McKinney, 1982; Simpson & Richmond, 1982). Many students in our college classrooms are taught from a very young age to work individually in their elementary and secondary school classrooms, while only allowed to talk with the teacher. Schools foster individualism, viewing the child as an individual who should be developing independence and valuing personal achievement (Greenfield, 1994). As such,

school learning commonly emphasizes independent work and trial and error learning. Greenfield argued that learning independently is best for learning situations in which specific tasks must successfully completed to indicate achievement.

Educational researchers comparing the collectivist cultures of Africa, Latin America, and Asia to the individualistic viewpoints of US White students have studied individualism within primary and secondary classrooms (Boykin, Jagers, Ellison, & Albury, 1997; Boykin, Tyler, & Miller, 2005; Rothstein-Fisch, Greenfield, & Trumbull, 1999; Tyler, Wade Boykin, & Walton, 2006). In this research, collectivism is viewed as an emphasis on the social context of learning and knowledge, and individualism stresses information disengaged from its social context (Hofstede & Bond, 1984). For example, Greenfield, Raeff, and Quiroz (1995) observed that when collectivistic students encounter individualistic schools, conflicts are based on hidden values and assumptions of many teachers.

> A kindergarten teacher was showing her class an actual chicken egg that would be hatching soon. She was explaining the physical properties of the egg, and she asked the children to describe eggs by thinking about the times they had cooked and eaten eggs. One of the children tried three times to talk about how she cooked eggs with her grandmother, but the teacher disregarded these comments in favor of a child who explained how eggs look white and yellow when they are cracked. (p. 44)

The first child's answers were typical of the relationships encouraged in collectivist cultures, where objects are most meaningful when associated with social interactions. The second child's answer was typical of an individualistic viewpoint, where objects are separate from social interactions. Because the second child's answer was demonstrated as correct, this interaction communicated to the students that individualistic viewpoints are valued and conform to acceptable standards. Over time, these interactions result in acculturating students to individualism, where thinking and

acting collectively is discouraged. This includes the idea of collaborative work in the classroom. In order to effectively facilitate collaboration with in college classrooms, many students must learn how to work and communicate together.

Because US students are often acculturated to individualized learning and may feel uncomfortable with collaboration, we need to know more about what happens when integrating team-based learning in all classrooms and this dissertation explores what happened in a technology education college classroom. Important to this research is gaining a greater understanding of students' viewpoints, and much of this information can come through learning what students say and do.

<div style="text-align:center">Conclusion</div>

Taken together, the literature described in this chapter explains the history of technology education leading toward collaborative learning and then the scholarship of small-group communication related to such a pedagogy. The literature on group process is vast and has helped to explain why many groups change. Clearly, groups often mature and progress to the point that they increase in performance ability over time. However, not all groups progress, as evidenced by issues with reticence, social loafing, individualism, and technology distraction. Although important, such nonproductive outcomes are not covered in most education texts about implementing team-based learning.

Based on the research of Wenger and colleagues (Lave & Wenger, 1990; Wenger, 1998; Wenger et al., 2009; 2002), the model presented here is one that involves the interplay of communication behaviors that are not described in the primary how-to books about using team-based and collaborative learning within higher education classrooms by

Johnson and Johnson (1991), Slavin (1991; 1995), Michaelsen and Sweet (2004; 2011). Much of that research is based on face-to-face learning groups, without consideration of technology's influence and student agency.

What I have explained is a disparate and varied scholarship that does describe both productive and nonproductive communication behaviors, based primarily on face-to-face work. Ultimately, it is the interplay of communication actions, in conjunction with effective pedagogy, which determines whether a group is productive or nonproductive. What is needed is a document that better explicates what communicative behaviors occur when higher education students come together to work on an abstract and complex technology task. This dissertation is meant to meet that need. As a result, six student groups, working on creating a complex and difficult website for a community client, were followed over three consecutive semesters (two groups per semester). Their communication behaviors were recorded, transcribed and copied, including their in-class talk and email messages. Therefore, the research question is meant to investigate the similarities and differences of communication within student groups while learning and creating technology:

> **What are the communication similarities and differences in productive and nonproductive groups while working together on an authentic technology project?**

Communication among collaborating students now involves more than face-to-face interactions. Students now communicate through email, texting, and social networking. To further complicate the situation, students in a technology classroom must also collaborate by sharing files and documents on the "cloud" and other online services. Technology has expanded and changed the way students communicate, so small-group communication research must expand to explain what happens when computers and other

devices are involved in the interaction. The research proposed here is meant to expand small-group communication research by discovering and describing what communication behaviors and patterns emerge in the context of a technology course making heavy use of collaborative authentic learning tasks. It is also meant to bridge small-group communication scholarship with that of education's team-based learning research by explaining how communication similarities and differences explain what occurs with productive and non-productive groups. The hope is that this bridging of the two areas of scholarship will help to better explain what occurs with both classroom and professional groups when dealing with highly abstract and complex technology projects.

CHAPTER 3

SITUATED LEARNING THEORY

Since Whitehead's *Aims of Education* (1967) and Dewey's *Experience and Education*, interest in realistic learning contexts has been strong. Such perspectives have provided a philosophical foundation for the approach to learning by doing. In their thought-provoking book, Lave and Wenger (1990) introduced a view of learning and concepts such as situated learning and legitimate peripheral participation. Their work has influenced many teacher educators, researchers, and professionals. For example, Newmann and his colleagues (1996) focused on authentic pedagogy in the classroom and the importance of real world activities and disciplined inquiry.

Authentic learning within this dissertation can best be described by the theory of situated learning in communities of practice (J. S. Brown et al., 1989; Lave & Wenger, 1990). This chapter will further explain the history and development of Situated Learning theory beginning with its interest in the 1970s and 1980s in apprenticeships as a historically significant example of situated learning in practice. In 1990, Lave and Wenger introduced Situated Learning theory to describe what happens when certain groups are related in their modes of learning through apprenticeship-type relationships. Situated learning is a social process that is meant to counter modes of instruction that leaves knowledge inert and unusable.

A later version of situated learning from Wenger and colleagues (Wenger, 1998; Wenger, White, & Smith, 2009; Wenger et al., 2002) viewed effective learning as a process of being fully involved in a community of practice where students engage and identify with others as they become embedded in activity, context, and culture. As Situated Learning theory developed, its use was assessed within educational contexts. It was found that instructors using situated learning should carefully consider collaboration and authentic tasks to make learning successful. They detailed specifics on educational contexts, tasks, seeing expertise and multiple perspectives. In doing these things, students should reflect on new knowledge while articulating their ideas collaboratively. To ensure proper learning, instructors need to create testing situations that teach and improve student learning.

<u>Situated Learning Theory Overview</u>

Apprenticeships provide a historically significant example of situated learning in practice. In the 1970s and 1980s, teachers and researchers in education investigated the notion of apprenticeships for school-based instruction (Bauman, 1973; Goody, 1989) (Greenfield, 1984) (Lave & Wenger, 1990) (Wood, Bruner, & Ross, 1976). Apprenticeships have been the traditional model of expert learning used for centuries in trades such as tailoring and carpentry. Scholars attempted to distinguish characteristics that were critical to apprenticeship's success in enabling learning, and they began the process of developing a theoretical perspective. Early in this process, Collins (1991) described situated learning as "the notion of learning knowledge and skills in contexts that reflect the way the knowledge will be useful in real life" (p. 122). Brown et al. (1989) used these ideas to produce a proposal for a model of instruction that had

implications for all areas of education. They posited a breach between learning and use created by the standard practices of our education; a system that assumes knowledge can be abstracted from the situations in which it is learned and used. The Brown et al. model argued that knowledge is linked to the activity, context, and culture in which it is developed and used. The model then recommended teaching with situated apprenticeship by enabling students to acquire, develop, and use knowledge tools in authentic domain activity. In this model, student activity involved not only hands-on exercises, but also made explicit their tacit knowledge through conversation. Teachers and fellow students support students' attempts at doing the task ultimately empowering them to continue independently.

During the 1990s, the further exploration of apprenticeships and situated learning (Lave & Wenger, 1990; McLellan, 1996; Wenger, 1998; Wenger et al., 2002) coincided with the rapid development in the educational uptake of multimedia, simulations, and eventually Web-based learning environments (Alessi & Trollip, 2001). Brown and Duiguid (1989) noted, "[O]ne of the most persistent educational questions following discussions of situated learning has been: How can these situated theories be operationalized?" (p. 10). This question has been answered over the past 25 years with Situated Learning theory, a comprehensive framework meant to explain and model operationalizing situated knowledge creation.

Lave and Wenger (1990) first articulated Situated Learning theory as a descriptor of what happens when certain groups, such as butchers, midwives in Yucatan, and learning teams in a college technology classroom, are related in their modes of learning through apprenticeship type relationships. Based on social constructivism, situated

learning assumes that knowledge is conceived as a social process in which individuals participate in mutual learning at different levels, which depend on a students' authority in the group—whether a person is a newcomer or a long-timer. This is the process by which a newcomer learns from the more longstanding members that comprise a community of practice. Lave and Wenger named this process "Legitimate Peripheral Participation."

Furthermore, they argued that knowledge remains inert and unused if taught in a context that separates knowing from doing. Knowledge given in abstract terms or meant simply for passing exams was first termed "inert" by Whitehead (1967) who described such learning as confined to instructional contexts and not real-world problem solving. It is a common phenomenon that knowledge learned in traditional instructional settings is not used outside the corresponding context (Renkl & Atkinson, 2003; Renkl, Mandl, & Gruber, 1996). Lack of knowledge transfer from in-school to out-of-school was seriously questioned by Lave and Wenger, because the primary purpose of education is certainly not meant to make learners better able to answer exam questions but to successfully deal with problems of everyday or professional life. As such, they proposed that such learning is situated in its learning context and difficult to use outside of the classroom.

To illustrate the issue of inert knowledge, Schoenfeld (1988) described a national assessment where math students did not understand the realistic use of computational skills in mathematical practice. A math problem on the exam read, "An army bus holds 36 soldiers. If 1,138 soldiers are being bussed to the training how many busses are needed?" Although 70% of 13-year-olds nationwide correctly performed the long division required for the answer, only 23% actually gave the correct answer of 32 busses. Almost a third said "31 remainder 12," an unrealistic answer. "The [students] failed to

connect their formal symbol manipulation procedures with the 'real-world' objects represented by the symbols [of mathematics] constitutes a dramatic failure of instruction" (p. 150). Because knowledge did not easily transfer to real life for many of these math students, they demonstrated a need for learning to occur within a situated learning environment, where learning is social and comes largely from their experience in participating fully within communities. Effective learning calls for a process of "Legitimate Peripheral Participation," being fully involved, in a community of practice, where students engage with others as they become embedded within activity, context, and culture (Lave, 1997). Such a social and situated activity allows students to learn a subject matter by doing what experts do. Such a learning activity often provides students the ability to transfer knowledge to new situations.

In later publications, Wenger (1998), Wenger, McDermott, and Snyder (2002), and Wenger, White, and Smith (2009) abandoned Legitimate Peripheral Participation while evolving the idea of communities of practice. Based on extensive observational research methods, they found that communities of practice are common and arise through groups of people who share a concern, a set of problems, or passion about a topic. For example, these communities can be seen as engineers who design electronic circuits and find it useful to compare designs and discuss the intricacies of their specialty. Common also are soccer parents who take advantage of game time to share ideas about the subtle part of parenting, and artists who congregate in cafés to debate the merits of a new style or technique. These people do not necessarily work together every day; they meet because their interactions are valuable. As they spend time together, they share information, advice, and insights, while helping to solve problems. They may create

documents or tools, or they might develop an understanding of what they share. Whatever reason for accumulating knowledge, these communities become bound by the value they find in learning together. "Over time, and a developed and unique perspective on their topic as well as a body of common knowledge, practices, and approaches, they also develop personal relationships and established ways of interacting. They may even develop a common sense of identity" (Wenger et al., 2009, p. 4). Through all these communicative activities, groups of people become communities of practice.

Communities of practice develop through inherent tensions in dualities (Wenger, 1998). They identified four dualities that exist in communities of practice: participation-reification, designed-emergent, identification-negotiability and local-global. These dualities exist as both distinct and complementary. One is empty without the other. For example, the participation-reification duality is linked to knowledge management of constructs such as the US Constitution. The reification[1] of the Constitution is an object holding a meaning; it is not equivalent to citizenry. Yet it is empty without citizens' participation. Conversely, the production of a reification about the Constitution is necessary for the citizens to act to bring together the multiple perspectives, interests, and interpretations that participation entails. As this example suggests, participation and reification cannot be considered in isolation; they come as a pair. They form a unity in their duality. It is through their various combinations that they give rise to a variety of

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[1] Reification here means "making into an object." This concept of reification is different from that derived from Marxist studies that as human beings become considered as physical objects they are deprived of subjectivity, a standard right of individual agency.

meaning experiences.

In Wenger, McDermott, and Snyder (2002) communities of practice evolved to explain a developmental process similar to much of group communication scholarship. According to this research, the negotiation of meaning within a community goes through a process of development in three interrelated cycles of interaction: mutual engagement, joint enterprise, and shared repertoire. A community is first built through mutual engagement in which members establish norms and build collaborative relationships. These relationships are the ties that bind the members of the community together as a social entity.

Through a group's interactions, they eventually form a joint enterprise. They create a shared understanding of what binds them together. Shared knowledge is (re)negotiated by it members and sometimes referred to as the community's domain. For example, a community of Web designers will work collaboratively to create a domain that is not an abstract idea of fixed set of problems, instead, knowledge of concepts such as HTML and user research changes and evolves along with the community and surrounding environment. Hot topics periodically arise and generate a new need for decisions and further knowledge creation.

Finally as part of its interactive practice, a group produces a set of resources, termed their shared repertoire. These resources can include both literal and symbolic meanings. As problems arise and are solved, as new technologies are learned and pose new challenges, the community's sense of what it does involves and grows. Yet, throughout all these changes, the community of practice often develops an identity "rooted in a shared understanding of its domain" (Wenger et al., 2002, p. 31).

Ethnographic research in business and online communities accomplished by Wenger and colleagues (Lave & Wenger, 1990; Wenger, 1998; Wenger et al., 2009; 2002) found that when people work together over long term, they often develop a group identity. Through their shared history and context, members negotiate knowledge creation and identity by giving significance to topics in relation to their practice. They provide a context in which to compare new information to what is already known. Their acts of negotiation and decision-making, about potentially significant knowledge, are what become significant learning (Wenger, 1998). Such an educational result occurs in part because engagement and learning within a community of practice does not imply or require homogeneity. Collaborative knowledge creation often leads to disagreement and discovery because members of the community see the world and technology very differently (Wenger et al., 2009). Conflicts and divergent views can act as both a challenge and a resource for community. Relational and identity formation can help group members to work out knowledge creation and decision-making. As these problems arise and are solved, as new technologies are learned and pose new challenges, the community's sense of what it does and who it is evolves and grows.

As Situated Learning theory developed through the writings of Wenger and others, scholarship evaluating how it could be applied and used also developed over time. This research began with mixed results because the theory was still in development. As the theory developed and participation in communities of practices was more fully explained, educational scholars began to understand its application through a greater description of collaboration and authentic learning.

Educational Contexts

Early in its development, Situated Learning theory was applied to educational contexts, and an early review of the claims of about situated learning in education was published by Anderson, Reder, and Simon (1996). They reviewed the four central claims of situated learning related to education: (1) Action is grounded in the concrete situation in which it occurs; (2) knowledge does not transfer between tasks; (3) training by abstraction is of little use; and (4) instruction must be done in complex, social environments. Using empirical research in cognitive learning of mathematics skills from the 1970s and 1980s, they argued that situated learning only works in certain circumstances that do not exhibit specific problems.

They then provided examples from their own observations. For example, they described reports from college group projects that demonstrated group learning could potentially become counterproductive. They observed some students complaining about the difficulty of finding times for the group to meet when working collaboratively on assignments. The effort and difficulty of scheduled coordination made the process frustrating. Some students complained that others exploited the system through loafing where members assumed that others would do all the work. Such loafing meant that the working members acquired all the knowledge and skills. An often reported practice involved some groups dividing the labor across classes so that one member of a group did all the work for one project, while another carried the burden for a different class.

Clearly, these are not the intended outcomes of situated and collaborative learning practices. Instead, Anderson et al. (1996) argued that situated learning should be thoughtfully implemented and scripted. Although admitting that collaborative learning

can be potentially better over individual learning, they asserted that it is not a panacea and should be carefully considered. This warning might have acted to convince other scholars to further investigate the specific characteristics of situated learning that effectively improve learning. The following is a detailed review of researchers' findings regarding collaboration and authentic tasks. These areas of study address the concerns found in Anderson et al. (1996).

<div align="center">Authentic Learning</div>

As Situated Learning theory developed, it became clear to researchers and teachers that knowledge can become situated through student-centric collaboration and authentic tasks. Learning tasks characterized as authentic are meant to promote real-life learning and skill building within classrooms. Such tasks are commonly characterized as embedded within context, complex and ill-defined, with reflective elements. Collaboration in authentic tasks is necessary for the articulation and reflective acts of socially constructed knowledge as participants witness expert performances and receive coaching and scaffolding that involves effective assessment. The following section describes each characteristic according to scholarship.

<u>Authentic Context</u>

An authentic context that reflects the way knowledge will be used in real life should provide purpose and motivation for learning, while providing a sustained and complex environments that can be explored at length (J. S. Brown & Duguid, 1993; Honebein, Duffy, & Fishman, 1991; T. C. Reeves & Reeves, 1997). An excellent example of a computer-based authentic environment based on a microworld was

Geography Search by McGraw-Hill (Collins, 1991). It taught history, math, planning, and problem solving. In this simulated world, student groups sailed ships from Europe to the Americas about the time of Columbus, to look for treasure that is distributed around North and South America. Land and other ships came into view on the screen when the students' "ship" neared them. Students had to calculate their routes using a sextant and compass in the same manner as sailors of the 1400s. They also had to keep track of food and supplies, so they did not run out at sea. In this way, students learned history and math in a context where novel problems continually arose, similar to real life problems experienced while exploring the world.

Authentic Tasks

These are tasks that are ill-defined and have real-world relevance while situating learners in real-life or work related environments. These tasks require complexity and should be completed over a sustained period, rather than a short time (Bransford, Vye, Kinzer, & Risko, 1990; J. S. Brown et al., 1989; Lebow & Wager, 1994; T. C. Reeves & Reeves, 1997). The goal for these assignments is to create a unique product to demonstrate achievement, even when there already exists an accepted and established procedure for solving the problem. Herrington et al. (2000) proposed further refinement of these tasks. They suggested that authentic tasks are ambiguous, require students to define the tasks and subtasks needed to accomplish the activity, are investigated by students over a sustained period of time, can be integrated and applied across different subject areas, are seamlessly integrated with assessment, create products valuable in their own right, and allow competing solutions and diversity of outcomes.

An exemplar authentic task for a college journalism student would involve

engaging in creating a complete news package (Enas, 2008). The student would be asked to begin by summarizing key points of news stories from wire services. She would then be asked to develop a news story through applying the basic skills and techniques for interviewing, then properly logging tapes and identifying key package elements. Next, she would be tasked with writing clearly and correctly in forms of news scripts, while evaluating work produced for accuracy, fairness, clarity, and appropriate style. Finally, the student would produce a news show demonstrating the many skills and techniques required for achieving this end. Through the entirety of this project, a student becomes situated in the environment of a news job while working on tasks authentic to that position.

Expert Performances

Authentic learning environments need to provide access to expert thinking and modeling of processes, access to learners with various levels of expertise, and observation of real-life episodes as they occur (J. S. Brown et al., 1989; Collins, 1991; Lave & Wenger, 1990). For example, junior management consultants working with those senior and more experienced were studied by Handley, Clark, Fincham, and Sturdy (2007). They studied how participation enabled or constrained junior consultants to develop consulting practices and identities within the consultancy community of practice. Several consultants indicated that it was through their participation with a business client that they were able to develop their identity and practice. By practicing management skills, with senior consultant oversight, such as leading small client meetings and taking responsibility for client deliverables, they experienced emotions of fear and self-confidence. Throughout this transitional period, their growth into self-confidence was not

immediate but took time because they sometimes let the senior consultant take over meetings. They moved between multiple forms of participation as they learned how to be a consultant. During this time of transition, the consultants developed their work-based identities as well as their sense of self as "good consultants."

Multiple Roles and Perspectives

Students must be able to explore the task from different perspectives, considering multiple points of view, and crisscrossing the learning environment repeatedly (Collins, 1991; Honebein et al., 1991; Spiro, Feltovich, Jacobson, & Coulson, 1995). Appreciating the collective nature of knowledge is important in an age when almost every field changes too much for an individual to master (Wenger et al., 2002). Today's complex problem solving requires multiple perspectives, benefitted by some expertise, and students need others to complement their learning. Yet, the collective character of knowledge does not mean that individuals do not matter. The best communities welcome strong personalities and encourage disagreement and debates. Through controversy, a community is made more vital, effective, and productive.

For example, 151 students in several business communication classes were asked to form groups for collaborative work (Usluata, 1997). Many groups were comprised of both genders and multiple perspectives. As these students worked together throughout the semester, they often experienced different viewpoints and conflict. Through continued communication, they learned to not only tolerate one another but to value each other's perspective and knowledge. Once students learned to work collaboratively through sharing information and making decisions together, they achieved harmony and cohesion, while valuing work with others having different backgrounds.

Reflection

Reflection is a critical element in the solution of authentic tasks because it provides nonlinear cognitive organization to help students readily return to any element of the learned environment if needed, and the opportunity for learning to compare themselves with experts and other learners in varying states of accomplishment (Boud, Kemmis, Keogh, & Walker, 1985a; Boud, Keogh, & Walker, 1985b). However, reflection is not automatic, and new experiences or initial learning may remain buried at the unconscious or subconscious level (L. D. Fink, 2003). When this happens the learning may be limited, distorted, or even destructive. Only when students pull their original knowledge up to the conscious level and reflect, does it become new and richer in meaning.

Some portion of meaning making will always need to be accomplished by students who spend time reflecting alone, but most people find solitary reflection is not the most effective way of accomplishing the task. When students engage in dialogue with others, the possibility of finding new and richer meanings increases dramatically (L. D. Fink, 2003).. As people collaboratively search for the meaning of their experiences, information, and ideas they also create the foundation for community (Wenger et al., 2002). Fink argued that creating such a reflective community greatly enhances the quality of learning at both the individual level and within the whole college experience.

Boase-Jelinek, Parker, and Herrington (2013) evaluated how a reflective peer review process worked with 300 preservice teaching college students. The authors had developed an online peer review system that automatically assigned the name and Web address of an assignment that each student was to review, as a required portion of the

class grade. Each assignment for peer review was provided with a web-based rubric specifying the criteria they were to use. Students were told that this same rubric would be used not only for peer review but also later for summative marking of their work by instructors. When students submitted their peer review, the system automatically sent an email to the reviewed student advising them that a review had been performed and gave them the link to the review. A reviewed student could then modify the work and ask for it to be re-reviewed. At the assignment due date, the teaching team used the same rubric to assess each student's work, and they reviewed the quality of the review each student had performed. Once marking was completed, students could view both peer and instructor reviews. Later, the researchers interviewed students and found they thought the review process was highly beneficial, both in terms of helping them reflect on and improve their submitted work and in terms of learning how to assess their own work. One student summarized this with the comment, "... I began to look through my work and compare it to the peer review, and I was able to see what the student was saying. I repeatedly told myself ... this isn't a personal attack, it is designed to help you get better marks, so stop being upset and improve your work" (Boase-Jelinek, 2013, p. 126).

Articulation

Within articulation, students are required to discuss and describe their ideas, a process that strengthens their understanding and reasoning while helping to identify any weaknesses and gaps in their thinking. Articulation requires that groups discuss the topic and give public presentations of their argument to enable the defense of the position (Collins, 1991; Lave & Wenger, 1990). For instance, Palsole (2012) used a team-based learning design in her technology and society college course. He assigned student teams

that were heterogeneous and diverse in knowledge and experiences. Lectures were then dropped in preference for students reading and preparing their notes, and they were to begin each class sharing in their teams what they learned from the materials and describing what it meant. The resulting discussions were often "vociferous" as students gave their point of view and sometimes disagreed with others. In the end, students performed well in critical thinking and ethical dilemma exercises, demonstrating a good deal of thoughtfulness in their answers. The need to prepare and come to class ready to articulate ideas led to a peer learning process that helped students to publicly describe and discuss their ideas. The only instructional problem was the need to cut off discussions that kept going even when the timers went off.

Collaborative Construction of Knowledge

Few realistic problems are solved by individuals, so collaboration among students is an important element in an authentic problem-solving process. Therefore, tasks need to be addressed to groups rather than individuals, and appropriate means of communication need to be established (J. S. Brown et al., 1989; Collins, 1991; T. C. Reeves & Reeves, 1997). Collaboration promotes discussion that might include multiple perspectives, articulation, and reflection.

Collaboration among student groups has been seen as essential to situated learning because a relationship exists between the abilities of an individual and the nature of the situation (M. F. Young & McNeese, 1993). The environment around real-life complex problem-solving, such as with technology creation, often involves collaborating with others. Knowledge is often socially constructed, based on the shared ideas, knowledge, and open discussion of others. According to Wenger et al., learning as a

practice requires the formation of the community whose members can engage with one another thereby acknowledging each other as part of the group. New groups do not start out as a community of practice in which learning occurs because these individuals do not have a history, shared contacts, or identity (Wenger, 1998). Over time, their engagement involves the negotiation of being a person in that context; this is seen as an identity as part of the practice of a community. This negotiation may be silent, and they may not necessarily directly address the issue of their participation and identification with the group. They deal with it through the way they communicate and act together, and the way they form a relationship. For example, Wenger described Ariel, an insurance claims processor, who demonstrated "profound connection" between identity and practice.

> How Ariel experiences her job, how she interprets her positions, what she understands about what she does, what she knows, doesn't know, and doesn't try to know – all of these are neither simply individual choices or simply the result of belonging to the social category 'claims processor,' instead, they are negotiated in the course of doing the job and interacting with others. It is shaped by belonging to a community, with a unique identity. It depends on engaging in practice, but with a unique experience. (p. 146)

Wenger described Ariel's identity and practice as something defined socially and through changing meaning in a social discourse of the self and of social categories. It is also produced as a "lived experience" within a community. Narratives, categories, and roles are often worked out in practice and come about through multiple events of participation reification.

Authentic Assessments

Assessment with an authentic learning situation needs to be tied directly to a successful solution of the task (Linn, Baker, & Dunbar, 1991; T. C. Reeves, Herrington, & Oliver, 2002). As such, learners should be given the opportunity to demonstrate their

effective performance and to craft polished products in collaboration with others. Assessment also needs to provide appropriate criteria for scoring products. Fink (2003) argued that authentic tasks require that instructors create testing situations that teach and improve student learning, not just measure it. Wiggins (1998) asserted, "Assessment must be anchored in and focused on authentic tasks because they supply valid direction, intellectual coherence, and motivation for the day-in and day-out work of knowledge and skill development….Assessment is authentic when we anchor testing in the kind of work people do, rather than merely eliciting easy-to-score responses to simple questions" (p. 21).

Renzulli, Gentry, and Reis (2004) observed and reported on an exemplary middle school that utilized authentic learning practices for teaching various lessons, including history and archeology. For example, they described several student teams acting as historians and anthropologists when learning about the history of South Dakota, having the opportunity to don gloves and examine original documents and medical bags from the 1870s belonging to a pioneer druggist. Assessment of learning did not involve a typical multiple-choice test; instead, authentic assessment involved looking at process, product, and performance of team collaboration.

Common with any innovative instructional model, there are several arguments and discussions about authentic learning design. For example, Merrienboer and Brand-Gruwel (2005) wrote, "authentic learning tasks must be carefully sequenced from simple to complex, that these tasks need to be performed in environments that gradually increase fidelity (i.e., similarity with reality) if learners acquire more expertise, and that learners' task performance is scaffolded by well chosen means of problem-solving support" (p.

414). However, several scholars have argued that a less structured approach is more appropriate in dealing with complex problems (Clinton & Rieber, 2010; Diamond, Middleton, & Mather, 2011; Meyers & Nulty, 2009). Furthermore, highly realistic simulations of the kind used in the military, such as air pilot training and medical education, are not necessarily efficient or effective in most educational settings. According to Herrington, Reeves, and Oliver (2013), the physical similarity to real situations is of less importance in learning than a mental realism, provided by immersing students in engaging and complex tasks.

Educational research into Situated Learning theory has prescribed the elements needed to design effective learning spaces. In fact, much of the constructivist learning scholarship, which often focuses on collaborative, interactive learning also reflects notions about the dynamics of meaning-making in learning situations. For example, Piaget (1969), Vygotsky (1986), and Bruner (1989) theorized that learning is an active process of producing meaning that is social, dynamic, and historical. More contemporary theorists saw learning as an environment of both resistance and malleability (Duffy & Cunningham, 1996; Honebein, 1996; Lebow & Wager, 1994), that involves complexity, realism and relevance, and it involves the mutual ability to affect and to be affected (J. S. Brown et al., 1989; Edelson, Pea, & Gomez, 1996; Pea, 1994). Constructed knowledge has been seen as the engagement of a multiplicity of factors and perspectives and the production and ownership of a new decision based on the convergence of these components and viewpoints (Gardner, 1985; Spiro et al., 1995). Finally, Cunningham (1992) argued that reflection through interaction on the incompleteness and changeability of information and knowledge may be partial, tentative, and specific to a situation.

Because Situated Learning theory best fits the research of this dissertation, the following text details how it will be applied during analysis and write-up.

Situated Learning Analytical Focus

Wenger (1998) placed the analytical emphasis of situated learning on the social negotiation of meaning. Such an emphasis comes from the theory's roots in social constructionism, which generally states that reality is actively constructed, maintained, and transformed by human actors through symbolic activities such as language use, behavior, and mediated images, not passively derived from a realism found in nature (Baxter & Montgomery, 2011; Burr, 2003). Meaning is not fixed in place and time, but it is ever changing and subject to negotiation through discourse, history, and competitive claims. Humans are seen as subjects with cognition who construe their world according to their purposes, knowledge, using symbolic resources. This act of meaning making establishes "facts" and beliefs in a group's world of institutions, policies, laws, rules, and objects.

Communities of practice form the core context for learning in Situated Learning theory. As discussed, these communities are formed through a discovery and learning process and provide the social environment in which authentic tasks can be introduced. In the context of communities of practice, dualities are used to capture the idea of the tension between two opposing forces, which become a drive for change and creativity. Wenger (1998) identified the dualities that create and sustain a community of practice: participation-reification, designed-emergent, identification-negotiability, and local-global. He described these dualities as "formed by two inseparable and mutually constitutive elements whose inherent tensions and complementarity give the concept

richness and dynamism" (Wenger, 1998, p. 66). These dualities refer to core struggles that are endemic to the activity driving change and creativity within a community. Because of their centrality to the formation of a community of practice and because curiosity about the formation of communities of practice in a specific classroom is the focus of this dissertation, these four dualities drive the primary theoretical structure of this dissertation. These dualities are also instrumental in analyzing the rich and vast data gathered for this dissertation. For example, participation-reification will illuminate amount of participation in creating project files, local-global will reveal how student communicated with one another or outside members, identification-negotiability will display how groups change from individualized to collaborative work, and design-emergent will uncover the process of group development. The following text will further describe how these analytical lenses can aid in this research.

Core Dualities

Wenger (1998) saw the negotiation of meaning as the interaction and tension of several opposing forces, which become a driving force for change and creativity. The concept of dualities is used to examine the forces that create and sustain a community. He described a duality as, "a single conceptual unit that is formed by two inseparable and mutually constitutive elements whose inherent tension and complementarity give the concept richness and dynamism" (Wenger, 1998, p. 66). The opposing entities in Wenger's dualities should be viewed from a perspective of balance rather than opposition. The terms imply a dynamism, continual change and mutual adjustment as the tensions within a community of practice can be both creative and constraining.

Participation and Reification

The duality of participation and reification is the process of meaning-making fundamental to the learning theory underlying communities of practice (Wenger et al., 2009). On one hand, group members engage in activities, conversations, reflections, and other forms of participation in the learning of a community. Through participating in community practices, members become part of the larger community. In this way, participation is both action and connection, while being both personal and social. Participation within a community allows students to create meanings and identities. This realization led Lave to conclude that, "developing an identity as a member of a community and becoming knowledgeably skillful are part of the same process, with the former motivating, shaping, and giving meaning to the latter, which it subsumes" (Lave, 1993, p. 65).

On the other hand, students produce physical and conceptual artifacts—words, tools, concepts, methods, stories, documents, and other forms of reification—that reflect their shared experience and around which they organize their participation. The process of transforming experience and its outcome into objects is known as reification. According to Wenger (1998), the process of reification allows communities of practice to capture and share meanings as they turn their local experience into something that is portable and globally significant. Reification is an abridged and concise representation of a typically messy practice, making participation easier to share, while offering an incomplete account because it is always incomplete, ongoing, potentially enriching, and potentially misleading. Reification must be balanced with participation in an effort to facilitate learning.

Clinton and Reiber (2010) described an instructional technology graduate program that moved students over three semesters into a space where they learned through participation in collaborative work to create technology objects for their classrooms. Students were given the opportunity during the first semester to listen to various presentations by experts, while submitting notes of their participation in the classroom discussions. By the second semester, students were asked to work with a permanent team. They were given regular opportunities where they participated to achieve some goal that produced a technology deliverable. Throughout their interactions, they were asked to become an expert in some aspect of their assignment production. By the third and final semester, students were expected to make decisions about their learning path and about the projects they created with their group. Through a gradual weaning of support from instructional staff, the students began to demonstrate a self-sustaining ability to collaborate in creating successful projects that they later used in their own classrooms. These students not only learned the skills to create useful technology projects for their teaching but they gained the confidence and ability to act like an instructional technologist.

As demonstrated by this example, participation-reification is a useful lens in analyzing the level of members' participation in creating class project files. As such, the participation-reification duality will be a useful analytical tool when ascertaining productive and nonproductive communication patterns from each of the six groups.

Local and Global

When students form a community of practice where they work locally together on a project, they also often consider how their work on a school task impacts their outside

lives. This perspective considers the duality between the local needs of student groups and their global needs, such as work, home, and family. Often, college students have outside needs that can interfere with their persistence through the work involved in collaborative work. For example, Castles (2004) interviewed several university students who indicated that several outside factors influence their success or failure in persistence in attending classes and completing assignments. Support from others figured highest in the analysis, either positively or negatively. In other words, students have trouble finding the ability to persist if they cannot find someone to support them through the college experience. However, Castles found that this support can come from almost anyone, such as a mother-in-law, other students, or tutors. Other outside stressors were found to figure into these students' ability to persist in college, including family and personal crises, physical health, and work-related and financial stressors.

When discussing local factors, Wenger (1998) identified several local characteristics that indicate when a community has formed.

1. Sustained mutual relationships – harmonious or conflictual

2. Shared ways of engaging in doing things together

3. The rapid flow of information and propagation of innovation

4. Absence of introductory preambles, as if conversations and interactions were merely the continuation of an ongoing process

5. Very quick setup of the problem to be addressed.

6. Knowing what others know, what they can do, and how they can contribute to an enterprise

7. Mutually defining identities

8. Shared storied, inside jokes, knowing laughter

9. Jargon and shortcuts to communication as well as the ease of producing new ones

10. A shared discourse reflecting a certain perspective on the world

According to Wenger, these characteristics indicate that the three dimensions of a community of practice are present to a substantial degree: mutual engagement, negotiated enterprise, and a repertoire of negotiable resources accumulated over time. As a group develops these dimensions of a community of practice, the members form an identity that allows for a locally shared meaning.

It is not necessary that all these characteristics are fully realized, but the less they do, the more the group looks like a personal network of interrelated practice, rather than a community of practice (Wenger, 1998). For example, it is not necessary that students interact intensely with everyone in the team or know each other well, but the less they do, the more their grouping looks like a personal network or a set of interrelated processes rather than a community of practice. It is not necessary that everything group members do is accountable to a joint enterprise, or that everyone is able to assess the appropriateness of everyone's actions or behavior, but the less accountability, the more questionable that there is a substantial undertaking that brings them together. Such a state usually involves much more time spent negotiating than trying to complete an accomplishment. Furthermore, it is not necessary that a repertoire be completely locally produced. Much of the artifacts may be imported, adopted, and adapted for their own purposes. However, if there are few locally produced negotiable resources, and if hardly any artifacts are created in that context, then perhaps the group may have no purpose in

being together and engaging in a sustained way.

Because the local production of how a group works together and its resulting mutual commitment and identity can differ between teams, the local-global duality is a social structure that is both experience and analysis. The groups researched for this dissertation can be analyzed using the local-global lens illuminating their level of commitment to one another, shown by the amount of time individuals spent communicating with each other as opposed to those outside of class through texting or social networking.

Identification and Negotiability

Wenger further described identity as a "locus of social selfhood and by the same token a locus of social power" (Wenger, 1998, p. 207). This duality results in the ability to belong, to be a certain person, and to claim a legitimate membership with the group. It is also the vulnerability of belonging to and identifying with a certain community that can sometimes influence how much an individual participates. As such, this duality can potentially provide the ability to influence the negotiation of meaning. In order to have an effect, the community must be shaped so that it has the ability to define, adapt, or interpret a creation of the group. Wenger describes an outcome of this duality as a "stake in the ground, something on which to take a stand" (1998, p. 235). He also sees this as a focus for identification (or sometimes nonidentification) and for a bid of ownership of meaning, and possibly sharing this ownership.

Within this duality, identification is that which provides experiences through which people can build their identities through relationships that provide associations and differentiations. Members of a community are able to assess the extent to which they can

identify with the mutual enterprise, culture, and history of the group. The extent to which members choose to identify with a community determines the nature of their membership and participation. For example, a college student placed in a long-term work group will first assess the extent to which he can relate to its members, abilities, and purpose, which will in turn dictate how this person choose to participate within this student community. It is through this dynamic and generative process that individuals become identified as something and also identify with something or someone in the community (Wenger, 1998).

Negotiability refers to the degree that individuals have control over the meanings created in their collaboration. This includes how an individual perceives her ability and legitimacy to contribute to and take responsibility for the direction of the community. Opportunities for members to negotiate determine the extent to which they develop ownership over the community's mutual practice. For example, Burnett (2011) described college students who negotiated their space within multiple roles, including outside roles such as family member and worker. Preservice teaching students were placed in semester-long groups to learn and discuss teaching and classroom practices when using technology. These students developed their own kind of identity based on past experiences and outside influences. They each saw their negotiation practices in the classroom differently within a group. One student saw herself as organized, proficient, and in control. Another student spoke of her high expectations for others' behavior but also explained her own ambition and creativity. Yet another student spoke of shyness and self-confidence in working with her student group. While these students interacted and discussed teaching standards and accountability—which kind of teacher they felt they

could be and how technology played into their view—they played out a teaching role and began to identify with the role of becoming a member of the shared teaching community.

Within this space of group interaction, students assume different levels of participation or roles (Lave, 1991; Wenger, 1998). If a student chooses to take a central role in the negotiation processes of a group, then she has been typically able to identify with the community to a great extent and thus take on a more integrated role in the future success and direction of the community through extensive decision making. Throughout the observations for this dissertation, it has become increasingly clear that identification and negotiability can foster participation, as well as non-participation, in group decision making. Therefore, the identification-negotiation duality can be a useful analytical lens when looking at how groups change from individualized to collaborative work and subsequent ability to make effective decisions.

Design and Emergent

According to Wenger (1998), the core challenge in fostering communities of practice is to manage the interplay between the designed and the emergent, meaning that the opportunity for a community to develop does not happen naturally. Effective communities of small-group learning must first be planned and designed, while allowing for the emergent community development. At one level, Wenger's argument is that a community and how they go about their practice cannot be designed, because communities are self-organizing, emerging in response to the local environment and the needs of the students. However, at another level he attempts to provide a conceptual and architectural framework for educators meant for facilitating the development and continuation of communities of practice. Because communities need to form their own

norms, Wenger argued that instructional designers should not overdesign but work to accomplish a "minimalist design."

Important to this minimalist design is the creation of a space allowing for student collaboration and less control of the instructor's role in that she facilitates rather than controls. Group members should be given time to participate and negotiate while developing some sense of identity. For example, Barab, MaKinster, and Scheckler (2003) described a college teacher facilitating an online discussion board known as "Useless Math" used primarily by preservice math teachers. This forum was a space created specifically for student participation and negotiation around the idea seemingly without a purpose. This discussion space became the most active of their online arenas and potentially the most interesting because students brought in emergent topics that were more meaningful to community members than those predesigned by instructional designers.

The duality of design-emergent deals with the creation of communities in the classroom that have the potential to emerge with learning, decision making, and identity formation is an interesting lens with which to focus to this dissertation research. As a lens, this duality can be categorized as study of the process of group development that results from the dynamics of designed and emergent issues.

The analysis for this dissertation will be guided by the principles of Situated Learning theory and social constructionism. Focus will be placed on the ways in which participants use and develop communication practices in their small groups that might allow them to form a group identity, or resist that development, make decisions, and learn within a community of practice that may or may not develop. As such, the research

question for this dissertation follows this line of focus:

> **What are the communication similarities and differences in productive and nonproductive groups while working together on an authentic technology project?**

Important to this research is the impact that technology may have upon students' communication behaviors. In order to analyze the process of such situated outcomes within my chosen classroom of study, I will use the dualities of Situated Learning theory to help discover and describe the communication patterns that emerge in this setting. As such, dual forces of participation-reification will illuminate amount of working participation, local-global will reveal level of group commitment, identification-negotiability will display any changes from individualization to collaboration, and design-emergent will uncover the process of group development. All these will be points of observation and invitations to see and understand the communication patterns that occur. As these forces appear and evolve (or devolve) throughout the semester, I will gain greater insight into the communication patterns that occur as students not only learn about technology but also learn how to work together.

CHAPTER 4

RESEARCH METHODS: AN INTERPRETIVE STUDY OF SMALL-GROUP

COMMUNICATION IN A TECHNOLOGY CLASSROOM

Many studies of small-group communication in educational contexts have been conducted from a stance that privileges positivistic and self-report surveys, preferring face-to-face, short term gatherings. These methodological approaches focus on the communication practices that groups go through when making decisions or completing a small task. Consequently, these studies have illustrated important insights, such as process, group identity, decision-making, and collaborative learning issues. Although these methodological approaches have produced important insights, including the need for extended time allowing student groups to progress and form an identity, they have paid less attention to longer-term interaction and to the influence of the bevy of computerized technologies carried in by students.

The current study diverges from past research by using qualitative and interpretive methods when studying communication of student groups within a computer classroom. Rather than looking just at staged communication performances of students, I focus on their spontaneous conversations and actions when learning and creating technology. This research involved a qualitative and case study approach to present a rich description of the complex social phenomena. Specifically, this study followed students

as they communicated through face-to-face, social media, and emailed while forming group identity (or not), making decisions, and collaborating to accomplish tasks across a semester. Subsequently, it will contribute to and further research about small-group communication and technology education.

An Interpretive Stance to a Case Study in a College Classroom

My choices for doing this work are personal and embedded in why I teach computer-oriented technology, such as Web design and development, graphic design, and video editing. I have chosen a site for this research with which I am familiar and spent time designing instruction so it is more student-centered, using team-based learning and situated learning methods. This study began with my optimism for learning outcomes and improved pedagogy. Although more realistic now, I am confident that if we continue to explore the communication practices of students in collaborative spaces and use this information in our praxis we can begin to facilitate better collaborative and technology learning. In order to better understand our practice of teaching computer skills with group learning and community of practice development, I wish to describe how students talk about and create websites, including both productive and nonproductive narratives as they occurred within this setting. This research will contribute to small-group and technology education scholarship by describing the peculiarities of student talk and behaviors within a technology context.

Designed as a qualitative case study, I have assumed that learning and realities are socially constructed, meaning is collaborative, and relationships of researcher and participants are interdependent (Lindlof & Taylor, 2010). Research and knowledge creation are socially constructed within a student-centered classroom. As scholars we are

influenced by the research as we, too, affect the study. Using the interpretive paradigm, qualitative research supports the assumption that reality is constructed by subjective perception and predictions cannot be made. People have free will, purposes, goals, and intentions, so people should be studied as active agents. The "facts" of social science research can never be isolated from its values (Lindlof & Taylor, 2010). Research is not, and can never be, objective, so reflexive thought and actions are critical for the responsible researcher (Piantanida & Garman, 2009).

What questions I chose to study, what procedures I chose to follow, and interpretations I made of the "data," what knowledge claims I offer are all aspects of this study constructed from the perspective of an individual self-situated in socio-cultural, political, and epistemological context (Piantanida & Garman, 2009). As such, learning to become a qualitative researcher is more than simply acquiring and applying an already established set of methods or techniques. It involved cultivating myself as an instrument of inquiry. Within this space, my observations and interactions with the students was shaped by my own experiences, beliefs, talents, and sensibilities. As a college technology instructor, I am also a mother, wife, daughter, and friend. My behaviors and beliefs are driven by these experiences and a spiritually centered life.

This context has helped me understand that learning is actually a process of doing or being knowledgeable in ways that are meaningful and recognized, rather than having knowledge (Vygotsky, 1986). Consequences for learning can be located within the interactional details of participation and not simply on traditional measures of achievement. Learning is therefore defined by both how it is locally enacted (interactions and positioning) and culturally framed (achievement and participation conventions) (K.

T. Anderson & Zuiker, 2010). Some students may take up the culture of computer coding in the classroom by using appropriate technological forms of discourse; some may not, however, for various reasons. Brown, Reveles, and Kelly (2005) proposed that the reasons for and consequences of doing school relate to the social costs of affiliating with "schooled" ways of talking and doing, which may be at odds with how students see themselves or want to be seen. These costs have been investigated in terms of socially constructed categories such as race, nationality, language background, and sexual preference (for an in-depth review see J. S. Lee & Anderson, 2009). Each of these categories is a socially constructed kind of difference, so how and why students choose to affiliate or not with school discourses, topics, and one another differs on a case by case basis as negotiated by individuals. This fact is precisely why I chose to associate such voice with student agency and view it as a political practice, one in which students work collaboratively (or not) to make decisions about learning procedures and practice (D. Johnson & Johnson, 1991).

I believe knowledge is situated and a product of the activity, context, and culture in which it is created and used (J. S. Brown et al., 1989; Lave & Wenger, 1990; Wenger et al., 2009). My purpose here also includes an intention to unmask how such a collaborative and authentic learning space is manifested through student communication behaviors in their groups. Traditional group communication scholarship has used quantitative methods to study zero-history groups of college students in one-time, laboratory events involving the solution of artificial, assigned tasks (L. R. Frey, 1994). I chose an interpretive stance and method so I could expand the type of groups studied, their manner of communication, and the nature of evidence used to support claims. Dollar

and Merrigan (2002) later argued that qualitative studies can also validate and extend existing group communication theory, generate new theory, recover neglected topics, and problematize conventional wisdom. For example, qualitative methods were leveraged to study group members' global and technology mediated communication practices to better refine our understanding of the role played by context in shaping those practices (L. R. Frey, 2002). Seddon and Biasutti (2009) used observation and videotaping of communication among the members of an Italian string quartet. This qualitative case study revealed communication behaviors used between members of a professional team during rehearsal and performance. Six modes of communication and two levels of attunement were revealed. The modes of communication were interpreted as verbal and nonverbal: instruction, cooperation, and collaboration. Results indicated that members of the string quartet were able to become empathetically attuned and produce spontaneous musical variations during practice and performance. These spontaneous musical variations were group reifications interpreted as examples of empathetic creativity. These results from a naturalistic setting revealed relationships between empathy and nonverbal communication and how this can impact group creativity. The group in the study was viewed as a complex adaptive system that sent and received messages resulting in empathetic creativity that resulted in innovative ideas for their performances.

<u>Qualitative Case Study</u>

As a form of qualitative research, this case study is a description and analysis of multiple bounded phenomena (Yin, 2009)—communication among semester-long student groups. Case study is both a methodology and an object of study (Bloomberg & Volpe, 2008; Creswell, 2007). Central to all case studies is that they all try to illuminate a

decision or set of decisions: why they were taken, how they were implemented, and with what result (Schramm, 1971). This definition cites cases of "decisions" as the major focus of case studies. Other common cases study individuals, organizations, processes, programs, neighborhoods, institutions, and even events.

Yin (2008) later described case studies in a two-fold, technical definition, which involves the scope and amount of data that result from such studies. The first part involves the scope of a case study in that it investigates a contemporary phenomenon in depth and within its real-life context, especially when the boundaries between phenomenon and context are not clear. In other words, I chose the case study method because I wanted to understand a real-life phenomenon in rich detail, and such understanding involved viewing them in important contextual conditions (Yin & Davis, 2007). This part of case study definition distinguishes it from other research methods in that, unlike experiments or surveys, it involves the context of contemporary events using multiple sources of information. Second, because phenomenon and context are not always distinguishable within real-life situations, data collection and data analysis strategies become the other part of Yin's definition of case studies: The case study copes with distinct situations in which there are many more variables of interest than data sources. As such, case studies depend on multiple sources of evidence, with data converging in a triangulating fashion and benefiting from theory to guide data collection and analysis. All said, the two-fold definition shows how case study research comprises an all-encompassing object of study and method—covering the logic of design, data collection techniques, and specific approaches to data analysis. Case studies are not limited to being either a data collection tactic or design feature alone (Stoeker, 1991).

How the case study method is practiced here is detailed below.

This case study involves a detailed description of a college classroom setting and its student participants, accompanied by an analysis of the data for themes, patterns, and issues (Merriam, 1998). I use the case study method to explore the bounded systems over time through in-depth data collection methods, including classroom observation, audio recording of group discussion, student interviews, group documents and files. This dissertation is a case study following six groups meant to draw a single set of "cross-case" conclusions (Yin, 2008). Data collection in this and other case study research is typically extensive, and the analysis found here is holistic, concerning the entirety of the case (Yin, 2009). Thematic analysis is not for purposes of generalizing beyond the cases but rather for rich description to better understand the complexity of the system. Merriam (1998) points out that such analysis is rich in the context of the setting in which the case presents itself.

When applying qualitative case study results, generalizability is not the goal but rather transferability, such as the ability to understand and gain knowledge that can be applied to similar contexts and settings. When discussing transferability, Patton (1990) talked of "context-bound extrapolations," which were defined as "speculations on the likely applicability of the finding to other situations under similar, but not identical, conditions" (p. 489). Toward this end, I address this issue of transferability by way of thick, rich description, using multiple data gathering points, that will provide the basis for a claim to relevance in a broader context (Schramm, 1971).

The Context: Comm 5500

The Setting

Because this project seeks to discover and describe patterns of communication in small situated learning groups, data are needed that capture students' behavior while they are engaged in these processes. The selected site is Comm 5500,[2] an advanced Web design and coding course, is a small upper-division semester-long college communication course at a large western research university. The University is the flagship institution in the Higher Education System of the state. The University's Department of Communication, through which this course was offered, is a mixed department, meaning that it contains programs in mass communication, journalism, speech communication, and rhetoric. Within these disciplines, applied learning courses are taught such as Web design and development. The department has a strong and diverse undergraduate population. It is one of the largest undergraduate programs on The University's campus.

Comm 5500 is designed as an extension of the web design and development concepts presented in the department's introductory course. This was a code-focused course where students learned HTML5, CSS3, JavaScript/AJAX and PHP techniques.[3] The course covered a great deal of information in rapid succession, and it was designed so that students would collaborate on an authentic project (with a business client) to learn

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[2] As requested by the Institutional Review Board, Comm 5500 is a pseudonym for the course name.
[3] For glossary explanations of these technical terms, please see Appendix A.

advanced and difficult topics in an effective manner.[4] On the syllabus the instructor

described an educational environment with critical thinking and learning by doing.

> This course is designed to allow you to actively struggle with hands-on exploration of web design by working with a community client. This material is best learned by doing, you will learn more thoroughly by completing exercises that require you to work with the concepts, theories, and facts. I view my students as critical thinkers with existing and emerging knowledge. I assume you desire new methods for organizing and expressing your creativity and analyses. During the semester I expect you to take in information for analysis, synthesis, and criticism. I expect you to cogently express your analyses verbally, graphically, electronically, and in writing to your classmates and myself. In order to be successful in this class, you will need to work productively and ethically on your own and with other students.

Student groups were established by week 3 of the semester because the instructor

wanted to wait until the roster stabilized because the last day to drop passed by this time.

To facilitate grouping, the instructor passed out a survey in an attempt to match students

based on interests and personality traits, such as how they approach new situations and

their tolerance for ambiguity.[5] Students were also asked to rank their preference for

website creation responsibilities, including HTML/CSS, JavaScript/JQuery, and Server-

Side Coding. In addition to grouping students with similar interests and personality traits,

the instructor attempted to include members strong in each of the three roles. Because

groups were comprised of three to four members, this meant that the group was

comprised of students who had the basic or emergent skill set required to accomplish the

authentic client project.

Because students were asked to work together in their groups throughout the

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[4] For an example course syllabus, please see Appendix B.
[5] See Appendix C for an example of this survey.

semester, it was necessary that they were given time during each week's class to talk and get tasks accomplished. However, instructional time was needed, so each night of class began with instructional time about various web design and coding issues. Students were asked to learn more advanced skills in web design through various learning modules. The first hour to hour and a half of class was usually set aside for lecture and learning. Students were then given time to work with their group for at least 30 minutes. This time could involve either working on in-class assignments or group interaction involving the authentic client project. How each team used this time differed according to the needs of the night and how cohesive the group had become. What I ultimately saw during these collaborative periods was interplay of communication practices that determined each group's ability to become either productive or nonproductive, so the research question is meant to investigate the similarities and differences that led to such outcomes.

What are the communication similarities and differences in productive and nonproductive groups while working together on an authentic technology project?

This dissertation is meant to better explain what communicative behaviors occur among group members when they work together on an abstract and complex technology, so those assignments and the project need explanation.

Students were given six skill-building modules in which they were to practice the technique taught during class presentations and in weekly readings. These assignments comprised 40% of the final grade and were to be turned in individually. However, these assignments took time away from the client task, so the instructor only assigned skill-building modules during the first half of the semester. Remaining nights of the semester allowed students to spend more time on the client project assignments. These remaining course assignments comprised 60% of the grade and were meant as milestones toward

completing the client site redesign.

All of the client project assignments were large and complex enough that required the entire group to complete. For example, the first group assignment was a proposal document for the site redesign. Known as a creative brief, this document was written for the class client describing a statement of purpose, website audience analysis, proposed site architecture, and detailed mockups of home page and content pages showing the theme, metaphor and rationale behind the design. This assignment was the first group assignment, and its complexity was the first test of their ability to work together on a project. The remaining three group assignments were due every 3 to 4 weeks at a time. As such, groups were given time after each class night's lecture to work together on their assignments. Students could choose to use this time to work on their individual assignments or make headway toward accomplishing the client project milestone that was next due.

The course was taught in a computer classroom in which each student had access to a personal desktop computer. The computers were set up so students could work individually, while having visual access to the front of the room and the instructor's projected computer screen. Because individualism has been so valued within educational contexts for so long, the classroom was designed so that students could work alone. The setting of this research was in a classroom of 20 computers set up for singular work (see Figure 1). Each computer was set up on a table that allowed room for a computer CPU with the monitor sitting on top. The keyboard and mouse were rested on the table in front of the computer and monitor. To the left of the keyboard was enough space for a book, stack of papers, or a cell phone.

Students often sat down at computers that they had used in previous classes. Much like students sit in the same spot from class to class in a standard classroom, learners in a technology classroom also tend to feel tied to a specific computer that may hold their working files or have a saved login and password for uploading assignments and social networking sites. When sitting at the computer, students either login to the classroom computer or they pull out their own notebook computer or tablet and place it where the keyboard usually sits (it gets moved up on the CPU or off to the side). Because these were adult students with lives outside of class, they also often placed their cell phones next to their computers or the keyboard.

Comm 5500 met for 3 hours once a week for the entire semester (15-16 weeks). The class is traditionally an evening class, so it began at 6PM and ended at 9PM. Because many of the students work before attending class, they often trickled in sometime between 15 minutes before and 20 minutes after the night's class had begun. Because the classroom door is at the front of the room, those already in the room often got distracted by any people walking through that door. This was especially problematic if class had already started, but the students became accustomed to this behavior over time and did not lose concentration when someone arrived late to class.

When students took the opportunity to work together, they often had to move their chairs over by other team members. They would end up sitting around one or two computers to work and make decisions (see Figure 2). Because the classroom was not designed as a collaborative learning space, students would do their best to sit in a tight space around one or two computers. Some students tried to alleviate these tight spaces by bringing in their own notebook computers to use in a more open space that was not
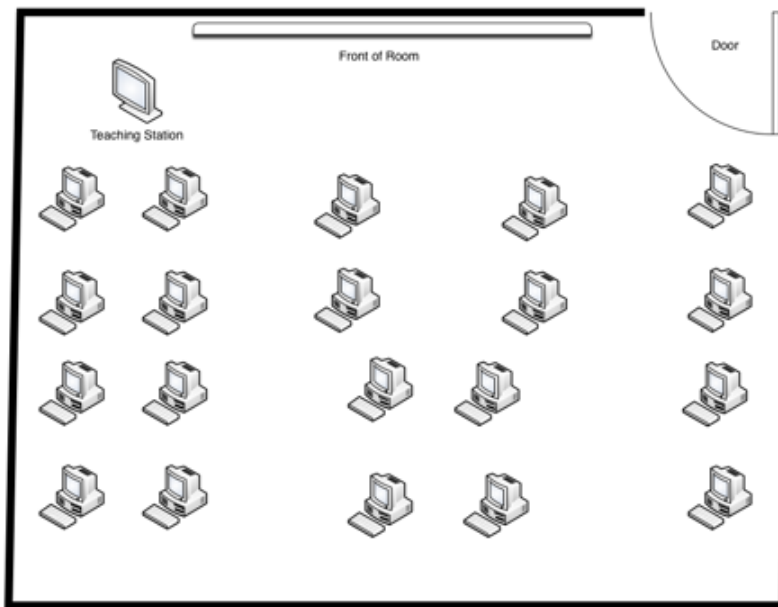
Figure 1: Computer classroom layout and teaching station
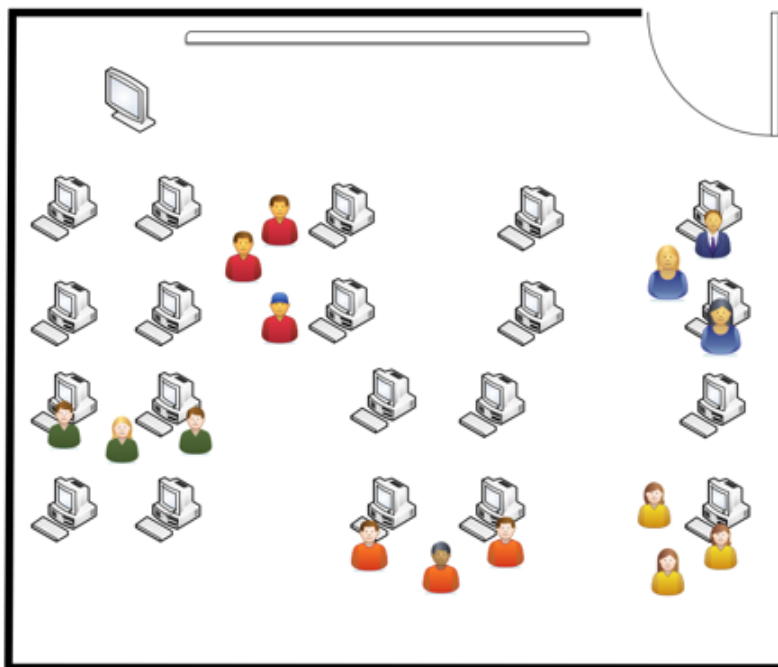
Figure 2: Exemplar student group seating

obstructed by desktop computers.

<div align="center">Participants</div>

<u>Students</u>

Enrollment in the course was 20 students for each semester. The course is normally comprised of predominantly senior-ranked students because it was a 5000 level course that involved a greater workload and more college experience than lower level courses. This course was normally evenly split with equal numbers of men and women, and students are generally aged 21-25. Quite of few had a serious family-style partnership, and some had children. Because the class was taught at night, a majority of the students worked during the day, at least 30 hours per week. Therefore, many students already had several outside responsibilities and identities. All students were required to have taken a prerequisite, introductory college Web design course that necessarily included hand coding of entire websites. Occasionally, a student who had not taken a prerequisite course was allowed to join the class because he/she worked professionally in Web development and already had some skills pertinent to the course.

A total of six groups were studied, two groups each semester for three consecutive semesters. Each group consisted of three to four undergraduate students. In order to communicate a greater understanding of the generous students who participated in the study, I wish to describe them in the following text. However, due to a concern for students' privacy, I have changed the names and descriptors for each student. Descriptions of the students are broken down by semesters and include a brief report of the client for which these students learned and worked during 13 weeks.

Semester One

Team Cyan[6] was comprised of two men, Dan and Jake, and two women, Ella and Sandy. Their team name was the result of a preassigned blue color that they decided to change to Cyan. Dan was a professional graphic artist for a Web design firm. Jake was an engineering student who was also native Taiwanese and English was a secondary language. Ella and Sandy both worked full time jobs in service industries. All four students were single, with no children.

Team Crimson was comprised of three men, John, Vinton, and George. All three men were married with children. This team's preassigned color was red, and they decided to name themselves Crimson, a version of the original color. George worked full time at a technology firm where he maintained Web servers. Both John and Vinton worked part time and were full time students.

The diabetes group of the state's Department of Health acted as client for this semester. Three representatives appeared the first night of group work (week 3 of the semester). When the client was first introduced to the class, they gave a tour of the existing website to students, after handing out a large binder to each individual group. It was quite a large website, and it needed a complete revision to fix broken pages and links. A great deal of the site held content for health practitioners, including printable posters to place in doctors' offices to teach about diabetes symptoms and care. Following the site tour, one representative drew attention to a rather large PDF file in the back of the

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[6] All teams named themselves within 3 weeks of initial grouping.

binder called the "Diabetes Practice Recommendations: Diabetes Management for Adults" or DPR. It was full of flow charts, tables, and footnotes. The students commented that it would take a lot of work to convert, not to the mention the work on revising the already existing site. However, the class decided to take up the challenge. Groups were to either select work on the original site or convert the PDF document to a new site, to be known as the PDR (Practice Diabetes Recommendations). Team Cyan decided to work on the original site. Team Crimson voted and decided to create a new website for the PDR.

Following the introductory visit, the clients looked in on students three more times, including twice during mid-semester (once during the 2nd and 3rd months) and during the final night of class. The 2 mid-semester nights coincided with major assignments meant to help students work toward the final site revision. For example, the second client visit occurred 1 week after students groups had turned in a client brief, a document that described the design the group had developed with examples of an audience analysis and graphical mockups of how the new site would appear. Each group met individually with representatives to present their ideas and receive feedback from the client. This feedback often caused the groups to change and improve their ideas, because they became aware of more issues relevant to an authentic situation.

The client set up a fourth time, on the final night of class, to evaluate teams' websites and announce the winners. One representative, Vivian, announced that another team, the Yellow Team, one for the PDR and the Team Cyan won for the full website. However, she wanted everyone's contact information, because she liked elements of every team's website and each team member should have the opportunity to become an

intern to help implement these new sites. Several students took advantage of this opportunity and gave the client their contact information.

Semester Two

Team Chartreuse was made up of three men: Luke, Nate, and Evan. Their group name was devised as a different take on the university's colors. Luke worked an internship coding websites. Nate worked as a graphic designer on Web and print products. Evan was a full-time student. All three men were single, with no children.

Team Razzmatazz was comprised of two women, Gabbi and Lisa, and one man, Derrick. This group name was the result of a conversation desiring fabulous work from each member. Gabbi was an older student who worked as a secretary. Lisa was a part-time student who worked full-time as a marketing assistant at a local TV station. Derrick was a full-time student who had taken a few software engineering courses. All three students were single with no children.

The client for this semester was a remote contact. A national hamburger chain had agreed to have a website redesign. They initially met with the group on their first night together through Skype. Students were given the opportunity to learn about the project and ask questions. The website was over 10 years old and needed a complete redesign to make it more modern and user-friendly. Similar to the project for the first semester client, students would be required to extensively plan the design and code the revised website. This amount of work required that the three or four team members participate in completing the project.

As the semester progressed, students submitted their design proposal and received email feedback from the association executives. The students were instructed to e-mail

the client with any questions. Students received returned emails within a week.

Presentations given by the group during the final night were seen by the client over

Skype. Ultimately, all the designs were chosen because the client liked aspects of all the

teams' work.

Semester Three

Team RAX included one man, Randall, and two women, Abigail and Xandra.

Their team name was developed as an acronym of their three names. Randall worked full

time and attended school full-time. He also had a wife and child. Abigail was single and

worked full-time, while also attending school full-time. Xandra was a full-time student on

scholarship from China, and English was her second language.

Team TGAAG was comprised of two men, Adam and Parry, and one woman,

Candace. The name TGAAG was created as an acronym of Two Guys and a Gal. Parry

was a full-time web designer and was single with no children. Adam was a full-time

graphic artist for local newspaper and father of two children. Candace was a full-time

student and stay-at-home mom with one small child.

The client was a faculty member of the communication department and executive

of a national debate association. One week after groups were formed, Mark, the client,

presented to the class. He talked about his goals for updating the design of the debate

association's website and hoped that the sites design would be improved while also

upgrading the user experience. Some students took opportunities to ask questions that

clarified what their task would be the semester.

As the semester progressed, the client visited the classroom when students turned

in major milestones in creating the new website. Mark met with individual teams to give

specific feedback. Students were then given a week to update their site components and turn in a revised version based on feedback from the client. The final day of classes a presentation night so the client could select his favorite site updates. He decided to choose the top three and ranked them. Team TGAAG's solution was selected as his first choice. Because the client observed that team RAX was not working well, even during the last day of the semester, he did not select their website solution.

Instructor

Essential to the researcher's access to collaborative technology learning and data gathering was admission to a fellow instructor's technology classroom. The instructional colleague chosen for this project is not only a fellow technology instructor but also my husband of 25 years. Both he and I have collaborated in designing classes so they utilize situated team-based learning in order to meet the seeming need of improved instruction for the difficulty and complexity involved in knowledge acquisition and transferability of technology skills.

I interact daily with this instructor, so the potential exists for harming students by sharing what is seen and heard. In order to prevent such harm and respect all participants, I made an agreement with the instructor to not share any personal information or observations until well after final grades have been posted. This agreement had to be refreshed at the beginning of each semester, and only once did I slip and reveal something about the students I watched. This slip was about a group of students that I was not following. This moment occurred during the third and last semester that I followed students. Such an experience made me realize that as qualitative researchers we can slip into an ease and comfort about the participants as our study progresses (M. J.

Smith & Pangsapa, 2007). Such a realization challenged me and made me appreciate, once again, that as the primary instrument I am not perfect but required to do my best. I must give respect to the participants in my study. I resolved again to respect my participants and maintain their confidentiality and safety, even when talking with my best friend. I resolved again to maintain the respect and care that these participants deserved.

Despite the need to keep private student information away from the instructor, I did need to talk with the instructor about the students just enough to be made privy to what is being taught and student learning expectations. It was therefore important that I treaded carefully when discussing the class with the instructor and by consciously not discussing students' communication or other behaviors. Through these careful actions, my work with an instructor I know so well had the potential to contribute several benefits to this study. First, I experienced ease in communicating with him, due to the extended length of our relationship. Second, doing research in his classroom gave me the opportunity to see what happens in a classroom similar to my own, where instruction is student-driven and situated. Second, he also gives me the freedom to carry out research in a manner that is best suited to the students, rather than a benefit to the instructor. He trusts me as a researcher, so I had few constraints or rules from him that would limit any ability to gather data and interact with students.

Researcher

Because I also teach several of the introductory courses that lead into this class, several students already knew my role as a technology instructor. To make sure that all students knew about my role, that information was announced as the research project was announced, and all students were welcome to ask for help throughout the semester. Such

a role did not allow me to act as an "inept" novice, as described by Lindlof and Taylor (2011), meant to allow me to ask students to instruct about how things work. Instead, I not only already had an understanding of how technology works, but was often able to negotiate my role as one of expert or helpful temporary group member, thereby giving greater access to the communication of students as it occurred. This role pulled me away sometimes to help students other than those in the two groups I was following. This sometimes temporarily prevented me from observing the two groups, but such was the price for access so that I could participate with the students of interest.

As I embedded myself as the primary instrument of this research, this study was conducted through the lens of researcher as participant-as-observer. Lindolf and Taylor (2010) describe the participant-as-observer as one who openly acknowledges her professional motives to site members. This role allows the researcher to study a scene from more than one vantage point, in contrast to the often used self-report surveys used by many small-group researchers. As implied by the name, observing flows from the perspective of participating. In contrast to complete participation with one or several groups of interest, this position allowed me to have the potential to expand and deepen involvement at the site by getting an overall view while more carefully engaging the particular groups of interest. Careful engagement and not pretending to be a member of a certain group often involved constant negotiation of my role, and these acts often deepened and sustained my legitimacy at the scene. Such negotiation gave a voice to site members, thereby giving greater authenticity and accountability to me as the investigator (Angrosino, 2005; Tedlock, 1991).

Approved by the Institutional Review Board, this project began at the beginning

of each semester by informing students of its purpose. Upon entering the class for observation and with the instructor's permission, the project was described to the students while explaining my role in the class and answering any questions and concerns. The goal of the study was to enter the course to research collaborative learning during Web design instruction. I sat in class, took notes, accepted handouts, listened to comments, and asked and answered occasional questions. Every student, regardless of participation, was made aware that they would receive no harm to grades or otherwise. No names or other identifiable information about the class or students were recorded in notes. Following this description of the research, the class, as a whole, was given the opportunity to retract permission for the researcher to attend. Students were then given 1 week to raise concerns about their participation either with me, the instructor, or the Department of Communication's undergraduate director. The Director of Undergraduate Studies' name, contact information, and office location was then provided. After this 1-week period, if no individuals dissented, students' consent in this project was assumed. Students were also told that they were welcome to ask questions and raise concerns about the class and research project throughout the semester with whomever they were most comfortable discussing those issues.

The goal of the consent stage of the research process was to acquire informed approval from every member of at least two groups in the same course over three sequential semesters. Two groups were selected each semester upon their formation during the night of week 3. Each group was quickly selected based on student members' willingness to communicate with each other and with myself. Each member was then individually asked to participate, and upon consent, I shared contact information with

them.[7] Any selected group that had any individual dissent was not followed and another group was selected. Because each class was comprised of five to six groups each semester, finding two groups to follow was not difficult.

Throughout this process, a separate journal was kept in which I wrote about my feelings and thoughts, including experience and perceived student communication patterns. These journal entries have informed the analysis process; such personal insight allowed me to better perceive patterns in the data.

In the following sections, I detail the context of this project, including site description, participants, how I conducted myself as a researcher, data collection, and analysis.

Research Design

The primary purpose of this study was not simply to describe what happens when students collaboratively learn and create with technology but also to explain the questions such as: What and why are things going on or not going on here? How and when are communication behaviors happening? Who speaks and to whom? How do they speak (tone, rate, volume and vocabulary)? What do they accomplish by speaking that way

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[7] The Institutional Review Board granted a waiver of signed consent for the observational portion of the study, allowing for verbal consent. A request was granted based on four reasons: 1) The observational data of this study were gathered during the everyday routines of the course, and students were not subjected to any additional risks as a part of classroom activities; 2) the purpose of this study was to observe student interactions in the classroom; 3) risks for students are further minimalized because only aliases will be used for the course and participants in the data collection, analysis, and final project; 4) no information about observations were shared with the instructor.

(warmth, greeting, criticism, challenge)? How do participants decide when it has ended? (Ellis & Fisher, 1994; Lindlof & Taylor, 2010).

Because small-group learning has become popular within many college classrooms, it is important that we better understand the what, when, how, who, and why of the productive and nonproductive communication patterns involved in these settings. As described in the literature review, group learning has many benefits but it has also been shown to have difficulties and problems implementing effectively, such as when a group has trouble resolving conflict (Burtis & Turman, 2006; Wheelan, 2005) and when individual technology students do not wish to collaborate (Waite et al., 2004). In order to productively illuminate students' group communication practices, several forms of student communication were gathered, including observation, student collaborative talk in class (first gathered in digital audio format and later transcribed), and any computer-mediated communication such as emails. To better understand the context of student communication, detailed notes were taken during each class and later expanded to fieldnotes that tell the story of each week's class.

Participant Observation

Observation has been characterized as "the fundamental base of all research methods" in the social and behavioral sciences (P. A. Adler & Adler, 1994, p. 389). Social scientists observe both human activities and the physical settings in which activities take place. Such observations can take place in the laboratory or in the "natural" location of activities, such as a technology classroom. Such observation requires participating in, observing, and recording/transcribing communication. This required that I participate in and watch students for the entire class period each week, including any

outside meetings they planned and invited me to during the week. My goal was to describe and interpret the observable relationships between social practices and systems of meaning, based upon "firsthand experience and exploration" within the cultural setting of the technology classroom (P. Atkinson, Coffey, Delamont, Lofland, & Lofland, 2001, p. 4).

Observation involved note taking in class. The observation for these notes and fieldnotes required that I sit in class each week for the full 3 hours.[8] This time was often dreary and long as I took notes of student behaviors and waited for the small amount of time when students were given to talk and work on class projects (they were given much more time the last 2 weeks of class). When students did take the opportunity to interact in their groups, I often walked over and set up audio recorders and lingered to watch and listen to their interaction.[9] I also took several pictures of this interaction in an attempt to record the nonverbal interaction. Yet, when this group time was over, I would once again move to the back of the room and take occasional notes.

When observing, I sometimes found myself drifting off and thinking about other things. This was never more prevalent than one evening, early during the first semester of my research, when the community client came into the class to describe their project for the student teams. The client was the diabetes group of the state's Department of Health.

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[8] Found in Appendix D is one fieldnote of many that were written during the 96 weeks of participant observation.
[9] I used a total of three audio recorders during each night of class. Each of the two groups had a running audio recorder sitting on the table as they experienced group work time during class. The third recorder was used as a general class recording and sometimes picked up interaction from the two groups that the other recorders did not.

They had come in to ask for the students to redesign their website, and the instructor had asked them to describe their audience. The main audience was explained as people with diabetes. They then narrated the behaviors that newly diagnosed patients exhibit in their emails and calls for help. Maintaining concentration during long class sessions was important to the success of observation, but this was sometimes difficult. I found myself quickly drifting off as I remembered the night that my then 5-year-old son was diagnosed with Type I Diabetes. He had been very sick for several weeks and that night he was so ill that he started slipping into a coma. My husband and I figured out what was happening and rushed him to the local children's hospital. He was in the hospital for nearly a week recovering from the devastation that diabetes had done to his little body in such a short time. I then drifted back to the present, and I realized that 10 minutes had passed and I had tears running down my face. In all that time, I did not know what had happened or who had said what. That event was not only hard on me but this was early in my observations and I came to a solid understanding about what it meant for me to be the primary research instrument. What I saw was not only constrained by my attention but also my experiences and knowledge. I learned to stay aware of this potential for bias, so I then started making more aware my thoughts and feelings within my fieldnotes.

<center>Student Discourse</center>

Student talk was captured as audio files during class and as emails sent during and between classes. Student talk was captured on digital audio recorders during each observed moment that student group members interacted. This meant that their talk was sometimes not caught. However, these audio files resulted in almost 200 hours, across all three semesters, of student talk that required transcription. This transcription was not easy

because it involved transcribing multiple voices within a loud classroom where several other groups were talking around them. Once nearly all of their talk was transcribed,[10] it was embedded in the appropriate spot of the day's fieldnotes to give their interaction a context. The fieldnotes were detailed enough to allow for embedding transcriptions. By far the most important component of this research has been these transcriptions of student talk because this dissertation is meant to describe their productive and nonproductive group communication behaviors across a semester. The transcribed interactions were also valuable because they helped to explain what was going on and how it was going on. This text answered questions such as: Who are the actors? How do initial interactions occur? How do actors claim attention? Where and when do actors interact? Which events are significant? (see Lindlof & Taylor, 2010, p. 150).

Another primary data point was gathering emails sent among members of each group. This was achieved because the students agreed to copy my email address with other team members in the send to box of their email client. This sometimes meant that I did not get emails, but I often found the missing pieces by looking at the bottom of replied emails. However, I was often copied on daily emails that required my regular attention as I recorded this interaction in my notes. In this manner, I sometimes became embedded in several groups' daily interactions.

These emails were of vital importance because they showed the work and communication that students did outside of class. Such technology-mediated

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[10] Some continued discussion of their personal lives was not included due to the immense time it already took to transcribe a similar discussion earlier in the night.

communication also demonstrated how students attempted to communicate when a student was absent from class. The emails were of primary importance because they filled in any missing information that might not have been apparent from classroom observations. The emails also contributed to the "webs of meaning" used to produce "thick descriptions" of students' communication behaviors and their significance for participants (Lindlof & Taylor, 2010).

Interviews

I conducted 19 open-ended interviews with students enrolled in the class who volunteered to participate in this portion of the study. Primarily, I interviewed those students I followed closely throughout the semester. These interviews were unstructured yet in-depth as I used my interview guide (see Appendix E) to steer me toward posing questions about group interaction and those events that appeared during participant observation. Interviewing as a research method is often differentiated from participant observation; however, both go hand–in–hand because much of the data for one method comes from the other (J. Lofland, 2006).

Interviews were voluntary and held outside of class at mutually compatible times and places. A brief announcement was made in class asking that students who were interested in participating contact me after class or by phone or email. I explained their involvement was completely voluntary and did not affect their grade or standing in the course. They were reminded that aliases were used in the data collection and final project. These interviews were later used to help triangulate interpretations made during analysis.

However, I could not use these interviews at their face value because I assume that interviews are not neutral and objective. Instead, they are "inextricably and

unavoidably historically, politically, and contextually bound" (Fontana & Frey, 2005, p. 695). The interview is an active process between two people, and their exchanges collaboratively create what is said and discovered. The active nature of this process leads to a contextually bound and mutually created story. Malinowski (1922) recognized the constructive nature of interviews by asking open-ended questions and answering questions asked by the respondent. He also let his personal feelings influence him; costs, deviating from the ideal of the cool, distant, and rational interviewer. As a tool, the interviewer is a person who is historically and contextually located while carrying unavoidable conscious and unconscious motives, desires, feelings, and biases. The interviewee carries his or her own subjective bounds, so Fontana and Frey recommend that researchers ascertain the "how" of interviewees lives in addition to the traditional "whats" of everyday life of the classroom group. Because interviewees are actively constructing what they say in an interview, the researcher should not have inherent faith in the trustworthiness and accuracy of the story told. However, interviewees are experts in their own perceptions and experiences, and these tales are an invaluable part of the description of what I see and hear from students.

Students were also asked about their communication during the semester as informal conversational interviews (Patton, 2002), to answer questions that appeared in context during field note write-ups, and as respondent interviews (Lindlof & Taylor, 2010) of students from both groups at semester's end, meant to evoke open-ended responses about their subjective standpoints regarding teamwork and communication throughout the semester. As per the IRB, those students agreeing to individually be interviewed signed an informed consent document wherein it explained that the meeting

was an open space for them to tell their own story of what happened regarding group communication during the semester.

Student Documents

Further context to help explain why students demonstrated certain communication behaviors was gathered in the form of student assignments and other documents. These documents included all of the documents that the six groups turned in for the four client project deliverables. For group Razzmatazz, Chartreuse, and Cyan I was able to grab regular snapshots of their online, shared folders on Dropbox or iCloud. For example, the members of group Razzmatazz used Dropbox for different purposes throughout the semester, and I was able to capture each of their milestones in dated folders on my computer (see Figure 3).

These documents were meant to add to the rich description of the narrative around the students' meaning making. Such documents are "contextually relevant and grounded
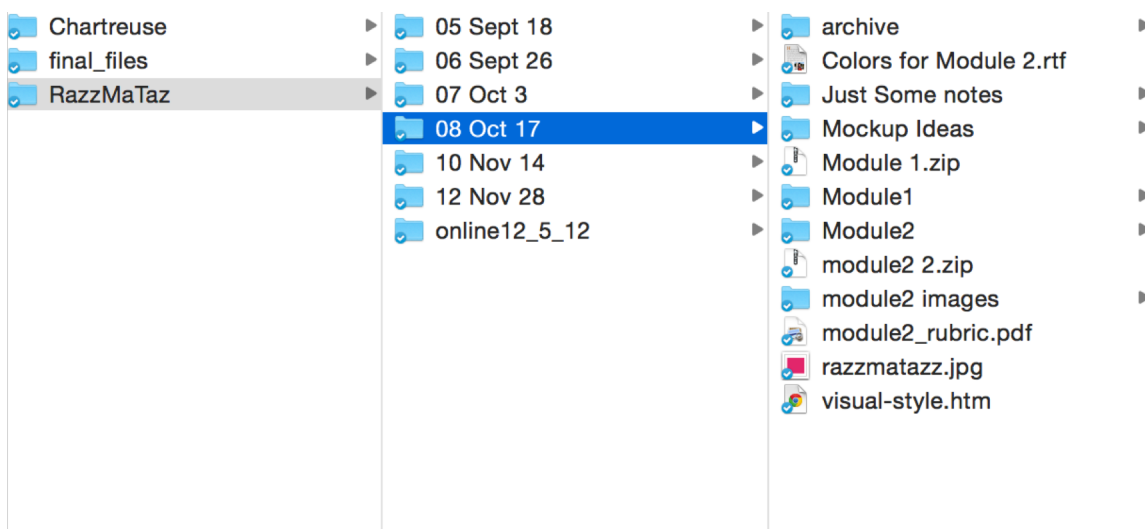
Figure 3: Milestone captures of group Razzmatazz's Dropbox folder

in the contexts they represent" (Lincoln & Guba, 1985, p. 277). According to Lindlof and Taylor (2010), this is especially true if a large number of documents are gathered and analyzed. The documents gathered for this research included all the documents turned in as assignments and many artifacts used to create them. These documents allowed me to examine each group's "paper trail," a construct that helped me understand why group members made certain decisions or came to a certain understanding or meaning. Many documents were the result of "a lively social process or as a result of a deliberative and/or create thought process" (Lindlof & Taylor, 2010, p. 236). Documents often went through several iterations during their lives and even changed into something new from their original form, so daily tracking of emails and changed files saved in the cloud on Dropbox or another site became important.

<div align="center">Data Analysis</div>

Once all data were gathered and upon receiving approval from my committee, I began the analysis and writing process. The beginning task in analyzing these data was to quickly read through all of the documents and get a sense of the whole. After taking time to reflect and process the whole set of data items, NVivo software was used to store a research journal.

Following this preliminary analysis, I used NVivo to create a codebook (Appendix F). Codes were first created using descriptive codes from the four dualities found within communities of practice: participation-reification, design-emergent, identification-negotiability, and local-global. As analysis continued several new codes and themes emerged, especially as codes collapsed into others that made more sense with the data. I then compared and interrelated the chunks of data, all while memoing and

writing about the ideas and relationship that arose during analysis.

Because the patterns were still confusing, the analytical reports and memos were then combined into six group stories that were further analyzed using the NVivo-evolved coding schemes. I then used NVivo to create comparative matrices (Appendix G), as described by Miles and Huberman (2013). Once I compared time against the codes created throughout the analytical process, patterns and themes began to become visible. Through the process of writing the results chapters, these themes and how they linked to (or did not link to) Situated Learning theory became evident.

<p style="text-align: center;">Studying Discourses of Communities of Practice as</p>

<p style="text-align: center;">Technology Is Both Content and Context</p>

In this study, I offer a detailed account of the interactions among group members as they learn and work on an authentic web development project. Because I wanted to look deeply into each group's communication practices, I chose to use the case study method. I chose the case study methods because I wanted to understand real-life phenomena in rich detail and within context. The rich depth and breadth of data gathered allowed me to more effectively illuminate the success or failure of negotiation and decision-making: why they were carried out, how they were implemented, and with what result. What I found was that technology and students' discursive practices influenced group communication and identity development. Using the dualities of Situated Learning theory and team developmental stages, I explain in the next two chapters how I analyzed the communication and behavioral patterns of the six groups. What resulted was the discovery of patterns of success and failure that depended on students' choices with discourse and technology.

In Chapter 5, I use Situated Learning theory's analytical dualities of participation-reification, local-global, and design-emergent to discuss how technology influenced each group's communication and development. The social and entertain aspects of "Always ON" technologies almost certainly delayed full group participation. Following the first deliverable, the members of each group began to understand their mutual accountability, and they began to see one another's mistakes and misunderstandings. Two groups did not deal with these issues, resulting in individualistic behaviors and using technology to ensure it. However, four groups did not experience such nonproductive behaviors as a norm and worked through these difficult behaviors. By the second and third deliverables, these students became fully accountable to one another and used technology to enable their full participation and identity.

In Chapter 6, I describe these teams over time using communication group theory and the analytical duality of identification-negotiability. Whether each group had a productive or nonproductive experience, each deliverable both acted as milestones to the final client project and to their development as either a collaborative or individualistic unit. Early in the semester, each group acted individually because they did not yet have an understanding of each other's abilities or a history of mutual experiences. Following the first assignment, all groups came to a collective accountability about the client project.

How they dealt with (or not) the resulting mistakes and misunderstandings was the first critical communication behavior that determined whether they succeeded in moving to a maturing stage during the second or third deliverable. Two groups did not deal with the resulting conflict, so they slipped back into individualistic behaviors. Their

collective productivity progressively became worse with each deliverable until members used technology to ensure their individualism.

However, the other four groups did deal with and forgive others for conflictual behaviors. They began helping each other to alleviate mistakes. These helping moments and the productive experiences of dealing with difficult communication behaviors helped these groups gain an understanding of how to negotiate and make effective decisions. These new collective skills then gave each group the ability to accomplish the second critical communication behavior: achieving a shared understanding of the task and how to accomplish it together. Once the four groups had achieved these shared experiences and understandings, their work transformed into highly effective teams that worked efficiently using full collaboration.

The final chapter is a summary of what occurred with the six groups and the theoretical model that results from the study's rich detail. I call attention to the similarities and differences of the productive and nonproductive ways that students communicate about the difficulties involved with their work and the negotiation and conflict practices employed while making decisions. I then provide an interpretive analysis of these students' negotiation of meaning with computers as content and context, resulting in an extension of Situated Learning theory within technology contexts. I call this model the Community of Practice Development theory (CPDT). The purpose of this model is to help demystify the process of technology-based communities in the classroom and workplace.

CHAPTER 5

TECHNOLOGY AND TALK: PATTERNS OF

GROUP COMMUNICATION

This is a project about how patterns of technology use influence discursive practices and group identity development in a college classroom. Students now bring their own devices into higher education classrooms, and they are often tempted to use these machines to the point of distraction that impacts learning. Mobile phones, their own tablets and computers, and classroom technology distract students because of multitasking with texting, email, Facebook, and online video watching. Because of the unique social functions of smartphones and online networking sites, students have the opportunity to remain always online and connected with friends and family.

What was once strange behavior in a public classroom space is now the norm and may be a symptom of Internet addiction (Cardak, 2013; R. L. Huang et al., 2009; Niculović et al., 2012), because students often think about using their devices and fail in their attempts to avoid it even when not exactly appropriate. Furthermore, Turkle (2011) viewed this problem as even bigger because she found that all students have formed part of their identity through these devices. Students carry multiple devices with them that enable them to express multiple aspects of themselves and different identities, even as they exist within a space meant for learning and collaborative work. Turkle found that

technology is seductive in that it offers the illusion of companionship without the demands of friendship, and our college students often demonstrate the desire to always be connected to their friends and information through their many devices. Students' "networked life allows [them] to hide from each other, even as [they] are tethered to each other." They would "rather text than talk" with frequent but brief statements that have become the norm in our everyday talk (Turkle, 2011, p. 1). She witnessed people who wanted to be alone in public spaces with their personal devices and networks. Although we have turned to technology to make us more efficient at work, we also want it to make us more efficient in our private lives. Students, too, feel a need to always stay connected and are accustomed to using brief, somewhat terse statements in their face-to-face interaction. "Always ON" is the new norm for their lifestyles. Most college students have a smartphone, and these devices allow them to be consistently attached to the network. Students live full time on the Net—always yoked to cyber-relationships even when in class.

Problems with using technology have also been found within collaborative, technology learning spaces. Wheelan and Lisk (2000) found that among 19 student groups using technology to communicate, 3 did not progress to an ability to negotiate and perform high quality collaborative work. They remained stuck in or regressed to a stage of dysfunction or conflict because they did not take the time to discuss their goals or used the technology to express continued tension and disagreements. Similarly, Waite et al. (2004) found that computer science college students assigned to work collaboratively initially displayed difficulty and negative attitudes toward group tasks. They preferred to work alone, because they wanted to bear the sole responsibility and get all the credit for

their work. In an effort to work alone, students cast a calculated risk to procrastinate their work so others could not contribute or refused to give technical and emotional support to group members. They rationalized such behaviors through statements such as "if I help them, they won't get the benefit of working it out for themselves." Both behaviors were damaging to collaboration and created problems with student success because they had either overrated their competence or underestimated the magnitude of the task.

In contrast, collaboration has begun to be mainstreamed into technology education thanks to a large research base supporting the use of group learning to increase student achievement of technology dependent learning outcomes. Within highly complex higher education classrooms, collaboration promotes the acquisition of technical and proactive coping skills, including the ability to identify and use information and access social resources to help reach learning goals (Greenglass, 2002; Schwarzer & Taubert, 2002) . Team-based learning has also been found to increase students' learning to think critically, to solve problems, and to integrate and apply knowledge and skills (F. Kirschner et al., 2011; Y. H. Lee et al., 2013; H. Middleton, 2008; Walmsley, 2013).

As students work together using technology and solving problems, they have sometimes been found to share knowledge and progress in their team development with all members contributing (Ernst & Clark, 2011). Technology facilitates their learning outcomes and team progress, but the specific type of technology did not matter. What was crucial was that students were easily able to receive and send messages with whatever technology they chose to use. What does appear important is that students use technology in a strategic manner such that it facilitates their functionality, interaction and community (Charlton et al., 2009).

The student groups who participated in this dissertation exhibited behaviors that can partially be explained by previous scholarship on team-based learning in technology classrooms. However, the rich descriptive nature of the data resulting from multiple sources in this case study revealed further information. For example, students were observed using technology as a distraction and an escape throughout each class period, especially during the early weeks of the course. This behavior was common during class lecture times. It also became an escape from group work time as friends or family would call or text during what was meant to be collaborative time. Such distractions meant that a student attending to his or her phone could not pay attention to or contribute to group interaction. Students would also sometimes escape from group interaction during downtime, when they felt uncomfortable or had little else to do for the night on the collaborative project. This behavior was often a symptom of communicative problems within the group.

Similar to the research that illuminated higher education students who preferred to work alone and not have to deal with interpersonal issues, members of two groups displayed similar preferences for individuality after experiencing a moment of conflict and never dealing with it. One member of each group took it upon themselves to finalize the client project because they were concerned about the class grade. In order to accomplish such a thing, even though others were also looking to participate in the task, the students wishing to work individually hid behind technology and used it as a retaliatory weapon that prevented full participation and negotiation of the client task.

In contrast to students' use of technology in an individualistic manner, it was also an enabler of certain students' legitimization into their group and the eventual

collaboration that occurred on the client task. For example, students in groups Cyan and Razzmatazz leveraged technology in such a manner that it promoted their ability to organize the task, or it helped them demonstrate how their skills could be of use to their group. Some students were able to lead their group to an organized method for completing their client task due to their greater understanding or ability to facilitate the website files. Similarly, reticent students were enabled to full participation by sharing their technology skills and contributing code to the client task. Once all members in these groups had begun participating in the negotiation of their client project, email and cloud-based servers were then used to enabled their effective collaboration on the large, final website task.

Analytical Focus

The theoretical base of this dissertation is built on Situated Learning theory. Lave, Wenger, and others argued that learning is a function of the activity, context, and culture in which it occurs (Lave & Wenger, 1990; Wenger, 1998; Wenger et al., 2009; 2002). This contrasts with most classroom learning activities which involve knowledge that is abstract and out of context. Social interaction and collaboration are critical components of situated learning—learners become involved in a "community of practice" that embodies mutual engagement about a joint enterprise, which results in creation of a shared repertoire. Learning results from collaborative social interaction and mutual construction of knowledge through higher-order thinking processes. By placing content within the regular transactions of the group working on an authentic task, learners negotiate the meaning of information, framing it in terms of the relevant issues while taking opportunity to investigate solving problems. As members practice their enterprise

with full participation, they become more active and engaged eventually assuming the role of expert.

Wenger (1998) placed the analytical emphasis of Situated Learning on the social negotiation of meaning. Communities of practice form the core context for learning and analysis in the theory. Within this context, dualities are used to capture the idea of the tension between two opposing forces. Three dualities that create and sustain a community of practice are participation-reification, global-local, and designed-emergent. These dualities refer to core struggles that are endemic to the activity driving change and creativity within a community. Because of their centrality to the formation of a community of practice and because curiosities of technology's influence is the focus of this chapter, these three dualities drive the primary theoretical structure herein. These dualities are instrumental in analyzing the rich data gathered for this dissertation.

The duality of participation and reification is the process of meaning-making central to the learning theory underlying communities of practice (Wenger et al., 2009). On one hand, group members engage in activities, conversations, reflections, and other forms of participation in the learning of a community. Through participating in community practices, members become part of the larger community. In this way, participation is both action and connection, while being both personal and social. Participation within a community allows students to create meanings and identities.

On the other hand, students produce physical and conceptual artifacts—words, tools, concepts, methods, stories, documents, and other forms of reification—that reflect their shared experience and around which they organize their participation. The process of transforming experience and its outcome into objects is known as reification.

According to Wenger (1998), the process of reification allows communities of practice to capture and share meanings as they turn their local experience into something that is portable and globally significant. Reification is an abridged and concise representation of a typically messy practice, making participation easier to share, while offering an incomplete account because it is always incomplete, ongoing, potentially enriching, and potentially misleading. Reification must be balanced with participation in an effort to facilitate learning.

The duality of participation-reification was found to be the central tension in the development of the six student communities. Mutual engagement was the prime context in which groups made sense of the project and how to work on it together. Each member entered a group with their own theories and ways of understanding the world; through their engagement practices, they mutually developed, negotiated, and shared new understandings. When practice was socially enacted, things had to be done, relationships worked out, processes invented, situations interpreted, artifacts produced, and conflicts resolved. When practice is individualized and does not allow full participation in creating artifacts, it suffers and does not exhibit embodied, delicate, active, social, and negotiated aspects of a working community. As a lens, this duality can be categorized as the study of the amount of participation that results from their shared enterprise in the reification of a repertoire of project files.

The second analytical duality used herein is that of local-global concerns. When students form a community of practice where they work locally together on a project, they also often consider how their work on a school task impacts their outside lives. This perspective considers the duality between the local needs of student groups and their

global needs, such as work, home, and family. Often, college students have outside needs that can interfere with their persistence through the work involved in collaborative work.

Several local factors have been identified that indicate when a community has formed, including shared engagement with mutual relationships while knowing what others can contribute and sharing stories and reflective discourse. According to Wenger (2009), these characteristics indicate that the three dimensions of a community of practice are present to a substantial degree: mutual engagement, negotiated enterprise, and a repertoire of negotiable resources accumulated over time. As a group develops these dimensions of a community of practice, the members form an identity that allows for a locally shared meaning.

Technological innovations provide the means for pushing the limits of a group's interaction, with transforming innovations in real-time communications using smartphones and social networking. However, their use of these technological developments is not simply straightforward expansions of engagement scope; instead, it involves trade-offs that can either help or damage meaning making and communication. For example, the same texting and chatting tools that can be used to expand each group's communication outside of class can be used during course time to engage with family members and friends. How the students of this study communicated with either fellow group members or those outside of class will be a analytical focus of the local-global duality.

The third duality utilized for this chapter is that of design-emergent. The core challenge for student groups studied herein is managing the interplay between premade instructional designs and student-provided ideas for what the code should look like with

the emergent and negotiated types of code that the group develops. The purpose of the course was for each group to create their own solution for the client website. The graphics and information architecture was to be their own and a creation of their mutual engagement. The instructor could not design such a website, because each group was self-organizing, emerging in response to the project and needs of the instructor and client. Yet, early in the students' knowledge acquisition, they started their projects with the example code provided by the instructor and various online sources, including the existing client website. The duality of design-emergent deals with the design of communities in the classroom that have the potential to emerge with learning, decision making, client project reification, and identity formation.

One of the primary tasks of each group was to generate ideas of how to uniquely code their client projects. Such knowledge generation was not static and changed with learning and group development. Knowledge and idea generation must be constantly discussed by those who understand the issues and are given a voice to do so. To keep up with the advancing amount and rate of change of knowledge, these people must work as a community. How members generate ideas and knowledge is determined by the tension of utilizing predesigned ideas, such as those from course examples, versus those that emerge from group discussion. As a lens, this duality can be categorized as study of the process of group project development that results from the dynamics of idea design and emergent issues.

Using the analytical lenses of participation-reification, local-global, and design-emergent, this chapter explores how technology played a role in the six student groups' development. Students sometimes chose to use technology to disable their collective

work, while others used it to enable participation and collaboration. This chapter uses

student talk and description of behaviors from these six groups to illustrate these patterns.

<u>Technology as Escape</u>

Wenger (1998) observed escaping behaviors within an insurance processing

community of practice at a company named Alinsu. He found that medical claims

processing at Alinsu was focused on procedures: how to follow them and how to use such

artifacts as forms, worksheets, computer screens, and manuals. While learning their jobs,

the insurance processors learned how much they needed to make sense of what they do or

encounter. They soon learned that the job was demanding and required occasional

escapes in order to cope. They devised ways to escape Alinsu's control with the treatment

of errors by developing and using a special type of claim form devised by the group.

They also learned to create some space for themselves. Instead of spending their time

worrying about claims issues, they put their effort into creating a work environment in

which mistakes were not a problem and enjoyment was to be had. Even while processing

claims and looking at the clock, they managed to have fun, collectively feel hopeless,

laugh at accident reports, share boredom and anger at a customer, spread rumors, discuss

their views, enjoy a snack, exchange stories, and feel the pain of uncertainty. Through all

these behaviors, Ariel and the other members of the claims processing team were able to

cope with the stress and difficulty of the strict procedural organizational rules.

Similarly, the need for students to escape from their reality as a passive

participant in classroom settings is not new. Traditionally, students whiled away the time

daydreaming while looking out windows or doodling on their notepapers. Technology

provides new opportunities for such escape. This classroom, like many others, always

had accessible wired and wireless Internet, and this meant that every student had the whole Web at their disposal. I sat every week at the back of class, and I was easily able to see the screens of most students in the classroom. Such a seating position allowed me to see that students had the ready and available option of logging into entertainment, shopping, and social networking sites. My fieldnotes from the early weeks are scattered with examples of some students exhibiting an almost addictive need to check their smartphones and respond to texts or Facebook comments while on the classroom computer. They were able to achieve such behaviors due to the computer screen that separated their view from the instructor.

Turkle (2011) argued that social-networking sites and other technologies are fueling disturbing levels of isolation and poor communication skills, while causing humans to mistake digital communication for actual human connection. The new interactivity of computers has many students in this study insecure in their relationships and anxious about intimacy, resulting in short and shallow statements during their early discussions. Turkle believed that the lack of communication skills is the result of individuals' fear of the risks and disappointment of relationships while expecting more from mobile technology to meet those needs and less from each other. Because computer technologies were so available, every student exhibited some sort of personal use of the classroom computer or their own technology device during time meant for instruction or group communication.

Because of my observational position in the back of the classroom, I often saw that some students often exhibited "Always ON" behaviors during the early weeks of the semester. What was sometimes addictive and distracted behavior often prevented these

students' participation with the instructional material, resulting in their inability to contribute to subsequent group discussions. For example, I often saw many students instinctively reaching every few minutes for their phones during lecture and group discussion time. Especially during the early weeks of the semester, this behavior was rampant throughout the classroom. The technology was both highly available and seductive in that many students used these devices to stay connected with friends and family, despite the expected norm of classroom behavior. As Turkle (2011) observed, these students sometimes used technology to hide from each other and escape into a space where they could be connected to friends and entertained in a way that had become the norm for them.

The seduction of escaping into the readily available technology was a common behavior among students in this study. The early weeks of the semester were when students were most likely to experience such technology distractions during lecture and group discussion time. Students' global needs and desires were more important during this period than their local interaction, as evidenced by regularly checking in with their phones to interact with outside individuals. They were new to both the domain knowledge of working on an authentic web development project and to the collective means in completing it. During this time, many students used the computer in front of them and their own devices to escape into tasks that had nothing to do with the lecture. I took pictures of such behaviors. Included in these photos is Randall reading a news site on his iPad. Abigail often looked at news and shopping sites that Xandra had showed her earlier. Candace logged into the course website and often took time to work on assignments for other classes. Other students were surfing various off-topic and

entertaining websites using Google. Therefore, during the early weeks not all students paid attention or took notes on what the instructor taught. Their nonparticipation prevented knowledge acquisition for the group project, and the instructor and I were often asked a lot of questions during group time on topics that had already been taught earlier in the night during lecture time. As a result, these students' ability to participate in a cooperative manner became problematic with the first group assignment.

Contact From Outside Friends/Family During Group Interaction

Students would also sometimes become distracted during time meant for group discussion and task accomplishment, by attending to a notification from a friend or family member contacting them through a smartphone or a social networking site, such as Facebook. According to Situated Learning theory, these students' attention to contact from outside the classroom can be described as a tension between the local needs of students within a group and their global needs, such as work, home, and family. Technological devices have pushed the limits of a group's engagement, with transforming innovations enabling real-time communication with outside influences using mobile phones and social networking. Yet, these technological developments are not simply straightforward expansions of engagement scope; instead, they involve a complex trade-off that can potentially be damaging to meaning making and communication among group members. Such damaging effects may have contributed to the students' early shallow interaction and use of small talk, leading to a lack of collaboration on their first deliverable. For instance during the early weeks, many of the students exhibited shallow conversation because they had little experience in working together on a complex project. This resulted in their conversation dominated by short

statements with little value, because they gave no explanation or expansion on what they said.

Part of the complexity of the groups' knowledge sharing and meaning making involved nonparticipation due to acting on global needs through technology distraction. For example, Adam, a member of TGAAG, often did not participate with his group's interaction during the early weeks because his wife attempted to stay in contact during class hours. During the 3rd week of their group interaction members were sitting together and meeting to discuss the personas meant for the creative brief, the first group assignment. Despite the needs of his group, Adam continued to exhibit a need to stay connected to outside family members. In my fieldnotes I describe a time when Adam picked up his phone as they all discussed the personas and soon discovered a message on Facebook from his wife. The following excerpt is taken from my fieldnotes:

> As this group talked, Adam would sometimes refer to his phone. He is a father, husband, and works full time. He stays in contact with his wife during every class. He was also looking at websites, such as Facebook, on his phone as they chatted.

While Adam answered his wife's query, the other two continued to discuss the personas and the design for those pages in the creative brief. Because he was distracted and missed a few minutes of their conversation, Adam did not participate immediately upon attending to their ongoing discussion because they had moved ahead without waiting for him. I observed that once he listened for a few minutes, he jumped in with a definitive statement that changed the subject because he did not fully understand the context of their conversation. Candace and Parry ignored this statement because it derailed their discussion about the look of their client project; both continued to move forward with their conversation about the website mockups.

Parry: Alright, I'm sending you guys the little template.

Candace: OK

Parry: It's just a JPG so...

Candace: So…

Parry: Well, what, I mean, I probably have an idea of what...

Candace: Yea

Parry: …we're after. We can also just incorporate…like what I've done

Adam: Photo. What kind of photo should we come up with?

Parry: I can take 'em if we get 'em. I mean even if you guys have phones.

Candace: Um hmmm.

According to my notes, Adam told me later that night that because he had lost out on part of this conversation and misunderstood the context, he decided to be more locally present and less globally distracted during group discussion times.

Another member of group TGAAG also exhibited distracted behavior with her phone because she was a mother with a small child at home. These were early weeks so students, such as Candace, were inexperienced in effective group communication and in working on a complex website collaboratively. Their knowledge of the domain and each other was shallow and so was their interaction. They interacted with a kind of small talk: short statements with little value. Their statements were often brief with no explanation or expansion on what it might mean to the project. For example, group Chartreuse's discussion of what the task entailed was shallow and not enough to make actionable decisions.

Luke: We definitely have like the first page, you know like he said?

Nate: Uh huh

Luke: And then...uh, but like this is definitely not enough for an entire page.

Evan: Yea.

At this stage, what they talked about may have mattered less than the interpersonal significance of just talking. Although a valuable part of their collective action, their talk was shallow and of little value to the client project, because they discussed little about how they would collectively work on the task. Their first assignment then became a grouping of individualized work, as evidenced by feedback from the community clients and instructor that their work appeared disjointed and not collaborative.

The task was so complex that it took weeks for the students to understand it well enough to begin achieving a shared coherence of the client project, so group members were seen to occasionally "check in" with their smartphone or a social networking website. Candace was often seen looking at her phone and occasionally stopping to interact with it. During the 4th week, the members of group TGAAG were sitting around Adam who was showing a robotics site that might be a good example of how to code the client's debate site. All their eyes were turned to this one computer screen. But their discussion about the comparable website was shallow and did not involve critical thinking and deep engagement of the task. Candace soon grabbed her phone out of her pocket and replied to a text from her spouse, and neither Adam nor Parry noticed this distraction. Instead, their attention remained focused on Adam's computer screen. Candace chose to be distracted by her phone and did not attend to their conversation, so the entire conversation about the robotics website did not include Candace's input.

Adam: I love how they have this set up.

Parry: The layout?

Adam: All these tabs go here when you go.

Parry: Yea.

Adam: And you know which one you're in.

Parry: That's got an active state on them.

Candace later told me that she thought her group's interaction was confusing and they did not understand her. The following are Candace's words as recorded in my fieldnotes:

I think at the beginning it was a little bit confusing. In my mind I was like, oh, this will be so easy, we'll just do this, you know? And then like I don't think the boys understood what I meant.

Their shallow interaction had left her with little context and knowledge of how to proceed with the task.

Throughout various weeks of fieldnotes, I recorded that both Candace and Adam did not participate in group interaction because of the many global communities in which they already engage in, such as family and work. According to Wenger et al. (2002), it would be absurd to think that people can or should identify with everyone and everything they meet. In a wide landscape defined by boundaries and peripheral groups, an individual's resulting identity is of necessity a mixture of being in and out of specific groups. So then, students were free agents who had to choose their engagement with the local identity and work with their group. Important to this development was a growing participation in their collective task.

Used to Fill Empty Time During Collaborative Work

Distraction and escaping into technology also occurred when students were meant to participate in active learning during group time. During the early weeks, the tensions were more than the duality of global/local identity. How groups participated in reifying

their group relationships during off-task moments was also critical to their development. Some groups were delayed and others paralyzed because technology was an escape that allowed their distraction from developing relationships. For example, all groups did not begin to discuss the project in depth until after their first deliverable. Based on the total amount of talk transcribed throughout the semester, groups RAX and Crimson talked significantly less than the others leading to much less discussion about their relationship and shared understandings. Yet, forming a relationship was important because it helps a group develop established ways of interacting. Through such engagement, students develop a unique perspective on their topic as a body of common knowledge, practices, and approaches.

During class lecture time, many students were often distracted by technology, even when they were supposed to be listening to important information for their client project. For instance, my fieldnotes during the third semester tell the story of their often distracted behavior.

> As Alex debriefed the personas, some students, such as Adam were paying close attention. Others, such as those in the back row, had their heads down and were looking at their phones. Those who like to stay off task during lecture do like to sit in the back of the classroom. They often use the display to hide behind…. Tonya and Quince always sit in back. As Alex is showing a Bugatti vehicle on the screen and asking students to describe what would cause this to be $2 million in cost, they stayed completely oblivious and looked at their screens. Tonya was text chatting on her cell phone from 6PM (it is now 6:20). Quince is watching videos on the computer in front of him.

The students also exhibited distracted behavior when they were given time every week to work together on their group assignments. This time was meant for group collaboration and decision-making but not all students spent the entire time on task. Once students completed the day's task or they had no active task to work on, they often turned to their smartphone or a social networking site to escape any downtime. These distractive

behaviors occurred most often during empty time before groups achieved an identity such that all members exhibited full participation in the complex work of their client task.

Many students exhibited such escaping behaviors because forming a cohesive group is not as easy as it was fifty years ago (Wenger et al., 2002). Many have had little to no first-hand experience of what it is like to live in a traditional community. As the population has become more mobile, it has moved from neighborhoods to "neighborhoodless" suburbs. The public places that once anchored local communities are largely absent in the suburbs. Yet, it is ironic that as people move away from the traditional neighborhood experience in their personal lives, communities of practice are become more important in organization life.

The same is true in many organizations that practice Web design and production; the creation of a corporate website requires that many different people work together in a team. It is because of this that the course in this study utilized team-based learning. Technology distracted students to the point of delay or obstruction of their relationship development. Some groups had members who mitigated such behaviors resulting in improved mutual engagement in the task, while others had no one who helped the group deal with reticent or distracted behaviors. For example, group Chartreuse experienced problematic technology distraction with a member that impacted full participation and their resulting practice. During the 10th week members spent their collaborative time working to code the third group assignment, an order form for the hamburger business client. Nate took it upon himself to work on the design and layout of the pages, while Luke coded the HTML form elements and CSS meant to follow the proposed design. Within this collaborative space, Evan did not know how to act other than giving

recommendations to Luke on the code. My fieldnotes tell this story.

> Evan (although purposefully moved closer to his group members) did not interact with his team during this period. Instead, he was very involved with his Facebook page. He did not have any code on his screen.

Evan later told me, during the final interview, that he did not like the feeling of not being able to contribute during these periods:

> So I don't like with that project we pretty much all were there doing it, we didn't really have individual things to do.

Later, he said that in order to escape a feeling of helplessness, he decided to log onto his own notebook computer and engage with his Facebook page. He did not have any code or anything related to the group assignment on his screen, and he did not yet feel a member of the team. Evan told me in an informal interview during the semester that he preferred to escape into his social networking world so that he could engage with his outside friends and family.

Just like those students who while away time looking out windows or doodling on a paper, Evan chose to escape into social networking websites to escape what he saw as empty time. My fieldnotes recorded that Luke noticed seemingly reticent behavior in escaping into technology and eventually mitigated by inviting Evan to participate in their group task. Luke physically moved closer to Evan and they talked about the form and what was accomplished during class. They then spent a few minutes talking about what they would do next week, during Fall break. I heard them talking about skiing and personal activities they planned to do with their free week.

According to Evan's interview, this friendly interaction seemed to help him feel more a part of the group because the following week he engaged with the group as Luke coded their group assignment.

> I feel it's easier to go and ask people for help, being able to go and just talk to people, and get ideas in the same field, or whatever. And just be able to communicate with people better, I would say…. I enjoyed doing group work, definitely, or just even being able to study with people…. Or it helped a lot I feel like, because you weren't really stuck with the whole bulk of the projects and stuff. You're able to split it up, and then come together. Give you ideas in what we did, and being able to bounce different scenarios and stuff off each other.

While they worked collaboratively, Evan even coded a portion of the page and emailed it to Luke to integrate in the final group project. Through slow relationship development between the members of group Chartreuse over the previous weeks, Luke was able to pull Evan aside and invite his full participation in their collective practice. He had once used technology as a distraction during seemingly empty time, and through Luke's friendly intervention Evan began to feel value in his work and began contributing to their reificative practice on the client website. This change in Evan's technology distraction behaviors was an important point in community of practice development for group Chartreuse.

As another example during the final week of class, the female members of group RAX were spending time individually looking at social networking and news sites while Randall took time to work on their group project. Such behavior had started early in the semester with all of them taking time during lecture and group time to singularity use their technology devices to surf the Web and work on other off-task things. This distracted behavior meant that the members did not spend time working collectively to develop a practice of relationship and project building, because they had experienced a heated conflict in class about how much work each member had done on the second assignment. During this conflict-based interaction, Abigail sternly and loudly explained that she had done the majority of the work and the others needed to step up. Others, such

as Randall, saw her contribution as finalizing this assignment not completing the entire

thing. Here are Randall's words:

> See, there was a couple of assignments that Angie had kind of had the final
> touch on it, where she was the final one to do the submissions and things like
> that.

My fieldnotes recorded that the other two had perplexed looks on their faces during this

dressing down. Later, I observed throughout the semester that this group never dealt with

this conflict and their relationship seemed to deteriorate over time, resulting in none of

them on the same page regarding the final client task and how to present it. During the

last 2 nights of class, Abigail and Xandra had been rather disengaged with the final

website because their group had not developed a strong relationship and experienced

difficulty that they never addressed. Their lack of collective participation had resulted in

no shared meaning making and talk about how to work on the task together.

Because Randall was highly motivated to complete the task despite his group's

inability to communicate well, he took ownership of the final client project. This mutual

disengagement became apparent when they talked the last night about how to present

their website to the client. Randall had shown up to class with 8½" x 11" printouts of

several of their HTML pages, and Abigail did not want to do anything more for their

presentation than taping these small pages to the front of the room. Randall disagreed and

wanted the client to easily see their proposed website update, and he suggested that he

create a presentation on his computer.

> Randall: Do we want to, do we have anything we want to do anything
> PowerPoint-wise or anything like that? Or are we just gunna...
>
> Abigail: I don't think so.
>
> Randall: Okay

Abigail: I'm wondering if we can even just get some tape and then tape 'em up and then kind of say this is what this is...I don't know.

Randall: Okay

Abigail: Or just hold them up I guess. It really doesn't matter.

Randall: I'd kinda like for Matt to be able to see into the details of the things we're doing.

Abigail: Okay

Randall: 'Cause some of the things we're doing in terms of visual, um

Abigail: So how would you foresee this?

Randall: I, what I can do is maybe I can pull up these...well, I can pull up any of the images that I've worked on um onto the computer here and we can throw them up there.

Abigail: Okay cool

Randall: Um so they can be more...

Abigail: Okay

Randall: ...visible that way. But other than that, we don't really need to worry about doing a full presentation or anything on it.

Rather than participating with Randall on creating the presentation file, Abigail and Xandra demonstrated a lower commitment to each other when they moved away from his computer and sat separately at their own workspaces. Such behavior had become the norm throughout the semester as each member moved to their own workspace and interacted with a technology device. I took pictures of this moment. Randall worked on the presentation, while Abigail and Xandra moved away. Both Abigail and Xandra told me in their interviews that at this point they did not know how to participate with Randall as he built the presentation file because they did not know all the little details of the final assignment. Abigail's frustrations are captured in the following statement taken from her interview:

> And the presentation he gave today, I had no idea of the little details he had done because he sent it to us the night before it was due. It's like he didn't go over what he had done or why he had done it. It wasn't a group effort at all. That was him doing what he wanted to do on the project. So that was frustrating to me.

Neither felt like they were competent in helping out, so they used technology to fill this time. I have photos of Abigail checked Facebook and Xandra looked over notes from another class. This last class and final opportunity to work collaboratively was instead used for individualized work because they had never taken opportunity to become fully participative in working together to reify either their community or the client project.

Technology Knowledge Design and Emergence

The analytical duality utilized for this section is that of design-emergent. The core challenge for the student groups was to manage learning of pre-designed code with emergent student ideas in the creation of an authentic client project. Because students were expected to learn coding while creating a large client project, it was critical that they worked collectively to create a high quality product. Students were also expected to create their own solution for the client website, including new graphics and programming.

Each group was supposed to self-organize, emerging in response to the project and needs of the instructor and client. However, early in the semester the students were new to the knowledge required to build the client project due by semester's end, so they often started their projects with example code provided by the instructor. Over the semester, they were then expected to make the website their own with unique code solutions to the problems and feedback posed by the client. Such code creation meant that students needed to constantly share premade designs and emerge with new ideas. How

members generated ideas and knowledge is the main analytical focus of the design-emergent duality used hereafter.

The analytical lens of design-emergent is used in the following section to understand how students managed or negotiated ideas and knowledge meant to help their group collectively complete the client project. Technology was a tool used to either promote or disable each group's collective practice on the client task. For example, members of groups RAX and Crimson used technology to ensure their individual work on their client task. The members of these groups experienced conflict that they never dealt with, and individuals decided to generate all the ideas and take their collective task on themselves. They ensured such actions by using technology to prevent mutual communication and hide their work from the other members. Emails were ignored, and project files were hidden on personal computers and cloud servers not shared with group members.

Conversely, students in the other four groups utilized technology to facilitate their mutual engagement. Early in the semester, students who took lead brought predesigned technology knowledge and ideas that helped their groups to get the first two assignments done before they were able to develop a full community of practice, such as when Ella from Cyan spent hours creating and then shared a document that summarized the project in such an effective manner that her group used it to help define their tasks. The pre-designed ideas that these leaders brought to their groups were often considered to be the final "decision" for their task. Although the groups were not yet fully collaborative, through these leaders' actions they were able to successfully complete their first two assignments.

As the semester and the group's interaction progressed, those members who had previously been reticent and not participated in decision-making were able to show their value through emergent technology skills; for example, Derrick of Razzmatazz began spending time with his group in class and sharing his tips and tricks for easier coding using browser technology. By demonstrating how their technology skills could be of use to their groups, these students became legitimized enough that they could begin contributing to the interaction and decision-making. Once all members in these groups had begun participating in the negotiation of their group projects, technology such as sharing files through email and Dropbox was then used to enable their collaboration. Through the combined use of email and cloud-based servers, these groups could effectively collaborate in the shared work required for the large client project. How the six groups studied for this dissertation went about working together using designed or emergent ideas and knowledge generation is detailed in the following text.

Technology as a Weapon

This section describes the behavior of students in which members did not make the effort or were not given opportunity to practice full participation for generating new ideas for decisions and tasks. Members of two groups, namely RAX and Crimson, went through difficult times due to mistakes and misunderstandings, which they never dealt with and these experiences festered into bad feelings. Wenger, McDermott, and Snyder (2002) argued that when groups do not actively work on several principles, such as designing for change and inviting different levels of participation, they are likely to develop a disorder.

For several reasons, including lack of participation because of technology

distraction and inability to come to a shared understanding, members of RAX and

Crimson failed to connect enough to develop trust such that they could collectively work

on the graded, client project. Their practice became stagnant and did not develop full

participation so they were unable to develop negotiative pursuits. Instead, individual

students in these groups decided to take ownership of what was meant to be a

collaborative project. Because several students were driven by a strong desire to do well

in the class, they decided to complete the client project on their own and used technology

to ensure it. They used technology to facilitate providing predesigned code solutions that

were not negotiable through others' ideas. These actions influenced how they were

unable to form collective action and resulted in poor feelings toward one another due to

individuals' conduct with technology.

Such actions with technology resulted in its use as a kind of retaliatory weapon

against other group members. Students in the Crimson and RAX groups used technology

in retaliation for behaviors deemed as undesirable or nonproductive. The client task was

large and complex, so email communication and cloud-based technology became

important elements that enabled sharing of the many files that make up a website. Cloud

services require that the "owner" of a folder intentionally share it; however, members

who decided to silo their work on the client task delayed or never shared files with other

group members. Others decided not to interact with certain group members, so emails

were ignored.

As an example, by week 10 the members of group Crimson discovered that they

were having difficulty coming to a shared understanding of the client task. George, who

had missed over half the classes, wanted to build the entire site by himself using a

JavaScript technology that he liked, and Vinton sided with him because he liked how it worked. George declared his desire to build the entire site himself the second night. My fieldnotes indicate that George further stated that he wanted to work on all the code and told the other two they were to work on the design and content only. However, the class objectives emphasized that each member was to spend their time coding and the client had already developed the designs. For example, the course syllabus clearly stated the course objectives.

> This course emphasizes use of the three core interface design languages (HTML5, CSS3 and JavaScript)…If you are completely comfortable with application-based computing and learn technical concepts easily, you will probably do very well in this course as long as you keep up with the assignments.

Vinton and John understood the course objectives and their need to practice the coding, so over the next few weeks my notes recorded that the other two attempted to tell George that he was mistaken, but these attempts to clarify expectations fell on deaf ears.

> George did not show up to class on September 21. John and Vinton were still talking and emailing George trying to convince him that his preconception was incorrect. Although initial and weak trust had formed early on, their ability to communicate effectively was weak.

This resulted in a rather competitive space where not all members had a voice. Only George's voice was the loudest because he would not listen to the others.

Wenger et al. (2002) described this behavior as pride of ownership and it can provide debilitating failure in the group by disallowing emergent ideas and participation from fellow group members. As in this instance, the enthusiasm of an individual for the domain led to excessive zealousness such that he ignored input from others inside and outside of his group. George was a professional Web developer at his day job, and it is not uncommon for engineers, like George, and other technical experts to feel such

exclusive ownership of their domain that they ignore others' perspectives. In addition,

John was also a mature adult who wanted to take ownership of the project due to his

strong opinion and self-perceived expertise in the domain. According to Wenger et al.,

being viewed as an expert in a domain also made it easy to believe that what he knew is

all there was to know about the subject. Such a belief can easily lead an individual to

claim exclusive ownership of the knowledge and its application while hoarding it from

the others. When an individual has decided to exclusively hold onto the domain, other

members are likely to feel hostage to the self-righteous expertise of the specialist. In his

final interview, George reported a discussion where Vinton declared helplessness and

George was frustrated with that attitude toward him.

> Um, what irritated me a little bit is when I'm working on it there, and Vinton looked at me and had no idea what it was. He's, you know, "What is this we're doing?" Miscommunication or misunderstanding on what exactly the site brief was for, but, uh, we -- I wasn't happy with it.

George knew quite a bit about back-end coding of websites and he claimed

exclusive ownership of that knowledge. In his final interview, he revealed his

understanding that he was to do most of the coding and the others were to draw the

designs and copy and paste the content.

> I was just going to be creating a framework that could literally just be via CSS appl- applied in any way, shape or form…. What we could do is just we'd have this one div allocated. This is the name that it would have. This would be reserved for the content.

Throughout the early weeks, he used technology to prevent the others from collaborating

by hiding it and not sharing the files, resulting in its use as a weapon against the others.

As explained by the design-emergent duality, such an imperialistic viewpoint led George

to be closed to alternative views, outside experts, or new methodologies because of a

passionate belief that his perspective was the correct one.

However, John felt that he understood the task and client better because he had not missed classes and had received feedback from the client. John proceeded to work on his own version of the site when it became clear to him that collaboration with George and Vinton was not going to happen. In his final interview, John described his need to break off from the others because they did not understand the client's goals for the project.

> We kinda broke off on our own to deal with our – our role, yeah, our role in each position in this. And a lot of collaborative work that I've worked on, either they – you gel and things work well or it becomes sometimes a mess that you have to kind of get back, and edit, and filter, and -- and, uh (break in audio). So, as we worked on each individual aspect, um, I think there was some lack of understanding on the exact goals for the client.

During week 11, John was the only member in class. It was 2 weeks before the final night of class during which they were to present their final work to the client. He was concerned because he felt that no substantive work had been completed on the whole project and he had been tasked the previous week with building the template file that the client required. He did not want the "cool" code that George had created because the client could not use it.

> Laura: So where's your peeps?
>
> John: Gone. I'm building a template.
>
> Laura: Yea.
>
> John: Make it just like a normal…
>
> Laura: Uh, huh. Like a normal site, huh?
>
> John: There's an IBM commercial years ago the guy's in a conference room.
>
> Laura: Uh, huh.
>
> John: The guy's telling them to do all this stuff that's cool to the CEO or whatever. The CEO says, "Cool costs me money."

John proceeded to work on the site during class and on his own time because he was

panicked that the assignment would not meet class requirements. He explained in his

interview that the task was so big it required hours of work to complete.

> And George wanted to build the application based on Ajax. While the
> concept is cool, it's time consuming. And when I noticed that he was just still
> working in some sort of sandbox testing the workability of it with no real
> design, that was a panic mode, and that was when I was gonna come up and --
> and that's what I did, and I've been -- I -- I -- I guess, in a way, I kinda lost
> some faith. And I figured if this is going to work, I'm going to have to get
> everything done, and I spent the weekend.

John's actions resulted in a big blowout in class during night 12 that was simply

an extension of the conflict they experienced for weeks over a misunderstanding of the

client task that they never dealt with. John completed so much of the client website by

class on week 12 that he arrived to class with a mostly completed and working project,

yet George sat for the first time in a space in the classroom where he could interact with

the others on his team.

Because George began to see value in the emergent knowledge displayed by John,

he began to open his view and try to find a way to work with his group on the client task.

He communicated this change in opinion during his final interview.

> And we're like, you know, okay, okay, you know, we'll, we'll, we'll run with
> what you have. I was like, "Well, let me at least just, you know, s- stop
> editing it, stop working on it." And, you know, he's sitting there in class
> literally editing the area. And it's like okay, you know, "I, I see that you've
> got this. I'll -- can run with this.

This resulted in the first time ever that George attempted to work with others in his

group. It was an opportunity for both John and George to come together and merge their

code. However, John was well past finding a way to make this happen because they had

already unsuccessfully attempted to combine their work several weeks earlier and their

ability to communicate had become strained. During John's final interview, he described

the panic felt when he realized George's website would not work with the client

expectations.

> Um, there was the moment we were trying to build this Ajax application and the question was raised, "How is this going to fit into a Dreamweaver template?" Wasn't really an answer for that. So, in my panic, (Laughs) I -- I built -- I quickly built the template.

The design-emergent duality explains such behavior as factionalism, conduct that

exhibits a strong commitment to the domain, and disagreements can turn into "religious

wars" (p. 143). This community was torn apart because of their internal strife over the

definition and scope of the domain, with individuals fighting for their own special

approach. Members became overly concerned with internal distinctions and spent more

time and energy emphasizing difference with others than moving forward with practice

development.

When George sat down with the others and asked for copies of the new template

files, John refused to hand them out until he had done more work on them. This behavior

mimicked George's behavior throughout the semester in refusing to share the code he

created, and it was another example of using technology as a weapon for retaliation.

> George: Did you ever get a chance to upload all those files? 'Cause I was going to finish tweaking. What I was hoping to do is me finish taking the framework, the harness, and finish working on that, um…
>
> John: I don't have any links in here, yet.

As the night progressed, it became clear to George that John's, and not his, client project

would be the solution given to the client. Vinton later described in his final interview

further complications that occurred with sharing files during the final weeks.

> John already took the programming away from George, and John left his, um, his thumb drive at work accidentally, apparently. So there was nothing to, to give to, to George to, um, to review or to approve upon.

George stated his frustration over the lack of shared documents during his final interview.

> And I'm like, you know, "And what else am I supposed to do now?" Um, I've -- he's essentially taking everything And one of the days towards the end, I, I was just like, "John, look, you know, you have essentially overdone everything that I have done."

During the penultimate night, George attempted to negotiate his use of JavaScript to code the site, but John explained it did not make sense with the Dreamweaver template the client needed. This created an impasse between George and John, and George responded with frustration and anger. While yelling at John, George stood up and held his hands in fists. My notes recorded that I feared they would come to blows.

> George: When we first, originally started out. I thought I was going to be doing the framework, which included the, which includes the style.css. I thought that was all going to be mine, and I've already started all that. And I already had a ton of it done, but, so it's kind of like I feel like all my work has just been garbage. It has just been dumped aside because you have already done it without even consulting us.

> John: Well, we needed, we needed a template. We needed a Dream… As so I took…

> George: Well, I had done it, though.

> John: Yea.

> George: And you didn't even talk to me or anything. You know, it was just like all of a sudden, everything that I had done was just dumped because I thought you were going to be doing the content, he was going to be doing the images and everything, and I was going to be doing the framework. And so essentially, everything I that I've done has just been a waste of time. And so it's just like, just let me do my part. Let me do my portion. I need to contribute.

> John: okay [very quietly]

> George: And everything that I've done so far is…

> John: Well, I'm just saying, yea, just let me know whatever changes you've made, then we're on the same page. And then I'll get all this done and then we can go through that as well. Okay?

> George: I mean, I literally spent hours and hours and hours doing the exact

same thing, 'cause I was of the understanding that I was going to be doing the framework, you were working on content, and he was working on the PDFs and the images.

John: We also had the discussion about my concerns that they wanted a Dreamweaver template and it going to get done. That is why I did take it upon myself to do this.

George: Whatever, you should have talked to me. 'Cause I was taking the Dreamweaver template, and I…

John: Well, I did, 'cause I said I was, and anytime we were going to have this as a backup. So…[pause] Um, yea, do the debugging, uh, we need to get this under wraps. This is the crucial part of it here. This is what makes it all work. That's your expertise.

George: Okay. Alright. I'm going to take off, so….

George then left the class for the night in anger, leaving John to try and complete their website so the team could present it to the client the following week. By this time, the group had two versions of the same website built by individual members. The pride of ownership and factionalism communication behaviors exhibited by members of this group became highly damaging toward community development, and this group never came to a shared understanding or collective way of working on the client project.

According to Situated Learning theory and the design-emergent duality, members of this group failed to connect enough to develop trust. Their practice remained stagnant and separated. John felt forced to work on their group project in an individual manner, and he used technology to prevent others from impacting his own work. John built the second site as a response to his perception that the first site did not meet the client's needs. However, George saw this site as an offense and a kind of weapon wielded by John in response to the difficulty the group had experienced throughout the semester. In fact, the offense was compounded when John waited to share his code on Dropbox until the last day before it was to be presented to the client. What then proceeded was a flurry

of emails when each member added code to the pages. Because they were not communicating effectively and overwriting each other's work, the site was completely broken when group members arrived the night of the client presentation. George described the panic he felt with the site broken and John not communicating.

> And I was just like, "I know, I know exactly what happened." I was like, you know, "I'll bet you he opened the file, hung – left it open for several days on his laptop. We went in and were making changes and saving it, and then he went and finished doing his stuff and then saved it – and overrode all of our stuff." And, um, so Victor and I were in a sheer panic. Victor got up and he ran out of the room. And he was, like, calling him, and he's like, "He's not responding to my text messages. He's not answering my phone calls." And then finally, uh, Victor got a call back and he said, "Oh, yeah. I'm running 10 minutes, 15 minutes late."

This resulted in the group showing broken and gray screens to the client. They left the class that night frustrated and angry at each other. John had to work the next week to fix the code and turn it in for his group.

The members of Crimson had experienced a moment of conflict and never dealt with it. Instead, they hid behind technology and even used it as a retaliatory weapon that prevented full participation and negotiation of the client task. As learned through the central duality of participation-reification, it was important that all members fully participate in order to negotiate and work together to create a shared client project. Only in this manner of practice can groups collectively work toward creating a high quality product. However, not everyone in this study was interested in devoting the time and energy required throughout the semester for this kind of project. As a result, group Crimson's relationship did not build to a level of full participation and shared understandings. An individual group member then took it upon himself to finalize the client project because he was concerned about the class grade and how they would look to the client. What resulted were not the working products of other groups, as evidenced

by the clients commenting that this group did not collaborate because their work showed it.

Not all students and groups experienced the kind of disabling communication practices experienced by members of RAX and Crimson. Instead, technology became an enabler that helped all students participate in ways that were highly beneficial to their groups. How these students used technology to help empower reticent students, effective leadership, and collaboration despite the difficult task, are described in the following section.

Technology as Enabling

In contrast to students' use of technology as an escape or a weapon, it was also an enabler of certain students' legitimization into the group. Such a legitimization enabled full group participation that allowed for shared negotiation regarding decisions and task completion. These communication behaviors acted as catalysts that facilitated four groups' development through the design-emergent duality predicted by Situated Learning Theory. Specifically, students in groups Cyan, Chartreuse, Razzmatazz, and TGAAG leveraged technology in such a manner that it promoted them into a legitimate leadership ability to participate in designing the organization and decision making about the task.

Similarly, several students exhibited reticent behaviors either because they had less dominant personalities or did not feel comfortable coding in front of group members. By demonstrating how their technology skills could be of use to their groups, these students became legitimized enough that they could emerge as contributing to the interaction and decision-making.

Technology Enabled Leadership

Leadership is considered by Wenger et al. (2009) as an essential component in a community of practice, whether formal or informal, concentrated in one member or broadly distributed and shared. Leadership in small groups has been well studied within communication scholarship, and emergent leadership is the construction of interest here. Team leaders were not assigned, so leadership emerged through team process when other members supported and accepted the individual as a guide for their practice. Through group process, members accept as a leader those who were verbally involved, stayed informed, sought others' opinions, and initiated new ideas (Ellis & Fisher, 1994). In addition to communication behaviors, personality is an important factor in leader emergence. Those members high in intelligence, dominance, and self-efficacy have been found to be more likely to be selected as the leader of a group (Berdahl, 1996). Certain members of all groups demonstrated these characteristics and were early in seeing their group as a community of practice. However, only those who were accepted by the others became legitimate leaders as in Cyan, Chartreuse, Razzmatazz, and TGAAG.

Using the design-emergent duality, this section explores how some students were often the people who were likely to take lead in pulling their project together by leveraging technology to benefit the group. These strong personalities would often bring in predesigned solutions to the group meeting that these individuals had worked on to gain a greater understanding of the project. For instance, Ella of Cyan and Gabbi of Razzmatazz both brought to their groups shared resources that benefitted them all. Group members who act as leaders have been found to potentially act as keys to success of the community. The planning and design of tasks to assign out to group members, even the

reticent ones, was of primary importance to these groups due to the management abilities

exhibited by these strong students. Through management and legitimacy and through

contributions to their groups, students acting as leaders were a necessity to success during

each semester's early weeks, a time when some members remained reticent to

contributing to the client task. These leaders often initiated workable ideas and brought

code and knowledge that helped the group move forward in their first and second client

project components.

Although previous communication research has revealed a bias against women as

task leaders (Davies, 1994), gender did not seem to matter with these groups as

demonstrated by the leadership of Candace, Gabbi, and Ella. What did matter for group

leadership was one or more members' ability to manage the task and leverage technology

to benefit the group. These people understood how to use broader opportunities for

collective work through their leadership in using communication technologies (such as

email and texting) and shared workspaces (such as Dropbox and iCloud).

Ella, of group Cyan, appeared by the second week as a strong voice in her group.

As the group talked about the first mutual assignment, she led the charge in making sure

that all members understood the task and who should accomplish what.

> Ella: Dan started on one, on a program he has on his computer, and I gave him a couple of ideas that I had last week. But if you have ideas, too, you want to draw that up in one of these powwows we can talk about what we like about each and integrate the two.
>
> Jake: OK.
>
> Ella: Or three.
>
> Sandy: Yea.
>
> Ella: So do you want to do that too or do you want to just give your input?

Sandy: Yea. I will come up with a design.

Ella: I am OK with not doing it but I am OK with contributing ideas, so, uh, and give… So whatever design…

Jake: So what is site architecture? Do you need just a prototype?

Ella: So the site architecture is just site mapping, so specifically, and that's again something I am going to work on, um but you are welcome to help me if that's something that you want. But what I want to do is like specifically identify…

Ella had asked that Dan work on the design mockups, Sandy develop the personas, Jake write the introductory text, and she would work on a site map. Her task was quite large and required that she come to an understanding of the entire vision of the client task and how they would achieve it.

Two weeks later, the group's creative brief (the first assignment) was due and they were to present it to the client. The group had met 2 nights before to combine their work into a cooperative document. They showed up that night with a digital version submitted to the course website, and Ella brought printed copies for the client meetings. She also brought printed versions of her site map specifically for each member of her group. Ella had clicked on every link on the client's existing site and written down each topic. She then went through and organized a more sensible way of linking pages together than the seemingly random way that it appeared on the client's site. This document full of ideas and knowledge was a critical component of Ella's legitimization as the group leader. Also important was her bringing the document to her group for further review and feedback.

Ella: …I have a really big headache. So I was trying to consolidate and I was going through the website with like a comb and I probably got about, um, three-quarters of the way and I was like most of this is gonna be just…

Sandy: Repetitive?

> Ella: …categorized. Yea. So I'm hoping that the information can be there and then I don't know if we should be in both places.
>
> Sandy: Yea.

Having completed the website map meant that Ella had a greater understanding of the client task and how the web pages were meant to be built than the others. This gave her a greater ability to take charge and give her opinion about various aspects of the client task. She demonstrated this ability a few minutes into their group time by making recommendations about the design coding to Dan.

> Ella: Um, I was thinking regarding these pages here.
>
> Dan: What.
>
> Ella: Get to them easy. I was thinking that, um, that she was talking left to right that I think that the people that are going to be in the biggest hurry are gonna be the professionals.
>
> Dan: Yea.
>
> Ella: Um, so I was thinking that we could move "Educate" to the first spot and the second being "People with" and then the third being the "Supporters." And then what I'd like to do is bring back, and I didn't have the ability to make this on the graph thing that I was trying to do. But also link them back to like the community and the page of resources as well, Um, for the providers.
>
> Dan: Um hmmm

Dan took this knowledgeable feedback and integrated it into the evolving look of the client's home page. Ella continued throughout the rest of the semester acting as a project manager and making sure that specific tasks were accomplished on the client website. She also was the major contributor to the rebuild of many of the new HTML pages that Dan would later use to create the entire website. Her management of the client project had become legitimized through her major contribution to the website coding and sharing of deep knowledge of the existing client website. Dan later told me in his final interview how important Ella's organizational skills and understanding of the client

project helped him successfully work with the group. Because she had prepared so many of the HTML files and shared with the group, Dan better understood his own responsibility on the client task.

> I think like Ella's a good example, she, I mean, she was really just organizing kind of the way that that paper was going to be going and stuff like that, kind of that, um, because I didn't even realize that we had like a document on the line that we could go and check out so I was like oh wow, she's really good at this.

> But Ella's been like really kind of the manager, like dictating what's going on, right, so she was really good at telling me what needed to be done, but at the time, like, it was just, uh, a lot more than what I was, thought was gonna happen within the group setting.

In a like manner, Gabbi of group Razzmatazz became a project manager through her leadership in staying available as a resource over multiple forms of technology communication, facilitating the shared cloud space, and beginning each group assignment. Her predesigned plans for the group to successfully accomplish their client project were critical to both their relationship building and task completion.

For example, during the night of the 2nd week the members of this group split up responsibilities for the first group assignment. Gabbi then set up a shared space on her Dropbox account and created the folders and initial files required for the deliverable. This meant that she led in the creation of their assignment by enabling a shared cloud folder in which she placed initial document files for Lisa and Derrick to complete. Once those files were updated on Dropbox, Gabbi emailed her group to let them know and suggested they update according to their assigned roles. She also suggested that they were free to contact her through multiple communication channels.

> I uploaded my files for our project to Dropbox. They are called Page1, Page2, Page3… I will be checking my email throughout the weekend. Feel free to call, text, or email me if you run into anything or have any questions.

The other two group members responded with emails and texts thanking her and giving

some feedback.

> I love it - great job! I think the button would be a nice touch, it would help the user remember where they are in the navigation. I like what you did with the header - the info I wasn't sure what to do with in HTML! Nice work guys. – Lisa

Because Gabbi was willing to communicate with group members using different

technologies, she was better able to fulfill her leadership role and facilitate group tasks.

Similarly, Gabbi facilitated each of their client tasks by creating all the web pages

and ensuring their quality, according to class standards, by voicing her desire to work on

the mobile version. As such, Gabbi stated that she was able to always go first in working

on the client task, and this made the other students' work easier because the files needed

updating rather than creation.

> Because their schedules are so crazy or they chose not to enter a project as soon as I would like to do it, I started as much of it as I could, and then just let them take it from there, to finish their parts. I was, kind of, on top of it, in case they didn't, so that their assignment, at least, could get done. But they always came through in the end. After the first assignment, I realized, I just had to be patient and wait. Even though I don't like to be last minute doing assignments, as they did. I just kind of let them do that.

This dominant behavior and Gabbi's ability to leverage the technology to benefit

the group meant that she acted as a project manager and primary coder and her group

appreciated that behavior. Lisa reported an appreciation for Gabbi's leadership in

preparing their resources and coding beginning HTML and CSS files.

> We kind of just fell into our own roles and Gabbi really good at, uh, organizing and planning. So she's always been the one to like -- I mean I would've done it, but she is like super quick and just does it. She'll go onto Dropbox and create all of our folders for us and all the files and just get it all started and ready and set up.

Technology Enabled Quiet Members

Where technology enabled certain group members to a position of leadership, it also helped several reticent students to become legitimized to the point that they were given more opportunities to participate, even when a dominant leader was in the group, such as when Derrick stepped up to help when Gabbi had already emerged as a project manager. The design-emergent duality argues that over time, members of groups practice mutual engagement that helps them make sense of the project and each other to the point of full participation. All students studied for this dissertation started the semester with their own theories and ways of getting things accomplished, as demonstrated by the different expectations exhibited by members of group Chartreuse. When groups learned to develop effective engagement practices, they mutually shared and developed new understandings of one another's abilities and how each could contribute.

However, such full participation did not come easily because several students exhibited reticent behavior by contributing less and seeking less information during the early weeks of the semester. All groups had reticent members, including Vinton, Sandy, Xandra, Evan, Derrick, and Parry. Reticence is the idea that a person is unwilling or unable to communicate due to abnormal level of fears or anxiety associated with another person or persons. According to previous research, these individuals may have found supplying information threatening because it involves group interaction, and may have felt fear because they would have had to respond to inquiries about their input (Burgoon & Hale, 1983; Rosenfeld et al., 1995).

Simply putting them in a group did not guarantee that they were willing or able to engage with the others at an effective level. Indeed, it took time for several of these

students to start interacting with the others in their groups; these reticent students often did not begin fully participating until their community of practice had developed into full participation. My notes in the later weeks of the semester are scattered with various reflections that these students had begun to participate more because their group relationship had developed and these individuals felt valued. These observations were confirmed by interviews with several of students. They stated that what took time was that they needed to feel more comfortable with fellow members through developing a relationship and showing through their work on the project how they could effectively contribute. For example, Sandy, a quiet member of Cyan, began to participate once she understood her role in the task and began to have successes in contributing her code to the group website. These feelings were communicated to me in her final interview when she stated that by the end of the semester they were working equally on the client project.

> I'm really glad that I had Ella and Danny on my team. *(Laughs)* For the rest of the project, like that they stuck with it and because both of them are really hard workers and I don't feel like... one of us really got bombarded with a lot of work with, which normally happens when working in a team in this school setting. It was pretty well evenly distributed.

How she began to contribute was much more than her voice contributing to the emails but also her ability to participate effectively with her own work on the client website. This emergent behavior appeared late in the semester, but it resulted in taking some of the project management and task design responsibilities from Ella, leaving her to spend more time on the client task.

Sandy was initially a reticent member who spent most of her time during the 1st 5 weeks sitting with her group and watching as Ella and Dan did most of the talking. Sandy's only communicative participation was to say "Yea" and "Uh-huh."

> Ella: Um, so as far as the index, like they went to do it three times like I said,

and this is what their content is originally. Just in menu, alone, and in every one of these is like 100 feet long.

Sandy: Oh

Ella: Yea and so I think that we can break it down, um, like this, like after you get into those three categories again but like they have here and maybe that one of the best formats like what we learned today is those drop down menus. Maybe that's going to be an easier way to simplify the information within the content itself.

Sandy: Um hmmm

Ella: And so, um, I think we can pretty much break it down to...

Dan: Which one is it?

Ella: Oh yea. See you have that stacked instead?

Dan: Well...

Ella: I was...it might be too heavy.

Sandy: Yea

It was not until Sandy had provided her personas for the first mutual assignment and her work to scrub several dozen HTML pages for the next deliverable, that she became legitimized into the group. Sandy's legitimization is an example of a reified "object" created through her participation and emergent ideas and help with her group. Knowledge generation and decision making was not static and initially came from strong personalities within the groups. However, this changed over the semester when reticent students such as Sandy began contributing by the third assignment and helping their groups invent processes, interpret situations, produce artifacts, and resolve conflicts by leveraging technology. Through this kind of full participation, Sandy's group Cyan further developed into a community of practice. Such a collective practice became further evident when the others valued Sandy's contributions to her group's discussions. As revealed in the following transcript, both Dan and Ella started listening to and soliciting

comments from Sandy by week 7.

> Ella: So, um, your thoughts about the feedback we got and changes we might make?
>
> Sandy: Um, it's kind of hard because do we just go with what Vivien said? Do we trying sending it to Jennifer and wait for..
>
> Ella: Wait for some more feedback?
>
> Sandy: Yea
>
> Ella: It sounds like she is pretty incredibly busy because we haven't had a lot of feedback from that first visit.
>
> Sandy: Yea.
>
> Ella: And so I worry if we wait to move forward, too, that we might not...
>
> Sandy: Yea.
>
> Ella: ...get the feedback that we want in the time that we want.
>
> Sandy: We should just go with what, um, Vivien said.

In a similar manner, Derrick, of group Razzmatazz, was a strong coder but reticent to participate in class with the group. Derrick was a computer science major and highly proficient with coding Java, common to software engineers, but felt uncomfortable working on technology in a collective way. During his final interview, Derrick told me that this interactive method of learning how to use the skills taught in class was uncomfortable to him, so he told his group that he preferred to work and research code while alone at work. He used his free time at his employment to do research and practice the code, at his own pace in his own way.

> The rest of the group, uh, learned it at their own pace because I have a larger background in, uh, in programming.
>
> So that way it gave everyone time to, to learn at their own pace, to figure it out, to see through example and at the same time, not be rushed to, to figure something out.

His absence extended beyond learning and group time in class. Derrick explained that he needed much more time than was afforded him in class to study and learn how to do the more advanced coding later in the semester.

> Um, as it became more, uh, difficult, more advanced, the, the things we were learning, uh, I had to study in my room, um, and that was usually the day after class I found that was the best time to study because everything was still fresh in my mind.

As Derrick spent his task work time alone and away from the classroom, he missed out on help and collaboration with Gabbi and Lisa. This behavior meant that his group was delayed in engaging in full participation and emerging into a community of practice. As illustrated earlier, Gabbi described in her interview that she was forced to continue as leader of their group and manage the project through bringing ideas and making most of the decisions, but in the end all members followed her lead and took care of their responsibilities.

It was not until Derrick decided to participate in their email and in-class conversations that the group began to act as a community wherein they exhibited full participation to the point of emergent negotiative practices. By week 7, he told me that he was beginning to see the value in working with the others. He had not already become accustomed to in-class interaction, so his initial entry into their collaborative space began with an email in which he let them know how he contributed to the client website and what still needed doing.

> I've done most of the php and JavaScript. However the php only works on [the course] server but the JavaScript should work anywhere. Now it just needs the CSS and we should be good.
>
> http://students.comm5500.org/razzmatazz/dzxxx/BuckyBurgers/
>
> Is the site to see the php of when you hit submit. And the JavaScript works on there too, BUT the CSS still need to be done. I put it on Dropbox

His group members responded with feedback on the pages he had created, with

suggestions on how he could improve them.

> Derrick:
>
> Looks like we are missing the choices for cheese and onions. I had those in the html.
>
> those require php also, because if they select cheese then they have to select a type, if cheese is not selected then no type is selected. Same with onions.
>
> Let me know if you'd like me to do that.
>
> Thanks,
>
> Gabbi

He replied to their emails with information about when he would update pages based on

their suggestions. The other two then sent several more emails with information about

their own updates to the files.

> Hey team -
>
> Just wanted to give you an update. I am still working on the CSS. I've uploaded an updated stylesheet to Dropbox so you can see what I'm doing, but it's not finished yet. I will have it done this evening.
>
> Did you figure out what needs to be done with the cheese and onions (mentioned below)? I noticed in the CSS that Daniel updated before I started on it that there is a "display: none;" for cheese and onion toggles. I didn't want to change that without touching base. Is that what is causing the problem or is it something else in html or php?
>
> Let me know if you update your files so I can update on my end.
>
> Thanks, Lisa

The change in their email interaction to a more collective practice was the beginning of

Derrick's full participation in the group. His in-class participation came a couple of

weeks later.

A change in his face-to-face behaviors occurred in class week 10. Derrick chose

to stay almost an hour in class to work with his teammates. This change meant that the group was finally experiencing full participation and Derrick emerged as a knowledge creator and idea generator. Through the lenses of participation-reification and design-emergent, this behavioral change meant that group Razzmatazz began to develop into a community of practice and Derrick was beginning to see value in such collective engagement. By this time, Derrick had realized the task was too large to work on alone and wanted to participate with his team members.

> Uh, in this group, um, I think it, it helped out a lot, because some of the assignments were really really large and so for me to have done it on my own, I wouldn't have time... and so you didn't have to, uh, be too concerned about putting more time into this class, or just figuring out what was supposed to be happening. So that really made it easier.

Because he took the opportunity to stay in class during this group work time, he also had the chance to interact with and benefit from collaborative work with his fellow team members. However, his sudden entry back into face-to-face interactions did not go unnoticed. Gabbi and Lisa commented on this, once it became apparent that Derrick was staying the night.

> Gabbi: I'm so glad he didn't,… we all came today.

> Lisa: Yea. Me too.

Both women quickly got over that Derrick was finally staying to work with them in class, and all three members of the team continued to work together to get the CSS working with the PHP that Derrick had provided over email. This emergent behavior of staying in class during the last weeks of the semester to collaborate and contribute ideas and help for the task meant that Gabbi no longer had to spend time designing task lists and emails to send to Derrick. He was readily available in class to discuss the task and responsibilities. Gabbi told me in her final interview that Derrick ended the semester a

valuable member of their group.

> He did follow through and followed through well… It is better in groups, to rely on each other's strength. It makes a better product of it.

Derrick's participation with the others in class also meant that he was readily available to emerge as a knowledgeable member who could help with problems that arose. For example, the team experienced some issues combining code as they collaborated to change the HTML and upload to the server to when checking their updates. As they experienced problems with positioning of elements on the page with an HTML form that was processed through PHP code, Derrick showed the others how to use browser tools to troubleshoot problems.

> Derrick: Let's worry about the height first and then bring the height down to the shadows…. This is how I...
>
> Gabbi: I never knew that...
>
> Lisa: No I...
>
> Gabbi: ...we love you forever!
>
> Derrick: See I found all the ways to cheat. Just wait until it gets to the right size and then copy those things over.
>
> Lisa: Oh that's awesome.
>
> Gabbi: Oh man!
>
> Lisa: Yay!

Derrick had demonstrated a developer tool accessed through the Web browser's "Inspect Element" when right clicking on an area of the students' Web page. For an example of what Derrick demonstrated to Gabbi and Lisa, please see Figure 4.

By showing his group how to use several browser-based tools for speeding their coding and troubleshooting, Derrick's group's opinion of him went from "he was the guy who always ducked out of class before work time" to one who was almost a "superhero."
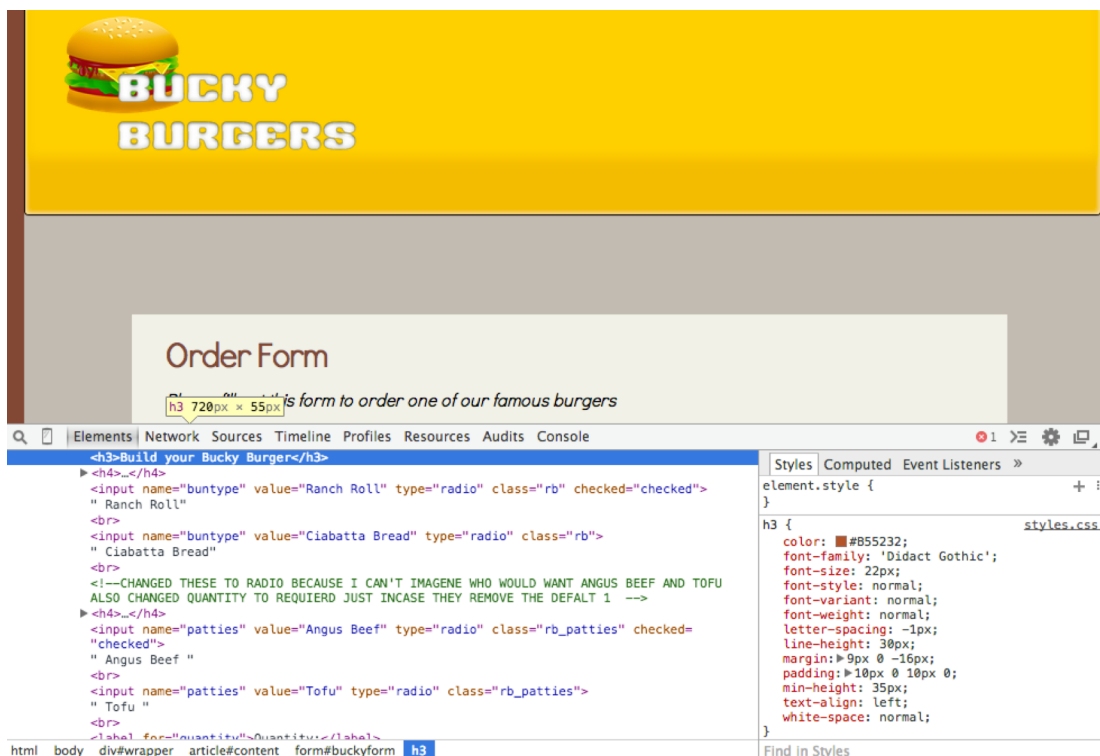
Figure 4: Temporary Web browser code edit window demonstrated by Derrick

This late, emergent ability to help the group greatly benefitted them at a critical time and helped their subsequent development quickly into a community of practice because of all the time and experience they had already gone through. Such a collective sentiment was exhibited in their communication following an episode where Derrick showed a common "trick" that he uses when coding their project.

> Gabbi: Because you just saved our whole lives...
>
> Lisa: Yes.
>
> Gabbi: ...with that inspect elements.
>
> Lisa: inspect elements (simultaneous)
>
> Gabbi: Oh my gosh!

Because of this strong positive reaction, Derrick felt more comfortable participating in their in-class group work because the other group members had accepted

his level of help with the complex technology and implementation on the client project. Throughout the remaining 3 weeks of their group time, Derrick stayed to collaborate with the others. Their group had truly become a team that through their engagement practices they mutually worked out what had to be done, how their relationships impacted the project, situations interpreted, artifacts produced, and conflicts resolved. Their work demonstrated embodied, delicate, active, social, and negotiated aspects of a practicing community. Through such a collective practice, team Razzmatazz was able to collaboratively work together and come out highly successful on their final project.

As an analytical lens, the design-emergent duality reveals how these students managed or negotiated knowledge and ideas meant to facilitate the development of shared understandings for the client project. Technology was a tool used by group members to either promote or disable each group's collective practice. For example, members of two groups were dissatisfied with their collective engagement and stagnant work behaviors, because certain members chose to engage less with each other and the task. These students chose to work individually on the client task and use technology to ensure it. Strong personalities in groups RAX and Crimson took primary responsibility for designing the ideas and knowledge that would go into their client projects. They used technology to prevent mutual communication and hide their work from the others. Emails were ignored or claimed to have not been received. Files loaded on cloud-based servers were not shared with fellow group members, although claimed to be. What resulted was technology used to hide and ensure individual work was viewed as a type of retaliatory weapon further damaging their community of practice. These groups ended the semester with singular individuals finalizing the project with no collective input.

In contrast, members of the other four groups used technology to help facilitate their mutual engagement. Several members took an early lead in organizing their collective project during a time before their groups had become a fully functioning community of practice. These students would become either highly familiar with the client website or would take responsibility to learn difficult and pivotal skills needed to make the first two assignments come together effectively for the group. They brought to their groups the ideas and knowledge that were predesigned and unilaterally used in decision making. They used technology to both stay in communication and share artifacts with the others in their group. Through these actions those members with a strong personality and an early vision of their groupness, were then able to manage the first two assignments and ensure their collective completion.

Over time, other students who had previously exhibited reticent behaviors began to participate with the group in their mutual task. Early in the semester, these students were quiet and did not participate much within group discussions, so they were often not consulted for decisions or given large responsibilities. However, through the ability of reticent students in Cyan, Razzmatazz, Chartreuse, and TGAAG to effectively participate in the first two group assignments, the other members began to see their value in their collective effort and their full participation became legitimized into their practice. Once these students were given a voice, they were able to help create a socially enacted engagement in which all members helped to interpret situations, provide ideas and answers, help in producing artifacts, and resolving conflicts. Through their effective use of technology to benefit their groups and others resulting acceptance into their practice, these reticent members were able to fully participate in collaborative work.

Conclusion

Although the vast amount of team-based learning and communication research can partially explain what occurred among members of the six groups studied for this dissertation, the student behaviors and talk revealed throughout this chapter reveal further information. Technology innovation and development has changed possibilities and development for communities of practice. The communities studied herein were highly influenced by these technologies, what they looked like, and how they functioned. The social and entertaining aspects of "Always ON" technology most certainly delayed full group participation, yet these behaviors did not stay permanent once students became more interested in their group interaction. For the students enabled by the trends that have arisen out of technology innovations, they were able to develop full participation that allowed for negotiated practices and collaboration on the client project.

Yet, what I found is that student groups' effective communication depended upon how they used technology. The community of practice outcomes occurred when using these innovative resources because those students intentionally used communication behavior to work collectively. For those two groups that could not achieve such an end, they exhibited communication behaviors that rendered collaboration almost impossible and the technology became a tool of those individualistic behaviors. When students in these groups experienced conflict and never dealt with it, individuals took it upon themselves to complete the group's project alone. They used technology to in essence hide from the others by not sharing resources and answering emails. The others in their groups saw this behavior as a kind of retaliatory weapon wielded in response to the difficulty they had experienced over the semester. The resulting dysfunction left the

group with poor quality client projects and bitter feelings, as told in their interviews.

Clearly, the use of technology in communities is much more complex than as a vehicle for growing communities of practice. Their relationship and shared understanding of the task are important developmental milestones that seem to influence whether technology was useful for these groups. How these groups developed into a community of practice (or not) is the subject of the next chapter.

CHAPTER 6

TECHNOLOGY AND TIME: COMMUNICATION AND

GROUP IDENTITY DEVELOPMENT

As reported in the previous chapter, although theorists often believe that

technology acts as a catalyst for a community's effective practice this study found that

student group members were autonomous individuals who chose to use it in their own

ways. The quality of relationship and participation levels of all members facilitated many

technology-use choices of individuals and their groups. When students were unable to get

past their individualistic behaviors and deal with difficult communication behaviors, they

used technology as a kind of retaliatory weapon to hide and maintain ownership of the

client project. However, when student group members were able to develop a quality

relationship and get past difficult communication behaviors, technology became an

enabler for both project leaders and reticent members such that they were able to

collaborate effectively on the task. Computerized technology use is, therefore, more

complex than a catalyst for group development and practice.

In this chapter, I describe in detail how groups changed over the semester,

resulting in engagement that facilitated either enabling or disabling of their community of

practice. As described earlier, two groups did not develop into a mature community of

practice, due to experiencing conflict and never dealing with it. The resulting

individualism took them to the point of never coming to a shared understanding of the task and how to work on it together. Those four groups who did achieve a mature community continued to grow as they practiced mutual engagement in a joint enterprise, while creating a shared repertoire. Several of these groups made the client project their own collective practice by using a highly collaborative method that achieved highly quality work in a short period of time.

Communication scholars have long studied the characteristics involved with successful group work. These researchers found that learner-centered training and collaboration does not come easy; instead, it requires time and development of several communication behaviors, including helping, negotiating, identity formation, and group process. Group process is the term used to describe the increasingly complex stages that groups go through before attaining high-quality decisions and outcomes. A group's development undergoes changes through time within its internal structures, process, and culture (Sarri & Galinsky, 1974). According to these scholars, groups develop and change along three different dimensions including social, activities, and communication processes.

Generally, groups are thought to develop along progressive stages (Mennecke et al., 1992; G. Smith, 2001). These stages are commonly known as "forming, storming, norming, and performing," yet how they develop is still under debate. The scholarly argument lies in the fact that some groups appear to sequence through these stages in a linear fashion while others cycle through or experience them in a nonsequential manner. This bevy of group process theories do make clear that groups do not start out as high performing and they experience different stages of maturity, and this was true for the

groups studied for this dissertation. Changes must occur such that members develop

structure and relationships so they can work together on a shared task. It is critical that

developing groups be given time and opportunities to learn how to work together well.

As members work collectively to learn how to work together, the goal of group

development is that members form an identification with one another (Lave & Wenger,

1990; Wenger, 1998). Identity is important because the group becomes a "lived

experience" with each other as developed by its communicative character, and it consists

of negotiating the meanings of their experience of membership in a community.

According to this viewpoint, identity and practice are profoundly connected. Developing

a group practice requires the formation of a community whose members fully engage

with one another on some task. Identity then becomes a layering of events of

participation and reification by which members' experience and social interpretation

inform their value.

Once group members have formed into the community of practice, they know

how to fully participate and act with competence (Wenger et al., 2002). They experience

competence and are recognized as such. Members have learned how to engage with

others, and understand why they do because they comprehend the enterprise to which

they are accountable. At this point, they also share resources, such as technology, used to

communicate and carry out their activities. Within this identity, their group development

grows through three dimensions, including mutuality of engagement, accountability to an

enterprise, and negotiability of a shared repertoire.

Group identity is also necessary such that groups are capable of making collective

decisions and acting on them. Negotiation and consensus is made most possible when the

group has four critical characteristics: (1) members share objectives, (2) members are status equals, (3) participation is full and balanced, and (4) opinions are negotiable (Ellis & Fisher, 1994). Such an outcome usually only occurs only after a group has formed an identity and developed to the point that they learn to communicate to the point of helping and supporting one another through effective negotiation. As such, they must have matured to the point of favoring their local group identity and capable of discussing tasks and decisions in a negotiative manner where all members engage.

<u>Analytical Focus</u>

The theoretical basis for the research described in this chapter is the four dualities of participation-reification, local-global, design-emergent, and identification-negotiability. As the students experienced the communicative tensions involved with these dualities, they all at least began to develop a community of practice. As reported in the previous chapter, how students worked through the tensions and chose to use technology to communicate and benefit the others helped influence their growth into or regression from a community. When students chose to hide within technology and/or wield it as a kind of retaliatory weapon, their collective action stagnated and developed into individualized work. In contrast, when students worked through any difficulties with the code and/or with one another, they often used technology to stay in contact and benefit their collaborative work.

How the students studied in this dissertation developed into a community (or not) will be detailed throughout this chapter using the stages of group development and the four dualities of Situated Learning theory. The dualities of participation-reification, local-global, and design-emergent were detailed in the previous chapter and will be used to

analyze communication and behaviors in this chapter. In addition, the constructs of group/community developmental stages and identification-negotiability duality will also be used in the analytical process of this chapter. A description of these constructs is given in the following text.

Identification-Negotiability

The fourth duality from Situated Learning theory used for this study is that of identification-negotiability. The core challenge of this duality is each student's ability to belong, claim a membership, and be able to fully interact with the group. As such, this duality can potentially affect how much individual participates and how much he/she has the ability to influence their negotiation of meaning. In order to have an effect on participation and negotiation, a community must be developed to the point that it has the ability for individuals to mutually define, adapt, or create meanings and artifacts. Wenger described an outcome of this duality as a "stake in the ground, something on which to take a stand (1998, p. 235). He also portrayed this as a focus for collective identification (or not) and for a bid of ownership of meanings and artifacts.

Within this duality, identification is that which provides experiences through which students can build their identities through relationships that allow them to assess the extent to which they can associate with the mutual enterprise, culture, and history of the group. The extent to which members choose to identify with a community determines the nature of their participation and reification of the client project. How a member assesses the extent to which she can relate to and value one another's abilities and purposes determined how each person chose to participate on the client project. It is through this dynamic and generative process that the students of this study used their

agency to dictate whether they collectively identified with their project and with each other (Wenger, 1998).

Negotiability refers to the degree that students had control over the meanings created in their collaboration. This includes how an individual perceived her ability and legitimacy to contribute to and take responsibility for the direction of the community. Opportunities for members to negotiate determine the extent to which they mutually develop ownership over the community's practice. Within such a space, students assume different levels of participation across the semester. Some take on an early role in leading the negotiation process, thereby taking the initial lead in directing the group's actions through extensive individual decision making. It is this act of decision-making, without negotiation and much input from other group members, makes up the identification portion of this duality.

In contrast, when a group of students has become a community with full participation, the members spend a great deal of time mutually negotiating about decisions and working together. When students behaved as full members of their group, they handled themselves competently. They experienced competence and were recognized as competent. All members had learned how to engage with others in a comfortable manner, and they understood why and what they did because they made sense of their shared enterprise to which participants are accountable. They often share resources and ways to communicate so they can collectively go about their activities. These dimensions of competence become characteristics of identity.

How these groups went about changing from an individualized practice to that of full participation and collaboration can be analyzed through this duality of identification-

negotiation. When a group can be seen to perform mutuality of engagement, accountability to a joint enterprise, and negotiability of a shared repertoire, they can be viewed as a fully collaborative community of practice. Such behavior has the opportunity to transform their practice into something more that a bunch of individuals working on the project; they may find their own ways of working on the task in a collective and innovative manner.

Group Stages

The groups in this study developed in a kind of linear fashion similar to the stages of forming, conflict and unrest, group identity and norm formation, and production. According to Situated Learning theory, these stages correspond with the developmental stages of a community of practice. Specifically, the theory argues that communities go through the phases of potential, coalescing, maturing, and transformation. How these theoretical stages match up to group communication's linear sequences is explained in the following text.

Forming (Potential)

The first stage is that in which group members come together to become acquainted with one another and orient themselves to the task. The common key issue at the beginning of a community is to find enough common ground among group members for them to start feeling connected and finding value of sharing insights, stories, and techniques. What energizes the members at this early stage is the discovery that the others face similar problems, a shared need to achieve something well (such as grades and learning), and have data, tools, and skills they can contribute. The key domain issue

during their formation was defining the scope of the domain in a way that evoked a true interest of members. The key community issue involved finding people who already knew something about the topic. Their key practice issue was to identify knowledge needs for their client project.

Through discussions attempting to address these key issues, they eventually find that some members have valuable insights and knowledge that can be learned. However, passion about others' potential to collaborate on the task is not enough to make a community. The overall goals in this stage are to promote community development around the three key issues (domain, community, and practice) by defining their focus, building relationships between members, and identifying topics and projects that are useful for members. Clarifying the primary intent of the community can make its development easier for members. Then as the group matures, it can expand its focus to include other areas.

Conflict and Unrest (Coalescing)

As members clarify their purpose and begin to coalesce around it, they soon realize that the problem becomes real. As a result, their community begins to evolve by changing the scope of their domain, either by changing boundaries or redefining them. Their first objective in this stage was to define the domain in a way that engaged the members. Thereafter, the key community issue was to develop relationships and sufficient trust to discuss difficult practice problems. The key practice issue was to discover specific knowledge that should be shared and how.

At the heart of this incubation stage is the development of deep insight into each other's individual practice, each other's reactions and ways of thinking, and a collective

understanding of the practice. Such understanding is nurtured through shared meetings and reified objects. A community is driven by the value that members get from it, so during these meetings they each needed to understand how their energy could translate into something useful, and within this complex environment such an understanding took significant time. Four groups found such an understanding by week 10.

Group Identity and Norm Formation (Maturing)

For those groups that were able to get through the coalescing and conflict stage, communication and Situated Learning theory scholars argue that community members begin to display cohesion and group identity. Groups begin to solidify group work patterns, relationships, and the structural arrangements allowing for completion of the client project. Their key community issue is to manage their boundaries, ensuring that they are not distracted from their core purpose. Each group's key practice issue shifts from simply sharing ideas and insights to organizing the community's knowledge and taking their enterprise seriously. As each community develops a stronger identity, members frequently see gaps in knowledge and feel a need to be more systematic in its core practice.

Maturing communities often develop a sense of professional intimacy in which they get to know each other's style and approach to technical problems. Because they have previously interacted and worked on joint projects, they discover their strengths and weaknesses and come to appreciate others' contributions, energy, and individual styles. They learn who in the community says little but has great insight as well as whose ideas must be checked and verified. They know whom in the group to contact for what kind of help. Important to this stage is developing a habit of consulting each other for help. As

they do this, they develop deeper relationships, while discovering collective ways of

thinking, approaching a problem, and developing a solution.

A community resolves it tension between design and emergent during this period

of growth when it learns how to preserve relationships, excitement, and trust. They also

learn how to maintain helping interactions while systematizing their practices. Resolving

this tension typically drives the group to a deeper sense of identity and greater confidence

in what it does. It is in this space that a community changes from defining to developing

the domain. A maturing community becomes more intentional about involving everyone

with an appropriate relationship to the domain – for instance, by assigning certain

individuals to certain parts of the task. This kind of growth often requires some

restructuring. The task itself, rather than individual needs, becomes the primary driver of

activities and their group identity.

Production (Transformation)

The final stage is a time of intense productivity and transformative effectiveness.

Group members have resolved many of the issues of the previous stages, so they can

focus most of their energy on goal achievement and task completion. Their

interdependency is based on the differentiated roles of each member in accomplishing

each component of the task or goal. Once group cohesion has been established and rules

have been further clarified and defined, members begin to actively produce or perform

their assigned tasks.

The main issue for a mature community is how to sustain its energy through the

natural shifts in practice, technology, and relationship to the instructor and client project.

The key domain issue is maintaining relevance of the domain and individuals finding

voice in the community. The key community issue is keeping the tone and intellectual focus of the community engaging and interesting. Their key practice issue is to keep the community on the cutting edge by developing new ways of accomplishing tasks together. Such communicative behaviors have the potential to transform their community practice into something much more than what people acting as individuals can achieve.

Summary of Findings

Although the literature partially explains what occurred with the groups for this study, it does not fully explain how these groups either developed or not when using and creating technology. Over the semester, each group was required to work on four assignments that were milestones in completing the client project. These project milestones acted as punctuated moments that facilitated growth or debilitating paralysis in their collective work. All groups began with the potential to form a working community, yet their start was not easy and delayed by technology distraction and inexperience with the complex client task. For example, all students remained individualized in their words and deeds, until they turned in and received feedback on their first or second group assignments.

As described in Chapter 5, early in the semester they had not yet developed a mutual connection or value in sharing insights, stories, and techniques. They were not yet used to working collectively so they often exhibited technology distracting and escaping behaviors, often preferring to talk with outside friends and family members through their computers and mobile devices. The students also often exhibited individualistic communication behaviors by using singular personal pronouns in their speech. During the early weeks, students often also sat in seats away from fellow group members due to a

need to continue working on a computer holding their files. Only when cued by the instructor did group members move their seats to a place where they could more easily talk.

Their primary discussion points during these early weeks were primarily to learn about one another and how they might contribute to the client project. These efforts to find common ground were not easy because they had not yet achieved cohesive discussion. For example, they often resorted to voting and competition when making decisions. Such concern for personal needs meant that individualism existed among group members during the early weeks of the semester. Although the members of each group took on certain task responsibilities for the first assignment, they never discussed how they would work together to accomplish those tasks. What resulted was feedback from the instructor and client that indicated it was evident they had all worked individually and had not worked to synthesize the assignment so it looked cohesive.

Despite these seemingly problematic communication behaviors, once the groups received feedback on their first assignment they began to talk more about their mutual accountability on the task. This behavior resulted in finding enough value in participating collectively on the next assignment. This understanding came at different times for the groups, either while working on the second or third assignment, and this knowledge helped them move into the coalescing and conflict stage of group development. Many groups reflected on their feedback and began to reassess individual's roles on the next assignment. As students worked on the project website, they began to talk about their collective roles in completing the task.

As students talked more about how they would work together on the assignment

and reviewed each other's work when trying to synthesize it, they often noticed others' mistakes in the task and misunderstandings regarding their interaction. Students from two groups (RAX and Crimson) did not deal with the conflicts that came out of their mistakes and misunderstandings and gradually devolved to behaviors similar to the first stage of individualized work. Students in the other four groups worked through the difficulties that arose from such conflict and used it as a catalyst for maturing their practice into the next stage, and each group developed at different times while collectively worked on an assignment.

Sometime during their work on either the second or third assignment, each of the four maturing groups was able to achieve a shared understanding of the task and how to collectively work on it.[11] Such an understanding was critical to these groups' ability to negotiate and work on the joint enterprise of a highly complex third assignment. The third deliverable was an order form that combined elements of HTML, CSS, JavaScript, PHP, and MySQL. This complexity done well required that all members cooperate in a joint venture that was ultimately effective through some mitigation of fellow group members teaching and helping behaviors meant to alleviate past mistakes and misunderstandings. Through groups' collective engagement on the joint enterprise, their community coherence increased as they also built up a shared repertoire of website files. Once all successful group members had achieved dimensions of competence, their groups matured into the final production stage.

_____

[11] The four groups that were able to get past conflict and mistakes were Razzmatazz, Chartreuse, Cyan, and TGAAG.

For several of the mature groups, their collaborative work transformed as they worked on the fourth assignment, a culmination of all their work throughout the semester in a complete website. They began thinking and speaking as if they had developed a group identity due to their use of plural pronouns, such as "us" and "we." Furthermore, three of the groups began practicing a coding method known as peer programming. They worked out a collaborative technique where one student, the driver, wrote code, while the other two acted as navigators who reviewed each line of code as it was type in. Peer programming increased their work quality without impacting time.

In sum, all six groups developed somewhat through the early stages of group progress. Due to feedback on their group behavior on the first or second assignment, all the groups found a collective understanding that they were mutually accountable to the task. Such a behavior moved them all into the coalescing and conflict stage. Because the knowledge domain and client project was highly complex and difficult, the groups started noticing mistakes and misunderstandings about the client website.

How members of the groups responded to the conflict that arose due to mistakes and misunderstandings determined whether they progressed or regressed in their development. Students in groups RAX and Crimson did not deal with the conflict and their talk about the collective task stagnated. This prevented the groups from coming to a collective understanding of how to work together, so individuals took steps to ensure the project got completed. Those group members who did take time to deal with the conflict through cohesive talk or forgiveness, were able to ultimately achieve a shared understanding of the task and how to collectively work on it. This talk helped the members of groups Cyan, Chartreuse, TGAAG, and Razzmatazz to mature into

communities of practice that transformed their collaborative manners to create high quality client projects. How the six groups of this dissertation study went about these behaviors in developing (or not) their group identity and level of productivity is more specifically explained in the following text.

<center>Early Stages of Development</center>

The goal for the instructor was to have each student work in a group so they could learn the skills of team communication while also learning how to develop a complex client project together. Situated learning theory argues there is a profound connection between identity and practice. Developing a practice requires the formation of a community whose members can engage with one another and thus acknowledge each other as participants. As a consequence, practice entails the negotiation of ways of being a person in that context. This negotiation may be silent; participants may not necessarily talk directly about that issue. But whether or not they address the question directly, they deal with it through the way they engaged in actions with one another and related to one another. Inevitably, their practices dealt with the profound issue of how to be a human being within a mutual engagement. In this sense, the formation of a community of practice is also the negotiation of identities.

Identity in practice is defined socially not merely because it is reified in a social discourse of the self and of social categories, but also because it is produced as a lived experience of participation in specific communities. What narratives, categories, roles, and positions come to mean as an experience of participation is something that must be worked out in practice. Developing such a social experience did not come easy or quickly. Group members first had to get to know fellow group members and develop

trust, while working through technology distractions and individualized work. Once they started talking, they spent almost all their time trying to find common ground and build their relationships.

All the groups worked on the first assignment in an individualized, collective manner, Yet, like all the project assignments, the first deliverable often acted as a developmental milestone that helped group members move to the next stage as they discussed their mutual accountability. At this point, students began to see others' mistakes and misunderstandings because they were working more closely on the assignment together. These discussions often became conflictual, and how the groups dealt with difficult behaviors determined each group's ability to develop past these early group stages.

<div align="center">Stage One: Potential</div>

At some point, the idea of forming a community of practice is introduced to a group of people, and this prospect leads them to form a loose network that tends to draw their attention. They begin to see their own issues and interests as communal and their relationships in light of a potential community, because they have a common goal or object to work on collectively. However, forming a community is not as easy as it was 50 years ago. Many have had little to no first-hand experience of what it is like to live in a traditional community (Wenger et al., 2009). As the population has become more mobile, it has moved from neighborhoods to "neighborhoodless" suburbs. The public places that once anchored local communities are largely absent in the suburbs. Yet, it is ironic that as people move away from the traditional neighborhood experience in their personal lives, communities of practice are becoming more important in organizational life.

Individual work is also valued in many K-12 experiences, so students often do not come to the class knowing how to think and act collectively. From the early days of primary school, students learn that individualistic work is valued and they must conform to such a standard. Thinking and acting collectively is discouraged, so how to work collaboratively is not a normal instructional topic in quite a few K-12 classrooms (Greenfield, 1995). As a result, many of our higher education students do not know how to work collaboratively from the moment they are placed in groups. The same is true of a majority of the students in this dissertation study. Even after students had been assigned in teams and told they were to work together, their group work happened neither easily nor quickly.

During the first 4 weeks of students working in groups, they all exhibited individualized behaviors. As described in Chapter 5, they were accustomed to individual work in classroom settings, and they were distracted by "Always ON" technology. Their potentiality in community development continued until they achieved several milestones. They first needed to spend several weeks getting to know one another's skills and abilities while attempting to find common ground and a place to begin their collective practice. The work they did on the first group assignment remained individualized due to the separation of tasks and their lack of coordination on what each would look like. Yet, this beginning collective practice was important to their group development because it helped them all understand others' styles and abilities. How the six groups exhibited these behaviors is detailed in the following text.

Individualism

During the first 4 weeks of their group formation, all students in the six groups behaved as individuals. Students are accustomed to individualized learning in school because they have been taught to develop independence and individual scholastic achievement. Using the analytical lens of identification-negotiability, this behavior can be viewed as a choice to identify with individual needs. Students were new to their group experience and did not yet know who their fellow members were or how to work with them. They could not yet relate to and value one another's abilities, so their participation in group interactions was thin and often distracted by technology. They interacted with a kind of small talk, using short statements that exhibited singular personal pronouns.

At this stage, they discussed little about the client project and how they would collectively work on it. Because they talked little about their collective work on the task, their first assignment became a grouping of individualized work. Such behavior existed until they completed and received feedback for the first group assignment. Similar to findings by Wenger et al. (2002), key projects and special events created developmental milestones for groups. These events broke up the normal routine of the developing community such that they re-assessed their collective manner and sometimes changed their behaviors for improved output.

Each student's individualized behavior within their group work was most evident when students selected a seat; they often chose the computer they had selected the first day, rather than near fellow group members. Some students even preferred to sit next to friends or acquaintances from previous classes. However, the primary reason for not sitting next to group members was that the technology required it. Students were asked to

work on code in class and upload their files to the webserver. Many students kept their working files on a specific computer and had input their own credentials for logging into the webserver and uploading their files. This meant that during this period a certain computer and seating position was more important for their work than sitting next to group members.

Only when cued by the instructor did students move their seats to a common area for their group; even then, they often kept their belongings at the original seat and moved back when group time was completed. Their personal technology files continued to keep students' primary seating positions at their original spot for several weeks. In this manner, the students demonstrated a preference for their global identities (class expectations and personal need to get assignment done) during the first 4 weeks of their experience together, rather than a more local identity of their group.

As the students discussed and shared information about their individual roles in creating the first group assignment, they exhibited their solo work through use of singular personal pronouns. Students used the personal singular pronouns "I" and "me," rather than plural ones such as "we" and "us." Students were still considering their own needs and opinions when discussing the task rather than considering those of the group and client. As an example, group Cyan was considering the look of the mockups going into the creative brief, during a face-to-face meeting. Dan showed the group his work on the mockups, but Ella interjected given her own opinions about how it should look. They used statements such as "I think…" and "I was…". Throughout this conversation, Ella demonstrated her own desire to achieve a good grade on the assignment.

> Ella: Yea and so I think that we can break it down, um, like this, like after you get into those three categories again but like they have here and maybe that

one of the best formats like what we learned today is those drop down menus. Maybe that's going to be an easier way to simplify the information within the content itself.

Sandy: Um hmmm

Ella: And so, um, I think we can pretty much break it down to...

Dan: Which one is it?

Ella: Oh yea. See you have that stacked instead?

Dan: Well...

Ella: I was...it might be too heavy.

Sandy: Yea

Use of singular personal pronouns was also evident in their emails during the 1st 4 weeks. In fact, any emails were driven by their technology-driven roles and individual work, rather than much of an attempt to collaborate on the task. Any email communication for the first assignment involved personal tasks and information, rather than any collaborative ideas. Several members used these singular pronouns that communicated an idea of individual technology tasks that were sent during week 5, a few days before the first group assignment was due.

I'm sorry for the delay Dan.

I'm going to spend my whole day on the site map tomorrow so I'll send out details when I'm done.

Ella

Similarly, Sandy used singular personal pronouns in her early email communication.

So here is my audience analysis and 3 personas. I also made a few corrections on the statement of purpose. Let me know if there is anything else anybody needs help with. I don't have my internship this week so I have some extra time.

Have a great break!

Sandy

Their communicative and task behaviors remained distinct and individual, so their initial learning experience and interaction remained individualistic rather than the intended collaborative manner. However, they did begin to exhibit collective practice behaviors in their weekly and extended talk attempting to ascertain others' abilities and find common ground so they could have a starting place for their community.

Finding Common Ground

The common key issue at the beginning of a community is to find enough common ground among members for them to start feeling connected and finding value of sharing insights, stories, and techniques. Using the lens of participation-reification, this behavior can be viewed as a beginning engagement that started their participation that was enacted as connection, being both personal and social. Such participation was an entry into a community where students can create meanings and identities. What energized the members at this early stage was the discovery that the others faced similar problems, a shared need to achieve something well (such as grades and learning), and having data, tools, and skills they can contribute. When students were initially asked to talk during week 1, their conversation involved sharing contact information and moved into determining educational and work experience that might benefit their pursuit on the client project.

John: So how comfortable are you with doing sites?

Vinton: I'd say…pretty dang.

John: OK. What's your experience?

Vinton: Uh…I design a lot so I'm pretty strong in design. The coding is, uh,

my rough point.

George: I am more comfortable with the back end. I do a lot with LAMP or WAMP.

John: I do a lot of coding and writing. I am pretty good so... I have put a lot of sites together for businesses so… JavaScript is my weak point. You might be a better designer than me, so, or a better writer. (laughing).

Vinton: I am very comfortable with my writing.

They had been cued to this activity because the instructor told the class that each group had been combined based on self-reported personality traits and technology skills.

The instructor's purpose was to create a cross-functional team because the client project requirements called for people with different skills and abilities related to the need of the project, such as user research, graphic design, HTML/CSS, Javascript, and PHP. By building teams composed of individuals stating that they have ability in one of the strategic areas for the project, the group had a greater likelihood of resolving the complex nature of the assigned task. However, this was a class designed to help students learn many of the technologies required to complete the task, so many students self-identified with abilities that were emergent or desired rather than manifest. As such, students spent several weeks attempting to determine one another's perceived strengths and abilities. The authentic technology task was so complex that they took extra time to determine what the task entailed and who would accomplish each portion of their big assignment. It was these two collaborative knowledge points that were critical to the development of each group. Although this understanding was not achieved for two groups, the other four groups who did achieve it took multiple weeks.

However, passion about others' potential to collaborate on the task was not enough to make a community. A community is driven by the value that members get

from it, so they each needed to understand how their energy could translate into something useful. They could not yet resolve the identification-negotiation tension because knowledge of how they would work together took time and so did their ability to negotiate. Early in the semester, their passion was still driven by individualistic needs to achieve in the class. This drive often resulted in competition rather than cohesive decision-making behaviors. As an example, the members of group RAX resorted to voting for decision making, especially during the early weeks of their group work. During week 2, they were working in class on the look of their personas for the first assignment. As they talked for a few minutes, they showed a disinterest in spending any appreciable time working together because they all stood while they talked. My fieldnotes indicate their preference for individualistic work.

> Team RAX stood while they talked. Such a stance did not allow them to collaboratively work on their projects; it also is a stance that easily creates fatigue and lack of willingness to talk long.

They were new to working together and were more comfortable with individual pursuits, so the group members decided to each create their own version of a persona to add to the creative brief.

In order to make sure that all three personas looked the same, Randall showed up this night with the initial design of the persona document and showed the others. Through this and other things he designed and shared with the group, he demonstrated leadership because he had already begun to see their group as a community of practice. He asked for feedback on colors and position of text boxes, while expecting that all members would use the design that he, alone, had developed. When Randall pulled up the design on his computer screen for the others to see, Abigail declared that she did not like the design. Randall then suggested that they vote on the design. When Xandra indicated she was fine

with the design, Abigail declared that she had lost the vote.

> Randall: And kind of whatever we are looking for. There we go.
>
> Abigail: Ummm, I think we should keep it neutral. What do you guys think?
>
> Randall: I can change the opacity. Something like that. Then the picture is going to take that place. You can easily take that off if you do not like it. I am saying that will make it look a little different than just a generic page but whatever you want to do.
>
> Abigail: K
>
> Randall: I will not be offended if you don't like my design here. So vote yes no.
>
> Abigail: I don't like it.
>
> Randall: No? Yes No?
>
> Xandra: I think yes.
>
> Abigail: You say yes?
>
> Xandra: Yea
>
> Randall: You like it?
>
> Abigail: Alright. Majority votes.

The following week, all three members showed up to class with their own version of the persona portions of the creative brief. Because they had all agreed on the same look to their personas, all three deliverables looked similar while not written in a collaborative manner. My fieldnotes tell of this group's individualized behaviors when presenting this first deliverable to the client.

> While these three students gave their presentations, their team members watched them but none of them added to or helped with anything. Because they had not cooperated on creating the personas, they each had to present their own personas.

The resulting feedback from the instructor and client indicated that the work had not been collaborative and needed revisions. Although they all looked the same, the writing and

type of persona was not consistent across the three because they had not worked together on the whole assignment.

Similarly, the members of group Cyan also experienced difficulty in being able to work together through voting and competition when working together on their first assignment. Because they did not yet know how to collaborate, they spent their early weeks working individually and appeared more concerned with individual needs than the group's. Individualized concerns resulted in students' inability to make cohesive decisions and opting for voting and competitive stances, because several members wanted to work on the same part of the first group assignment. During the night of week 3, the members of group Cyan were discussing their roles for creating the client website. As they discussed their strengths and backgrounds, they soon discovered that several wanted to take the same task of designing the website. Then, in an attempt to resolve this competition, they spent time learning each other's skills and abilities. Dan declared that he was experienced with graphics professional work but not comfortable with interacting with the clients. Ella preferred the design aspects of website creation, because she did not receive good grades on her code, yet she also indicated that she was not strong in creating the site's look. She did not mind working with clients, especially if a lot of questions were needed, and she felt organization was her strongest point. Jake was a computer science student and comfortable with complex coding, so Dan thought he could work with Jake to build the site. Sandy was a reticent member and did not participate in this discussion, other than agreeing with statements once in a while.

> Ella turned to Jake and asked: Do you have a lot of previous experience too, Jeff?
>
> Jake: What?

Ella: Ummmm… Working with websites previously? Do you have a lot of knowledge?

Jake: Yeah

Ella: Yeah, supportive

Dan: Yeah and we need that. I think my worst area is talking with the clients.

Ella: …and that's not a problem for me where there's lots of questions. I feel like one of my strengths is organization.

Dan: Okay.

Ella: I don't necessarily know how to make it look like I want on the site.

Dan: That's where me and Jeff can come in on the site.

Ella: Yeah.

Because both Ella and Dan still wanted to do the design, the group did not know how to proceed. They were both more concerned with their own needs and did not negotiate. This period was early in their group process and the first time they attempted to make a decision, so they were not practiced in how to work together and negotiate. I was not able to capture this conversation on my recording, but my fieldnotes indicate what was said.

> They chose to vote on who would take on the design role. Ella voted for herself. Dan, Sandy, and Jake voted for Dan to take the graphics design role. Sandy told me later that night that she wanted to let Dan work on his reported greatest strength of design and Ella to work on the organization of their task. Jake agreed with a head nod when Sandy told me this. The group then moved on and discussed who would take on the various tasks required for the first assignment.

Ella emailed the group by the end of the week.

> Sorry for the delay of this email everyone.

> Last week we discussed dividing up the Project Brief assignment due OCT 19th.

> Part I: Statement of Purpose – Jake

Part II: Audience Analysis – Sandy

    Personas – Sandy – grandmother = caregiver, grandfather = older patient

    Dan – parents = younger(ish) patients

Part III: Site Architecture – Ella

Part IV: Design Guide – Dan

This email was evidence that she had almost immediately accepted her role as organizer of their task, a role that she took seriously.

Because these groups were still made up of individuals who had concerns and personal needs, their collective behavior was neither easy nor evident during the early weeks. While attempting to learn of each member's abilities and make initial role decisions, they had not yet resolved the identification-negotiability tension by not developing a practice of negotiation and decision-making. They resorted to voting and competitive behaviors when attempting to decide roles and task responsibilities. This individualistic behavior was rampant through the first 4 weeks of every group's interaction. Although seemingly problematic, the acts of participation that groups experienced as they competed and voted on task responsibilities helped these groups start building a connection that was both personal and social. Such participation helped these groups change and coalesce into a collective practice as described in the following text.

Stage Two: Coalescing and Conflict

As communities evolve, they often change how they talk about the scope of their domain, either by changing boundaries or redefining them. Following feedback on either the first or second group assignments, all the groups started changing how they discussed their collective task work. The members of each group began to understand they were

collectively accountable to the instructor and client for a revised website. Yet, this understanding came at different times for each group. Some groups, such as Cyan, Razzmatazz, TGAAG, and Chartreuse developed an understanding of their mutual accountability while discussing and reviewing feedback on assignment one or working on assignment two. The other groups, such as Crimson and RAX came to such a collective understanding while either reviewing feedback on assignment two or working on the third deliverable. It took time because they needed to develop relationships and sufficient negotiation skills to discuss difficult practice problems.

Because a collective task involves discussion of how to accomplish it, each group was required to negotiate who must be accountable for which components, what standards to use in assessing it, and what the final product would look like. These interactions regarding accountability included what mattered and what did not, what was important and why it was important, what to do and not to do, what to pay attention to and what to ignore, what to talk about and what to leave unsaid, what to justify and what to take for granted, what to display and what to withhold, when actions and artifacts are good enough and when they need improvement or refinement. Accountability to the task in such a manner was just as important to forming a relationship with others. According to the identification-negotiability duality, accountability to the enterprise is one of the dimensions of community practice and developing group identity. Accountability as an identity translates into a perspective. It does not mean that all members of a community look at the world in the same way. Nonetheless, an identity in this sense manifests as a tendency to come up with certain interpretations, to engage in certain actions, to make certain choices, to value certain experiences – all by virtue of participating in mutual

enterprises.

For groups to be successful in progressing through this stage, they needed to act personable, treat information and resources as something to be shared, and be responsible to others by not making their lives more difficult. Because many students (not all) understood that making their work life more bearable was essential, group members often enforced responsibility. However, the extent to which mutual accountability was violated demonstrated the extent to which the community wielded influence on behavior.

Mistakes and Misunderstandings

As students understood their collective accountability and began to spend time talking about the task and related responsibilities, they sometimes found mistakes and misunderstandings that needed to be rectified. Misunderstandings or mistakes were found in various places, including code, how members interpreted the client's needs or how the group communicated. Students did not always understand that these disagreements did not equate with conflict, and they sometimes did not deal with such misunderstandings. Students differed in their ability to cope with and utilize feedback in their group interactions.

It was students in groups who did not deal with the difficult feelings that came out of disagreements who eventually used technology as a retaliatory weapon. These behaviors left the group members of RAX and Crimson with bitter feelings. As told in the previous chapter, the members of group Crimson experienced debilitating conflict, and how their story unfolds is a complex set of mistakes and misunderstandings that led to conflict and hard feelings that were not dealt with. The root cause of this group's conflict resulted from not all members feeling accountable to one another, the instructor, and the

client until the last week of class. Two members of Crimson took it upon themselves to work individually on the client project, and feedback from one another and the instructor that disagreed with such individualistic behavior was not taken well.

In contrast, members of the four other groups understood that feedback and disagreements should not disable their group's productivity.[12] Such an outcome occurred despite early trouble working together. For instance, several students were viewed as reticent and participating less with their group. During Dan's final interview, he was frustrated that Sandy participated less on the coding side, meaning that he was forced to do more.

> And so I k-, and that was kind of frustrating to me is like, I was like, so why, uh, can't they code as well, you know? (Laughs) so, that, 'cause I've, I felt like a lot of this last part of it, because I hate like with Sandy's content that she ended up giving me was the exact code from the pages on the website, that, original site so she, her job was supposed to be like scrub.

Despite such difficulties, each individual in these groups told me they had decided that they were collectively accountable to the instructor and client, and these thoughts influences how they dealt with one another. I was told by several of these students that they forgave any seemingly aggressive communication and moved forward with their group's work. As an example during Chantele's interview, she reported that these kinds of difficult conversations went better when they talked face-to-face rather than over email. She gave an example of talking about how difficult some tasks were for her to accomplish and face-to-face mitigated any misunderstandings and mistakes.

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[12] The four groups that eventually matured into a community were Cyan, Chartreuse, Razzmatazz, and TGAAG.

> I think you definitely need to have that face to face interaction so that—
> because I don't know, I guess if you're just like doing everything through
> email it might come across as like—I don't know, like you're being lazy or—
> you know, but I really didn't know how to do it so I felt like I could talk to the
> guys and say, "I don't know how to do that, but I really will do anything else."
> And they're like, "Okay," like it—but if I did that all through email I think it
> would've been harder for them to understand, you know? So I think you
> definitely have to have face-to-face contact. But just all the little stuff I felt
> like was good through email.

Ella told me that later in the semester, Sandy's reticence waned and she began taking on

more responsibility with the group project. Through their mutual work on the final

project, they were able to pull off the final website.

> So, (Laughs) so, we had what -- we thought we had the foundation, but then,
> we realized we needed a little more depth, but luckily, we did that in time. So,
> um, uh... Sandy picked up some extra slack, Dan did more than he was
> initially planning, and -- but it came together.

Productive groups were then able to start the practice of negotiating about their task. As

they did this, they developed deeper relationships, while discovering collective ways of

thinking, approaching a problem, and developing a solution. According to the

identification-negotiability duality, these were necessary first steps to reaching a stage of

maturity.

Members of group TGAAG experienced mistakes and misunderstandings during

the 2 weeks they worked on the second assignment. Between the weeks of 6 and 7, the

members of this group began using email to discuss and make decisions regarding the

second assignment. Their in-class group face-to-face time was used to share online

resources, rather than discuss the assignment in detail. Instead, they decided to use the

asynchronous method of email to attach project files and make decisions about them.

Parry first cued their work on this assignment through an email. The three then sent a

series of emails asking each other about expectations for the assignment and how they

would complete it. After a few days, Adam sent out an email with a suggested HTML page that each should work on. He asked them to choose what section for which each would take responsibility.

This is what I suggest as assignments for everyone:

Assignment 1

Home

About NPDA

Suggestions

Assignment 2

Members

Documents

Assignment 3

Awards

Payments

Let me know which assignment group you would like. If this doesn't work let me know as well.

Thanks

Candace soon responded over email asking to take the HTML pages from assignment two. Parry then emailed with a request for assignment one. Adam emailed saying he would take the remaining assignment three.

Over the next few days, Candace and Adam worked on and saved their files to their shared assignment folder on Google Drive. They then waited almost a week and a half before Candace emailed Parry for a status update on his portion. Parry then waited until 2 days before the assignment was due to paste the wrong code into the group's folder; this mistake had broken the group's website. Candace first emailed Parry (while

CCing Adam) indicating the mistake and her confusion.

> Do you have any idea what is going on with the document? I see Parry's code cut and pasted to the document. Does that need to be deleted? I see where you did the things that need to be fixed. Have you done your part? I'm a little confused.

Adam replied to Candace and copied an email to Parry indicating he needed to fix the code before it was due the next day.

> I did the section titles "Specific issues." After this is the Section Parry copied and pasted into the document.

> Below this is the code that you assigned to me. I put my name just above where my assigned code begins.

> I Emailed Parry and explain to him what needed to be done. I have yet to hear back from him. He will need to revise or replace what he has done in the document sometime before class tomorrow.

Late that night, Parry responded with an apology and explanation that he would have the fix completed by the next day.

> Hey y'all,

> My bad I haven't been in contact with one another, I've been out of touch all day in a no–service area. I am still working on the assignment, and it should be done by tomorrow before class.

Parry applied all fixes by late that night and emailed the group. They responded the next morning with feedback on small code tweaks that would make the site look better. Adam took on those edits and then turned in the assignment before the night's class. Despite Parry's mistake and the response by Candace and Adam, this group was able to work through some difficult communication and move forward with their work in a collective manner.

Through forgiveness and willingness to work together, this group not only learned how to work through mistakes but they also gained experience in how to negotiate

effectively about an issue. At the heart of this incubation stage was the development of deep insight into one another's individual practice, and this came about because they were willing to work collectively, despite mistakes and difficulties. These communication behaviors helped TGAAG group members experience one another's reactions and ways of thinking as they also developed a collective understanding of their practice. Such understanding was nurtured through shared meetings and reified objects they create together.

Unlike the groups who were unable to develop mutual accountability and work through difficult mistakes and misunderstandings, the four groups TGAAG, Razzmatazz, Chartreuse, and Cyan were able to interact in ways that helped them develop deeper relationships, while discovering collective ways of thinking, approaching a problem, and developing solutions. Through their communicative practice and the technology-enabled collective engagement described in the last chapter, these group members better understood how to negotiate thereby resolving the design-emergent duality (Wenger et al., 2002). This important step in the development of their group communication was critical to each of the four group's growth into a community of practice. How these groups matured into an identity is detailed in the following text.

<div align="center">Group Identity Formation and Maintenance</div>

A group identity is a layering of events of participation and reification by which their experience and its social interpretation inform each other. These layers build upon each other to produce their identity as a very complex interweaving of participative experience and reificative projections. Bringing the two together through the negotiation of meaning, they construct who they are. In the same way that meaning exists in its

negotiation, identity exists – not as an object in and of itself – but in the constant work of negotiating the self. It is in this cascading interplay of participation and reification that their experience of group life becomes one of identity.

When students are with a community of practice of which they are full members, they are in familiar territory. They can handle themselves competently, as with TGAAG when they quickly dealt with mistakes. They experience competence and they are recognized as competent. They know how to engage with others, because they had already spent hours interacting. They understand why they do what others do because they understand the enterprise to which participants are accountable. Moreover, They share the resources they use to communicate and go about their activities.

These dimensions of competence, as described by the identification-negotiability duality, become dimensions of identity, including accountability to a joint enterprise, mutuality of engagement, and negotiability of a shared repertoire. As described in the previous section, accountability to the enterprise is the first dimension of identity and necessary to each group's ability to develop a collective engagement practice. Within the dimension of mutuality of engagement, students become who they are by being able to fully play a part in the relationship of engagement that constitutes their work. As an identity, this translates into a form of individuality defined with respect to a community. It is a certain way of being part of a whole through mutual engagement. The third dimension of community competence involves the negotiability of a shared repertoire. Sustained engagement in practice yields an ability to interpret and make use of the repertoire of that practice.

As an identity, this translates into a personal set of events, references, memories,

and experiences that create individual relations of negotiability with respect to the repertoire of a practice. Reconciling aspects of competence demands more than just learning the rules of what to do when. It requires the construction of an identity that can include these different meanings and forms of participation into one connection. Understood as the negotiation of an identity, the process of reconciling different forms of membership is deeper than just discrete choices or beliefs.

Stage Three: Maturing and Identity Formation

As described in the previous section, all groups experienced some level of difficulty once they began to understand that they were collectively accountable for the client project. How the students in those groups responded to mistakes and misunderstandings set up whether they were able to effectively communicate through difficulty. Because the members of four groups took the time to work out their differences, they were then able to move forward and collectively go about the business of the client project. Furthermore, as each community developed into a more mature state of being, it did not remain stable because they changed their practice.

As was evident earlier in their group development, these changes occurred at different times for each group. Some groups worked through difficult communication behaviors while working on assignment two and others while working on the third. Although each of the four maturing groups (Cyan, Chartreuse, Razzmatazz, and TGAAG) had their own norms and timing on understanding their mutual accountability, they all did eventually begin to learn how to better collaborate and negotiate through decision-making. As they developed these practices of mutual engagement, members of each of the four groups began teaching and helping others in an attempt to mitigate

mistakes and misunderstandings. Simultaneous to their helpful engagement, group members took more time to collectively work on their joint enterprise. This engagement meant that they must first come to a shared understanding of the task and then discuss how to work on it together. Acting as another critical milestone in their group development, members were able to better resolve tensions between participation-reification, local-global, and identification-negotiability concerns. Resolving these tensions typically deepened each group's practice on their joint enterprise as they developed a shared repertoire.

Development of Mutual Engagement

During the maturation stage of a community of practice, their primary concern shifts from establishing value to clarifying the community's focus, role, and boundaries. While it accomplishes these tasks, the group becomes more intentional about involving everyone to participate in defining its role. They desire this full participation because they gained an ability to work through difficulty and started negotiating about the task. Coherence among community members is the result of mutual engagement of participants. Their mutual engagement came about because they successfully developed a shared understanding of how to communicate despite mistakes and misunderstandings. Practice existed because people were engaged in actions whose meanings they negotiated with one another and all members, including reticent students such as Sandy and Evan, were fully participating in these discussions. Through these interactions, they begin to define a community.

Yet, their group identity required more than allegiance, knowing those in the community, and being in geographical proximity. Mutual engagement involved the

competence of the individual and of others. It drew on what an individual did and knew, while also depending on an ability to connect meaningfully to what is not done and unknown. Competence was being shown through leaders such as Gabbi and reticent students such as Parry. Such interaction worked effectively toward the task because members had different roles and levels of competency, giving them largely overlapping forms of competence. Because they belonged to a community of practice wherein they helped each other, it was more important to know how to give and receive help than for an individual to try and know everything for him/herself. Such a shared practice depended on mutual engagement that continued through helping and teaching behaviors.

Maturing communities often develop a sense of professional intimacy in which they get to know each other's style and approach to technical problems. Because they had previously interacted and worked on joint projects, they discovered their strengths and weaknesses and came to appreciate others' contributions, energy, and individual styles. They learned who in the community says little but has great insight as well as whose ideas must be checked and verified. They knew who in the group to contact for what kind of help, and many groups learned to call on help from different members due to their mix of skills and knowledge. For example, Derrick of Razzmatazz could help with complex code and Lisa later emerged as a teacher in coding the design. This knowledge aided their understanding of who needed help and required mitigation to prevent mistakes and misunderstandings that had become apparent. Although helping behaviors began with the first assignment, high quality teaching from fellow students did not occur until after members began to achieve shared understandings of how to work together. The helping member needed to feel comfortable sharing knowledge and the recipient must have been

willing to listen and apply it. Such cohesive behaviors added to and improved upon the

client project and development of group identity.

As an example during week 7, members of group Chartreuse had begun

collectively working on the third assignment of the client project. Because this group had

begun actively collectively working on the code, they began to experience difficulty

when combining with others' work as illustrated by an email from Nate to his group

regarding several pages due by week 7.

> I accidentally built it off Evans initial farmersmarket.html instead of Luke's index.html. Didn't realize this until today, and some of Luke's code wouldn't mesh with what I was doing. As a result, there's some wonky validation errors I can't quite figure out, if you have the time to look at them that'd be great.

Luke took this code and made some corrections on Nate's attached files. He then

attached it to an email reply and copied it to everyone in the group. Within this email, he

not only told his group about the problems but also reminded them about some

information taught in class several weeks earlier.

> Sorry, I forgot to validate before I sent the last email. I made a few corrections in the attached files. There is still one HTML error caused by a width="100%" attribute on an image, but I'm pretty sure Alex said that we can ignore those errors. There are quite a few CSS errors, but they all relate to CSS3 properties and deprecated properties that are there for cross-browser compliance. I think we'll be ok, but if you want to look at the errors and come up with a better solution then that's cool.

Due to Luke's leadership in helping the group to create a high quality second

assignment, his fellow members subsequently encouraged his role as the central coder for

their collaborative behaviors late in the semester. Not all teaching moments came about

because of mistakes. Instead, these moments came about because of the nature of the

class as a learning environment.

The client project was a complex enterprise comprised of many different sections

and types of code. It was on one of these nights when Gabbi of Razzmatazz was taking

lead on coding the third assignment and the other two were working on their assigned

accessory web pages that she received high quality help and instruction. Derrick, of

group Razzmatazz, had been of great help to his teammates and even others in the class

during the later weeks of the semester. His past experience regarding programming of

software and websites meant that he was able to share many skills and tips with the

others. In their final interviews, both Gabbi and Lisa told of how important Derrick's

skills were to creating a higher quality deliverable. For instance, Lisa revealed how his

and Gabbi's skills made their work easier.

> I know Gabbi and I relied on Derrick to do like the really hard stuff
> [laughing]. But we learned a lot from him by doing that. So I think it was a
> smart move. Um, I know on this last project in particular, he's doing all of the
> PHP and JavaScript and we're doing like all the styling.
>
> Um, he's, he showed us a lot of tricks and I've also learned from Gabbi too
> because, um, there's a lot of shortcuts in Dreamweaver and, um, one thing that
> Derrick taught us today was, um, you can Inspect Element and we knew, we
> knew how to do that but you can actually edit in Inspect Element, in, um,
> Chrome. And we have like never known that. So we were doing things the
> hard way. And then one thing I learned from Gabbi in Dreamweaver was the,
> that you can connect to the server, like from Dreamweaver and so you don't
> have to like go upload to the FTP every time.

Lisa was also able to teach her team members about things she had learned. For example,

during week 7 she taught Gabbi about Google fonts.

> Gabbi: So your CSS stuff uses this um...
>
> Lisa: Font
>
> Gabbi: Font. That tells us how to do that and then here's all the colors that
> you can use the following colors.
>
> Lisa: Oh and we went over the fonts in our usability class so...
>
> Gabbi: Oh you did?

Lisa: Yea

Gabbi: Good so you know I can't wait to see that code. OK so then there's all the colors and...

Lisa: Basically, it's an external like thing. It goes out to the server, brings back this font. So you don't even have to have it on your computer.

Gabbi: Yea.

Lisa: It'll like pull it off the web and...

Gabbi: Really?!

Lisa: Yea.

Gabbi: Can't wait to see that code. That'll be awesome.

Lisa: Yea.

This interaction resulted in Gabbi integrating a Google font in the HTML of their client project. Similar to the internal help of Chartreuse as described in the previous chapter, all members of this team were able to contribute to the creation of a high quality joint enterprise because all members were able to contribute due to help and teaching from other group members.

Creation of a Joint Enterprise

The next characteristic of a coherent community is the negotiation of a joint enterprise. A joint enterprise is the result of the collective process of negotiation that reflects the full complexity of mutual engagement, including goals and mutual accountability that became an integral part of the practice. Their negotiated enterprise was defined by both group members through their mutual engagement and by the boundaries set by instructor and client expectations. Their enterprise, therefore, was in making the place habitable and the task do-able for themselves.

According to the identification-negotiability duality, this kind of internal growth often involves some restructuring, and the groups attempted to come to a shared understanding of the task and how to accomplish it together. Simultaneous to their community development through helping and teaching behaviors, the students of the four teams worked on finding a shared understanding regarding the task. Although important, this task is not easy and takes a level of engagement Crimson and RAX could not achieve. The other four groups did achieve this shared understanding but it took groups like Cyan weeks to mutually understand the task and how to work on it together. These conversations usually specifically detailed what the final assignment would look like and who would accomplish what task. For example, team Razzmatazz had such a conversation during week 6 where they told me how they were breaking up the task while using the strengths of certain members.

> Gabbi: We just talked about how we're going to divide out the module.
>
> Laura: Who's gonna do what? And what are you doing this week?
>
> Gabbi: Well, we're going to decide who's gonna do what but we're hoping that Derrick wants to do the jQuery. and then either she's going to pick what, I'll do whatever she doesn't want to do.
>
> Lisa: Either HTML or CSS
>
> Gabbi: Yea.
>
> Laura: K
>
> Lisa: We're both afraid of jQuery
>
> Gabbi: I mean I am willing if he doesn't want to, I will do the jQuery.
>
> Lisa: I'm fine with like whatever you want. I need to learn.
>
> Gabbi: In a way I kind of like understand a little bit of what it's trying to do.

When this step was successful, this shared knowledge was a critical step to developing

group identity and negotiation competence because their participation in a shared understanding reified their mutually created task elements.

These discussion points became a visible pattern when evaluating each group's achievement of this shared understanding. For example, five groups were able to come to a shared understanding of what the task entailed, including RAX, Razzmatazz, Chartreuse, TGAAG, and Cyan. However, only four groups were able to achieve a shared understanding of how to work on the task in a collective manner, including Razzmatazz, Chartreuse, TGAAG, and Cyan. Because these four maturing groups were able to gain both a shared understanding of the task and how to work on it together, they were able to move forward with the task and work on it in a collaborative manner. How these groups achieved such understandings is told by several examples that follow. As occurred with an earlier point in the semester, not all groups reached such an end at the same time. For example, group Cyan worked through the problems of misunderstandings and missing group members and came to a shared understanding by week 8, and Razzmatazz accomplished such an end between the weeks of 5 and 6.

The members of group Cyan had experienced the difficulty of Dan and Jake missing from class during a period when they were to start making decisions about their task. They received conflicting feedback from two different members of the client team; this meant that they first had to interpret the client feedback before coming to an understanding of the task and how to complete it together. Because Ella and Sandy were the only members in class for 2 weeks after they received conflicting client feedback, they remained frustrated during their mutual interaction and did not know how to proceed.

Ella: But I didn't hear anything about him. Last time, we knew he was going to be gone (referring to his trip during Fall break). Maybe he was just sick or something.

Sandy: Yea.

Ella: So, um, your thoughts about the feedback we got and changes we might make?

Sandy: Um, it's kind of hard because do we just go with what Vivien said? Do we trying sending it to Jennifer and wait for..

Ella: Wait for some more feedback?

Sandy: Yea

Ella: It sounds like she is pretty incredibly busy because we haven't had a lot of feedback from that first visit.

Sandy: Yea.

Ella: And so I worry if we wait to move forward, too, that we might not...

Sandy: Yea.

Ella: ...get the feedback that we want in the time that we want.

Sandy: We should just go with what, um, Vivien said.

They both decided to contact the other two group members through email to communicate what had happened and ask for feedback. Despite the male members' lack of communication with the group, both Ella and Sandy decided to look past this problem and attempt to get them to engage with the client task. For example, Ella emailed Dan with information about what had occurred in class the night of week 7. She asked for Dan's input and engagement with their client project.

Hey Dan,

We missed you at our Site Brief presentations. I've attached Team Cyan's Site Brief as a printed copy was given to Vivian last week. I have also attached the original as a color reference. As you will see we have already begun our edits based on our meeting with Vivian and Alex. We would greatly appreciate your feedback on our interruption of your requests especially regarding the

segregation of audience into the three categories of which we will rename to elevate confusion.

Thank you for your time. We hope to be able to meet your needs with our project.

Ella & Team Cyan

What happened next was not shared with me except for an informal interview with Sandy and Ella that I reported in my fieldnotes.

> Before week eight, Dan contacted his group over email and apologized for being sick and missing class. Once the others received this email, they met before class and came to a shared understanding that the three of them were committed to work on the project.

This shared understanding helped them to begin a new pattern of using texting and emailing to set up a face-to-face meeting the hour before class of week 8.[13] They set out to make a decision on how the group would proceed despite conflicting feedback from the client. Because Dan had missed the night of conflicting feedback and had already told the group he would write the code of their proposed design, he brought a three-page website to this meeting based on their previous design. Both Ella and Sandy gave feedback on his design.

> Dan: Oh I'll make these as wires so it's like two blocks right, I guess? Um, somehtin' like that. What do you guys think? Obviously not stretched, but...
>
> Ella: Ummmmm, I think they're floating a little too much.
>
> Dan: Got it.
>
> Ella: So I don't know if maybe we do that with maybe you know how they're kind of boxed in with the white? Um, Maybe we box them in separately? Like

---

[13] This pattern of texting to set up subsequent face-to-face meetings continued throughout the remaining weeks.

actually create kind of a visual box to just kind of fill in some space?

Dan: All right.

Sandy: I don't know, 'cause I don't think it does photos well. They're not our photos anyways, but...

Ella: I guess we're gonna have to figure out what is a legitimate option as far as...

Dan: Um, like may something as simple as that? Or?

Sandy: You want like a...

Ella: (laughing)

Dan: Cheesy thumbs up?

During this discussion, both women brought up specific changes that both clients had suggested. It was during this meeting that the three of them came to a shared understanding of what the task entailed. Because Dan had brought a beginning document for their client project and they could move past previous difficulties, they were able to work together and make decisions as he worked to update the code.

Later this night, the group took every free opportunity to meet together and continue to work together as Dan coded further on the HTML/CSS template. By the time the official group time came around, they had met twice and used this time to make final decisions on the template they would use to create the remaining HTML pages of the client website. They had all decided to move forward with the tweaked proposed design and create the remaining pages. Their conversation then moved to making decisions about how they would work together to accomplish the task.

Dan: Um, what I would like from you guys…

Ella: Um hmmm

Dan: If I'm going to start writing the code, I would like to just put pages together. Is if you want to like find content and stuff like that. Like the actual

wording and stuff like what you guys want to put in the site? Um.

Ella: That's what the scrubbing is.

Dan: Um…

Ella: We're supposed to take the content and then, like the first time we broke down the syllabus and make sure that it's just aligned and pretty and breaks are where they need to be and formatting of just the basics of paragraphs and stuff?

Dan: Got it.

Ella: So that's what he thinks is going to take the longest amount of time.

Dan: Uh huh.

Ella: But in theory we're gonna have like somebody work on home page, somebody work on templates, and then a couple of us scrub but you're flyin' through stuff.

Dan: Uh huh?

Ella: So…

Dan: Yea. That sounds good to me. You guys tell me.

Where group Cyan achieved their shared understanding while finalizing assignment three, Razzmatazz had several members who already worked professionally on teams. As a result, they were able to accomplish such an understanding between the weeks of 5 and 6, while they planned work on assignment two. In an email stream after receiving feedback on their first assignment, individuals in this group discussed what the task involved and then quickly moved onto how they would collectively work on it. All members spent several days sending emails about how they would work on any subsequent assignments. Finally, Gabbi proposed a way for them to fairly divide out the tasks.

Hello All:

I have an idea for our next project. We could have each of us take one of the

design.

The person taking mobile will start and when they are done then they pass it off to the next person and so on.

This way we can be consistent and we won't be designing over the top of each other.

We would need to come up with a schedule so we each would have enough time for our designs.

What do you think?

Gabbi

When they all arrived to class the following week, they discussed who would take each of the tasks. Because my recorder was not working during the early hour of class, I took the opportunity to have them tell me what they had just discussed. Gabbi would start and work on the task first; she would develop the smartphone version of the website. Lisa worked on it next and developed the tablet version. Derrick went last and finalized the computer version of the site.

Gabbi: We're dividing out so that each...

Lisa: Is there one that you prefer?

Gabbi: No, I have three days to get the mobile so the next person can do the tablet part...

Lisa: Um hmmm

Gabbi: ...and then we'll come back together and kind of finesse the rest.

Researcher: So you're going first?

Gabbi: I'm going first, yea.

Laura: Awesome

Lisa: I'll do desktop

Gabbi: Wait, OK

Lisa: My schedule's a little crazy right now.

Gabbi: OK

Lisa: So that'll give me a little extra time

Gabbi: Sounds good. I was going to use icons for the navigation for the mobile instead of just you know or buttons. I haven't decided.

Lisa: Um hmmm

Derrick: You want uh later on when he gives us a little time, us to do well there's not one on this wall but one of those things where we sketch out...

Gabbi: Yea we could sketch out what we're...

Derrick: Basic...

Gabbi: Yea, that would be good.

Derrick: ...outline or whatever it's called

Gabbi: And we need to decide you know since it's due Oct 24th how many days that we can give each other deadlines.

This discussion not only worked out what each member was responsible for but also how their work would influence one another. Such talk benefitted their work and group identity development. A community resolves it tensions between participation-reification and local-global concerns during this period of growth when it learns how to preserve relationships and share understanding on the task and how to achieve it collectively.

They also learned how to maintain helping interactions while systematizing their practices and further developing their shared repertoire, including activities, relations, and objects. They were the result of a joint pursuit in negotiating meaning over time. These artifacts were not in of themselves coherence, but it was gained as the community went through the practice of pursuing an enterprise through continued mutual engagement. By working together to mutually engage in their joint enterprise to create a shared repertoire, they also resolved the identification-negotiability duality. Resolving

these tensions typically drove the group to a deeper sense of identity and greater

confidence in what it did. It was in this space that these communities changed from

defining to developing the domain. The task itself, rather than individual needs, became

the primary driver of activities. How the four matured groups further developed into

transformative communication and productive working behaviors is told as they worked

to create the final client project.

Stage Four: Production and Transformation

By the time the four mature groups were working on the fourth and final

assignment, they identified as a team working on a collective purpose. As the teams

learned how to work together more effectively and had received critical feedback from

the clients, they moved to more collaborative practices. Even the most reticent students

such as Sandy and Evan were participating in negotiation and task preparation by this

time. This highly collaborative behavior was outwardly exhibited by their tendency to sit

together, even when a computer was not available for individuals.

By the 10th week, members of the four matured groups would often arrive early to

class so they could sit together and get as much done during class time as possible. These

before class meetings would often bleed into the beginning of class, and the instructor

would sometimes allow the class to begin late because he was pulled into some of their

conversations. During class, they stayed sitting with group members and continued to

work throughout any lecture or class business. They also met during class break and

again during official group time. When these groups had formed an identity, the

instructor was forced to tolerate their whispers and not so quiet talk while he lectured.

For many of these teams, their communication and group practices had moved

beyond simple negotiation. To do what they were expected to do, the group members produced a practice with an inventiveness that was all their own. Once they had resolved the four dualities, they moved beyond simple negotiation by finding new collaborative ways to work on tasks. On one hand, they invented local ways of accomplishing tasks that met class expectations. On the other hand, they also invented ways to work on tasks together in a manner that honored the relationships they had built up, including finding their own methods for completing tasks together while dealing with and making jokes about mistakes, discussing their views, and sharing snacks. I often witnessed groups such as Cyan and Razzmatazz banteringly discussing one another and the task in a manner that also critically assessed the project steps. They had learned the delicate balance of having fun while they discussed and negotiated their collective work. It was through such inventive negotiation by the community that conditions, resources, and demands shaped the collective practice that sometimes amazed the clients. Each successful collective enterprise was never fully determined by outside expectations or an individual; rather, it arose in response as a communal response to a specific situation. Their communal responses often resulted in high quality work that was much more than an individual's abilities.

A kind of social energy occurred with the combination of the three dimensions of shared practice, including mutual engagement, joint enterprise, and shared repertoire. Through mutual engagements, group members were seamlessly interwoven in a collective practice. The joint enterprise created relations of mutual accountability, while shared histories of interaction became resources for negotiating meaning without the constant need to compare notes. Their synergy resulted in all students participating fully

while thinking and acting collaboratively, through the use of plural pronouns, such as "we" and "us." Their work on the joint enterprise also transformed into a method known as peer programming, a technique where one student acted as the driver writing the code while the other two members participated by reviewing each line of code as it was typed in, as when Parry and Evan sat around and gave recommendations to Luke as he coded.

Finding a Shared Voice in the Group

By the time the four mature groups were working on the fourth and final assignment, they had developed into a fully social practice. They had previously developed three group assignments together, so their practice involved the action of collectively working on the client website in a historical and social context that gave structure and meaning to what they did. Because all members, including those who were reticent, had participated in their group work and had demonstrated their value, their working practice became one that was always social. Being included in interaction that matters was a requirement for becoming engaged in a community's practice; engagement was what defined belonging. Because the groups had matured in their relationship, communication, and task practices, they had moved into the final production stage. At such a time when the groups experienced full participation and shared reification, all members had found a voice in the group and participated in negotiations. Included in interaction that brought coherence and full participation was talk that weaved discussion about the task and personal information.

In order to be a full participant, it may have been just as important to know the latest news about a fellow group member's family as it was to understand how to complete the latest task. As students in the four groups talked as often as possible during

the final 4 weeks, their use of plural pronouns mirrored their view as a collaborative, community of practice. When the students worked together collaboratively on a client project, they exhibited their shared thinking through the use of plural personal pronouns, such as "we" and "us." This behavior changed from the early weeks when students primarily used singular personal pronouns, such as "I" and "me." All groups had developed such talk by week 10, and these behaviors demonstrated a consideration of the group's needs and opinions when discussing and working on the task, which they had developed as norms with the client task and technology in order to effectively work together. Their use of plural pronouns did not indicate a royal "we" that is sometimes used in a community, such as a whole classroom or a political constituency. Instead, the use of plural pronouns signaled a sense of group identity. Their collective identity was evident in several ways. For example, by this time Sandy was fully participating and using plural pronouns when discussing and negotiating about specific project tasks. In addition, Parry used plural pronouns when asking the instructor questions about his group's project.

Perhaps these students had become more comfortable and effective at generating mutually satisfactory problem solutions. Their actions and words demonstrated a greater sense of shared responsibility in the client task, and this seemed to have helped them collaborate more effectively. All existing members of Cyan had demonstrated talk using plural pronouns when discussing their joint enterprise. During week 9, the group spent all their time working together in class on the client website. They had recently come to a final, shared understanding of how to move forward on the task, and they were putting those decisions to use by working in class and sharing what they had accomplished in

meetings with the client. As they discussed their mutual work to the client and afterward during their shared group time, they demonstrated a kind of collaborative thinking by using plural personal pronouns. Their pronoun use included "we," "us," and "you" to indicate shared understandings and task responsibilities.

> Sandy: What if we did like the three still but took like two mini boxes and put 'em over there. Like the social media, social media and then about us?
>
> Dan: Got it...so let's do...
>
> Sandy: What do you think of that idea?
>
> Dan: So like having the two main, like how I had the three before? Like...
>
> Sandy: Yea.

They used similar plural pronouns when emailing each other about the client task. During week 10, Ella emailed the group asking for their input on the last big push to complete the client task.

> Since we do not have class on the 23rd, that leaves one last completely open class time on Nov 30 to do so. Let's complete all of our individual projects by then so we can drop content that day and have one additional week it we need to get together again outside of class. Does that sound okay with everyone? Questions? Comments? Suggestions? Complaints? Please at least reply so I know you all got this.
>
> Almost there! THANKS!

Similarly, the members of group TGAAG exhibited a change in pronoun usage from "I" and "me" in the early weeks to "us" and "we" during the final weeks. In the course of the eighth week, the members of this group were finishing the third assignment and discussing how to complete the fourth assignment, the final client website. This discussion was an exercise led by the instructor to help the students finalize the colors and theme of the client website.

> Parry: Um, how we want it, words that we want to feel?

Alex: Yea. Just descriptives. So adjectives, um to describe the NPDA website.

Parry: As it is now or way we want it?

Alex: The way you want it to be.

Parry: The way we want it?

Alex: This is visualizing.

Parry: Yes. We're thinking big.

By the 6th week, they had also begun using plural pronouns when discussing their mutual task over email. While discussing final points of their third assignment, group members understood the shared nature of the client task and their engagement reflected this point. For example, Candace emailed the group asking if they needed to proof read the code and style it a bit more, while also cheering on the team.

> I think it's starting to look really good. From what I can tell all the information that we need is there. We probably each want to proof read it a couple times and make sure all our words smashed together mesh well. Also do you think the layout of the page is okay? I like it.... just wasn't sure if it needed to be styled? Good work team!

Parry responded with an affirmative email and similar plural pronouns that exhibited his thinking their work was shared participation and ability to negotiate his ideas.

> Layout seems to be ok so far. We will most likely need to go through, as you mentioned, and clean it up a little bit. But all and all, it seems to be coming together quite well. Good job team. Do we need to print this out?

When practice was in action, students talked as a community when things had to be done, relationships worked out, processes invented, situations interpreted, artifacts produced, and conflicts resolved. Although each group may have had its own version of the enterprise, pursuing them always involved the same kind of embodied, delicate, active, social, negotiated, complex process of participation.

Transformative Nature of Communities

According to Situated Learning theory if the members of a group have a strong commitment to one another, their combined synergy between engagement, enterprise, and shared repertoire leads to a transformative practice. Such a transformation creates upheaval that can be more easily survived due to the community's establishment of a clear domain and their practice is well established (Wenger et al., 2002). When it works, a transformed group has the potential to more fully meet their potential and have a real effect as Wenger notes: "As a locus of engagement in action, interpersonal relations, shared knowledge, and negotiation of enterprises, such communities hold the key to real transformation – the kind that has real effects on people's lives" (p. 85).

A transformative practice includes both what is explicitly said and what is represented by reified objects. It includes the language, tools, documents, images, symbols, well-defined roles, specified procedures, and contracts that various practices make explicit for a variety of purposes. But it also includes the implicit relations, subtle cues, unspoken rules of thumb, intuitions, understandings, underlying assumptions, and shared world views. Many of these may not be articulated, yet they are signs of membership in a community of practice and crucial to the success of their enterprise. Each of the four mature groups had transformed their work by always working together, and three of them stepped up their game by fully collaborating on the final deliverable by using what is known as peer or extreme programming techniques. "Communities of practice are the prime context in which we can work out common sense through mutual engagement" (Wenger, 2002, p. 47). All members have their own theories and ways of understanding the world, and their communities or practice are places where they

develop, negotiate, and share them.

The students of the four groups had developed a practice of always sitting and working together, so three of them (Chartreuse, Cyan, and Razzmatazz) worked out their own system of working together in class on the client task. Because their work had become so highly collaborative and built their identity, these groups spent time in class working together on a single computer in a transformative manner. Peer or extreme programming techniques occurred when one student, the driver, wrote code while the other two, the observers, pointers, or navigators, reviewed each line of code as it was typed in (L. Williams & Kessler, 2003). Three groups transformed their practice to use this programming technique, including Cyan, Chartreuse, and Razzmatazz. While reviewing the code, the observers consider the strategic direction of their work while devising ideas for improvements and likely future problems. This frees the driver to focus all of his/her attention on the tactical aspects of completing the current task, using the observers as a safety net and guide. Peer programmers are known in the industry to spend about 15% more time on programming than individuals, resulting in about 15% fewer defects. A website or software program with two or three programmers possess greater potential for the diverse solution to problems because they all bring different experiences, access information in different ways, and hold different relationships to the problem due to their functional roles (McDowell, Werner, Bullock, & Fernald, 2002; L. Williams, Kessler, Cunningham, & Jeffries, 2000). Peer programming increased these students' work quality without impacting time, so all these teams were able to complete the majority of their final code within the constraints of class time.

The seemingly favorite way to peer program was to sit side by side in front of the

monitor. They might sometimes slide the keyboard and mouse or notebook computer back and forth. Most of the time, the observing students would call out ideas or read off code snippets after looking them up on their own computer, meaning that all group members had the opportunity to fully participate in the task and they often did. This interaction resulted in their use of suggestions, alternative ideas, disagreeing, and synthesizing concepts to finally make group decisions. Such a process often resulted in much better ideas and quickly completed high quality projects than they were capable of in the early weeks of the semester. In whatever manner they went about this practice, all members were equal in participating on the task, and they were able to complete high quality work in a short time amount.

As an example, on the 10th night of class the Cyan team sat together, sitting in a peer programming configuration with Sandy and Ella sitting on either side of Dan. They sat in these positions the entire 3-hour class period, spending the entire time working on their site. The team talked as Dan drove the central work on coding the HTML/CSS pages. Ella and Sandy took opportunities to make suggestions and consider alternatives. For example, Dan asked for a decision on floating content in the template, and both Ella and Sandy proposed alternative ideas.

> Dan: Oh I'll make these as wires so it's like two blocks right, I guess? Um, somethin' like that. What do you guys think? Obviously not stretched, but...
>
> Ella: Ummmmm, I think they're floating a little too much.
>
> Dan: Got it.
>
> Ella: So I don't know if maybe we do that with maybe you know how they're kind of boxed in with the white? Um, Maybe we box them in separately? Like actually create kind of a visual box to just kind of fill in some space?
>
> Dan: All right.

Sandy: I don't know, 'cause I don't think it does photos well. They're not our photos anyways, but...

Ella: I guess we're gonna have to figure out what is a legitimate option as far as...

Dan: Um, like may something as simple as that? Or?

Sandy: You want like a...

Ella: (laughing)

Dan: Cheesy thumbs up?

They continued with the decision-making and decided on using a suggestion from formerly reticent Sandy about the three versus two categories on the home page.

Sandy: What if we did like the three still but took like two mini boxes and put 'em over there. Like the social media, social media and then about us?

Dan: Got it...so let's do...

Sandy: What do you think of that idea?

Dan: So like having the two main, like how I had the three before? Like...

Sandy: Yea.

Because this group took the time and opportunity to sit and work together in a peer programming configuration, they were able to make decisions together through practices of negotiation. All three active members of the group participated in idea creation and synthesis, so the final product was high quality and resulted in being selected by the client.

Likewise, Team Chartreuse began using peer coding practices by week 8. Their seating involved Nate and Evan sitting on either side of Luke. As Luke took lead on coding a hamburger order form, the other two gave suggestions and alternative ideas. Both Evan and Nate spent quite a bit of time suggesting form fields while Luke coded the page.

Nate: Alright then the next...uh

Luke: Patties.

Nate: The next is patties. And it's a required field.

Luke: Patties...um

Evan: And on this one can you only choose 3? Or can you choose 3, each?

Nate: It's...it's a check box.

Evan: Yea.

Nate: But I wonder if there's um 'cause I know last time we talked about doing like multiple patties. So is there a way to like initiate a checkbox and then have it bring a drop down after you...

Luke: Um...

Evan: Or what if we had like a quantity, like just a box that you put like a number in it?

Luke: Yea, I think...

Evan: ...I think that would solve it.

Luke: I think that would work, 'cause...

Evan: You click...

Luke: The default would just be zero? For all of the input?

Evan: Um hmmm

During the following 3 weeks this team worked in a peer programming pattern when coding the final components of the client website. In fact, the group decided to get all their coding done in class because they were quick enough collaborating on the work with peer programming methods; this meant none had to do any work outside of class. Although not the winning client project, they all received stellar final grades and felt good about each other during last interviews, such as when Luke stated this experience changed his view of group work.

> I think it was a really good experience, where everyone was contributing. It probably raised my expectations on what teamwork, group work will be like in the future. Because I've seen how it can work, if it is working correctly and everyone's doing their portion.

The final weeks of the four matured groups was a time of highly collaborative behaviors in which students always sat together and worked on the project in a new way. Through their history and past experiences, students were better able to work together because they identified with one another in their speech and practice. The synergy that came out of their mutual engagement, joint enterprise, and shared repertoire resulted in highly efficient teams that output high quality work.

Conclusion

Progressing through the stages of development, the groups of this study underwent several changes in their focus, relationships, and practices. They started attempting to ascertain each other and the task. The complexity of the task and inexperience in working collectively delayed their collaborative practice. A few weeks into the semester after each group had worked on one or two assignments, they began noticing mistakes and misunderstandings due to a shared understanding of their collective accountability. Because several students were either inexperienced or did not find value in engaging with fellow group members to deal with the conflict, their mutual work reverted to an individualistic phase. Several of these students chose to take on the client project individually and further damaged their collective practice by using technology as a weapon.

In contrast, members of four groups did take time to deal with the mistakes and misunderstandings, so they were able to finally begin developing a shared understanding

of the task and how to work on it together. Although this was an essential milestone in each group's development, the early delays and their inexperience in working on such technology projects meant that groups did not achieve this understanding until about mid-semester. Each group was different, and those groups that did achieve this understanding did it during either assignment two or three. Once they did come to a shared understanding, they then began sharing ideas and tips, while building, refining, and expanding the project and their community. They moved from a loose network of personal relationships to groups with a common sense of identity, combining intimate knowledge of each other's approach with a sense of collective responsibility. Their focus shifted from solving common problems to systematically exploring its subtleties through peer programming practices.

CHAPTER 7

CONCLUSION

This project has been motivated by an interest in how small-group communication facilitates learning of difficult technology concepts and why some student communities of practice do not develop, despite all the seeming benefits of their collaboration. I paid specific attention to the discourses of student group communication across the entire semester to gain a greater understanding of how technology influenced their developmental processes. In this final chapter, I first present an overview of the entire project. I then turn to this project's key contributions, particularly focusing on how small-group communication and team-based learning has been largely silent on long-term community of practice communication involving non-productive behaviors and computerized technology as significant actors. The findings of this study show that successful group work is not automatic because it is ultimately the interplay of communication and technology use choices that determine the success or failure of community development and task completion.

Because Situated Learning theory is inadequate in explaining the group communication processes that occurred with the students of this study, I have chosen to present a new theoretical model that builds on and better explains what occurs as these communities of practice progressed or not. What I explain in this chapter is a model of

technology team development that explains the productive and nonproductive aspects called Community of Practice Development theory (CPDT). This theoretical model is not meant to replace existing theories; instead, it is meant to better help technology instructors, researchers, and professional Web and software project managers understand developing communities of practice. I close the chapter with reflections on the limitations of this work and offer invitations for future scholarly work.

I argued at the beginning of this study that although the small-group communication and team-based learning scholarship is vast, it does not provide a thorough and descriptive account of the patterns of communication behaviors that occur with students collectively working on an authentic technology-based project that is both complex and ambiguous. The research does not illuminate how, in the case of technology as content and context, students collaborate in long-term groups that shift from one form of communication (face-to-face) to another (technology), the ways in which technology affords a distraction or support to group identity and process, and the communicative patterns that allow students to navigate the community-based tensions that must occur for students to achieve reported cohesion and successful learning.

Unlike previous scholarship, I focus on how technology and student's discursive practices influenced group communication and identity development. I chose to use the dualities of Situated Learning theory and team developmental stages to analyze the communication and behavioral patterns exhibited by the six groups. The dualities of participation-reification, local-global, design-emergent, and identification-negotiability helped me better understand the communication patterns that changed over the semester-long class. For example, participation-reification helps to explain how participation

resulted from their shared enterprise in the reification of a repertoire of project files. The local-global tension helped explain how students communicated with either fellow group members or those outside of class. The dynamics of individual versus group knowledge and idea generation was made visible through the design-emergent tension. Finally, if and how these groups went about changing from an individualized practice to one of full participation and collaboration was analyzed through the identification-negotiability duality.

I also used the theory of group stages to explain the developmental changes that each group experienced as they either did or did not grow a community of practice. Each group changed through time in their internal structures, processes, and culture. As an analytical lens, it helped reveal how each group changed along three dimensions: social, activity, and purpose. The social dimension concerned the organization of the group's structure and patterns of participant roles and structures. The activity dimension focused on each group's activities, tasks, and operational processes. A group purpose dimension is derived from their shared norms and values. In using these and Situated Learning theory's analytical lenses, I focus on demonstrating the long-term, technology-based communication patterns that have been overlooked within small-group and team-based learning scholarship.

The Story of Six Groups' Community Development (or Not)

During the course of the semester, the six groups researched herein were highly influenced by how they used technology, what they looked like, and how they functioned. Technology acted as either an enabler or disabler of community of practice development. As the groups progressed through the stages of development (or not), their practice

changed as they worked to gain a greater understanding of the task and each other. Such an understanding was delayed because of their technology distractions, low knowledge in developing an authentic Web design project, and inexperience in working collectively on a large project.

As illustrated in Chapter 5, the social and entertaining aspects of "Always ON" technology most certainly delayed full group participation, while promoting individuality and lack of communication regarding how to collectively work on the first group assignment. Students were often observed during the early weeks using technology as a distraction and an escape during lecture and group discussion periods. During time meant for group interaction, students would escape shallow conversations by connecting with family or friends on their smartphone or tablet. Such distractions meant that a student attending to his or her phone could not pay attention to or contribute to group discussions.

Because of these issues during the early weeks in the semester as described in Chapter 6, none of the groups developed a mutual connection or found value in sharing insights, stories, and techniques on the first group assignment. Instead, the students worked and talked individually. They often spoke using singular personal pronouns and sat apart from fellow group members unless cued to work together. The primary discussion points during these early weeks were to learn about one another and how each member might contribute to the client project.

Efforts to find common ground on how they might divide up the first task were not easy because none of the groups had yet achieved cohesive decision-making. They often resorted to voting and competition when making decisions about how to go about the first assignment, including who would take on certain tasks. So much time was spent

on finding common ground and deciding who would take on which part of the assignment that they never discussed how they would coordinate their work on this first deliverable. What resulted was feedback from the instructor and client that it was evident that they had not worked together on the first assignment, a creative brief. Many were asked to adjust the deliverable so it had a common theme and looked as if they had worked together.

Although these students had not yet found a connection, they did gain experience in working together, and with feedback all groups began to talk about their mutual accountability on the task. However, each group's shared accountability came at different times, either while working on the second or third group assignment. This behavior resulted in each group spending more time talking about how they would work on the client project together, and through this communication they moved into the next development stage of coalescing and conflict. They talked more about the second or third assignment and attempted to synthesize it so their work looked more collaborative than their first deliverable.

Many students began to notice others' mistakes in the task and misunderstandings regarding their interaction. This resulted in conflictual behaviors that each group dealt with differently. Students from two groups (RAX and Crimson) did not deal with the conflicts that came out of their mistakes and misunderstandings, and they over time they developed individualized and less productive practices. Because their communication became difficult, students would sometimes also escape to technology from interaction during downtime or when they felt uncomfortable working with fellow group members. This behavior was often a symptom of the larger underlying problem in their

communication practices. Because certain members of these groups were concerned for their grades and believed they could not collaborate with the others, they chose to work individually to create the final client project. In order to ensure that they had total control over the final project, these individuals used technology to hide and prevent fellow group members from participating. Because these individuals did not trust their fellow group members to help contribute to the client project, they used technology as a kind of retaliatory weapon to make sure the work remained individualized.

Members of the other four groups also experienced difficult interpersonal communication, such as conflict over mistakes and misunderstandings. Nevertheless, these students chose to either work through these behaviors or look past them. Those students who were more mature in their group skills looked past any difficult behaviors and continued to work with the others. Students who were less experienced openly talked and forgave conflictual behaviors. Such a productive reaction to difficult communication behaviors moved four groups (Razzmatazz, Chartreuse, Cyan, and TGAAG) into the maturing and identity formation stage of community development.

Once these groups were able to get past difficult communication behaviors, they took time to come to a shared understanding of the task and how to work on it together. This understanding was a critical moment in each of the four group's practice because it gave them a purpose in which they could value and identify as their own. They were then able to work in a manner of full participation because their previous work together on the client project had legitimized each member's contributions. For example, several students leveraged technology in such a manner that it promoted their ability to organize the task, or it helped them demonstrate how their skills could be of use to the project.

Some students were able to use these skills to lead their group to an organized method for completing their client task due to a greater understating or ability to facilitate the website files. These students took the lead early in the semester because they were the first to see the potential of their community. Within the four successful groups, individuals became legitimized into a leadership role because they leveraged technology to help the group move forward on the client project. During a stage when the groups were acting individually but learning how to work together, these students' legitimized project management role helped them succeed in helping the group complete the first two assignments. Once all members began a practice of full participation, their leadership roles were not as important as decisions and tasks became more negotiated and collaborative.

During the later weeks, reticent students were enabled to full participation by sharing their technology skills and contributing code to the client project. Some students acted reticently during the early weeks of the semester; they contributed less and sought less information. Simply putting these individuals in a group did not necessarily guarantee their contributions. They needed time working with their community to become willing or able to engage with others at an effective level. The reticent students in this study revealed that what took time was that they needed to feel more comfortable with the others by developing a relationship and showing through their work on the project how they could effectively contribute. In this manner, these reticent students were legitimized into full participation within their community, and all members transformed their practice of negotiation and collaboration. Because each of the four groups practiced full participation when working on the task, their communities grew and matured as

members shared knowledge and helped one another.

Through their continued work together, they developed a practice of mutual engagement, joint enterprise, and shared repertoire. These actions allowed each of the four groups to resolve the four tensions of participation-reification, local-global, identification-negotiability, and design-emergent, as they moved into the final stage of community development: production and transformation. Indeed, these four groups transformed how they worked and spoke to one another. They not only spent time negotiating regarding decisions and tasks, but they also began thinking and speaking as if they had developed a group identity due to their use of plural pronouns, such as "we" and "us."

All four groups spent their time together as they fully collaborated on completing the client project. Three of the groups even transformed how they worked together. They began using a peer programming method, which allowed all three members to fully collaborate on the task. In this manner, these groups were efficient and quick in creating high quality products that had every member's input.

The story of these groups' developmental changes (or not) has contributed to the theory that I call Community of Practice Development theory (CPDT). How this theory extends and contributes to existing theory is described below.

A Model of Technology and Communities of Practice

Using the analytical lenses of Situated Learning theory's dualities and linear group development, I have demonstrated the changes that each of the six groups experienced throughout the semester. How they did or did not progress as a community of practice was often the result of how they chose to communicate and use technology.

Although many theories exist to help explain discrete behaviors revealed in this study, they do not fully interpret the communication patterns embedded with technology as content and context to either promote or disable community development. I, therefore, present a new model of community of practice development that better explains what was found herein.

What I explained in Chapter 2 is varied scholarship that described mostly productive and some nonproductive group communication behaviors of mostly short-term, face-to-face groups. The findings of this project are an extension of previous research that reported the nearly always positive outcomes of collaborative and team-based learning. For example, Michaelson and Sweet (Michaelsen et al., 2004; Sweet & Michaelsen, 2011) reported that collaborative learning increases student achievement across all grade levels and topics, from math to reading to technology education. Collaboration benefits novice learners due to acceptance and help from fellow group members (Handley et al., 2007; Vickers, 2010).

Technology instructors have increasingly used group-based learning because students gain technical and proactive coping skills, including the ability to identify and use information and access social resources to help reach learning goals (Greenglass, 2002; Schwarzer & Taubert, 2002). Gilly et al. (2012) argued that proactive coping converts the stress of technical risks and threats to coping with challenges; such skills could speed and deepen learning and adoption of technology abilities. When groups are comprised of individuals with heterogeneous skills and knowledge, students have shown better learning outcomes due to increased critical thinking and problem solving episodes within standard collaborative learning spaces (D. J. Cunningham, 1992; Driscoll, 2005;

Macy & Neal, 1995) and when designing and coding software (Walmsley, 2013).

As reported in Chapter 2, the primary how-to books for team-based and collaborative learning argue that these positive outcomes are the reason for using such instructional methods (see D. Johnson & Johnson, 1991; Michaelsen et al., 2004; Slavin, 1991; Sweet & Michaelsen, 2011). However, fellow instructors and group communication researchers have revealed that not all groups progress or succeed in their collective efforts, due to issues such as reticence (Burgoon & Hale, 1983; Rosenfeld et al., 1995; Waite et al., 2004), technology distraction (Cardak, 2013; Ehrenberg et al., 2008; Fried, 2008; R. L. Huang et al., 2009; Niculović et al., 2012), and a culture of individualism (Bradshaw & Stasson, 1998; Greenfield et al., 1995; Simpson & Richmond, 1982). Evidently, not all practices are equally good stewards of their knowledge domains, and this research set out to learn why this occurs in technology learning spaces. Ultimately, it was the interplay of communication and technology use choices that determined the productive or nonproductive nature of the six groups studied for this dissertation.

Clearly, the use of technology in communities of practice is much more complex than has been reported in previous literature as simply a vehicle for growing communities of practice. Based on extensive observational methods, Situated Learning theory is widely popular and was able to help me explain what occurred with the four analytical tensions and gave me a vision of a working community of practice. However, this theory only got me so far. Because I expanded my methods beyond extensive observation by also thoroughly gathering student talk in person and over email, interviewing to understand how each individual felt about their experience in their group, and collection

of group artifacts to know the resulting quality of their work, I was able to see communication patterns influenced by technology and commitment levels that were not explained by the theory. My analysis moved beyond Situated Learning, and what resulted is a model that helps to explain what happened in a space where technology was both content and context and why some groups develop more or less of an effective practice. What I explain here is a model of technology team development and practice that I am calling Community of Practice Development theory or CPDT. The theory I propose here is not meant as a replacement for other existing theories. It is meant help explain the development of teams in technology classrooms or industries, thereby helping technology instructors and professional project managers better understand developing communities of technology practice.

My assumptions as to what matters about learning and community development are built on the principles of Situated Learning theory. Within this theory, the nature of knowledge, knowing, and knowers can be summarized as follows. I start with four premises. Community members are social beings that socially construct meanings, relationships, and artifacts. Knowledge is a matter of competence among all members with respect to their mutually valued enterprises – such as making decisions on the layout of a web page, being civil, and coding a programming object for a Web application interface. Knowing is a matter of fully participating in the pursuit of such enterprises. Meaning, a way of talking about relationships and skills, is ultimately what the community produces.

The primary focus of this theory is on community development as social participation. Participation not only refers to engagement in certain activities, but a more

encompassing process of being active participants in the practice of social acts and constructing identities in relation to their community. Such participation shapes not only what members do but also who they are and how they interpret what they do. How effective a community is in their practice is often determined by members' level of commitment to their enterprise.

This theory is also built on the decades of small-group developmental process theories that argue for stages of change. Like other living things, communities of practice are not born in their final, productive state. They go through a natural cycle of birth, growth, and death. Many go through such radical transformations that the reason for staying together or desire to work individually is different from the beginning to the end. Just as described by previous scholarship all groups developed in a somewhat linear manner. Four groups progressed in the predictable sequence of Individualism, Coalescing, Maturing and Identity Formation, and Production and Transformation. However, two groups changed over time in stages that further complicated their non-productive communication patterns.

Whether the six groups moved through productive or nonproductive stages, their progress or regression to the next stage was usually punctuated with work on a project component or deliverable. The level of work carried out either collectively or individually seemed to concentrate their effort in such a way as to further solidify each group's feeling toward productive or non-productive communication patterns and behaviors. For example, groups who communicated and spent more time working together on their projects further built up the artifacts of collective experience and documents. These artifacts built during creation of deliverables were instrumental in

growing their community of practice to the point of moving to the next stage.

However, those groups that were not communicating well did not create shared experiences and documents, so their bad feelings and poor communication practices increased with each deliverable to the point of further regression toward individualism. I found that these groups experienced four stages, including individualism and no direction, unrest and low commitment, limited communication, and finally individualistic and retaliatory behaviors.

The driving force of progress toward collaboration or regression to individualism was the level of commitment experienced by each group as a whole. As communities evolve through their stages, their commitment level determines how much energy they give toward communication, strategy development, and effectiveness of their collective practices. The differences experienced by the productive and nonproductive outcomes of the six groups was primarily driven by their level of commitment toward one another and their shared understanding of the task and how to accomplish it together. The two self-reproducing patterns of practice are illustrated in Figure 5. As illustrated by the graphic,
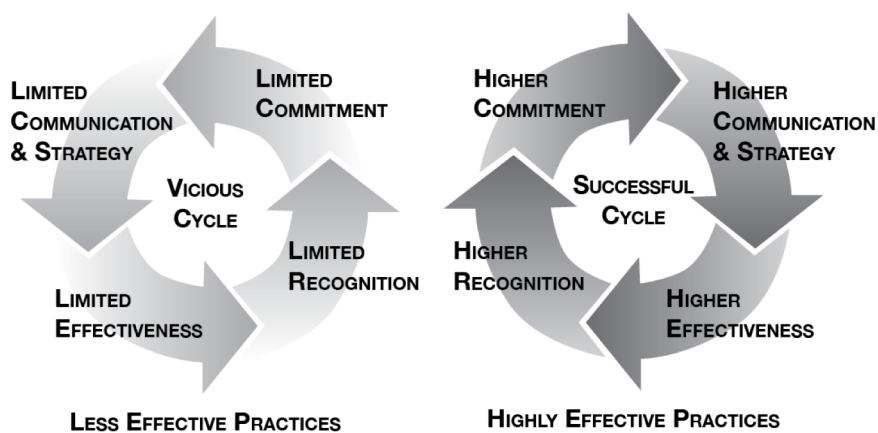

Figure 5: Commitment level influences the level of
communication and effectiveness

the level of commitment either winds up or unwinds a community's collective practice. Winding up represents advancement or development, while unwinding can be seen as a process of entropy or decay in their practice. Limited commitment elicits limited communication and strategy formation leading to limited effectiveness in creating a quality deliverable thereby unwinding their community of practice. Higher commitment often creates an atmosphere of higher communication and strategizing leading to higher effectiveness and quality of product therefore winding up and increasing their community of practice.

The graphic also communicates that changing commitment levels can jump a group from one self-reinforcing cycle to another, resulting in a change in their communication and effectiveness. These jumps and changes are influenced by potential risks that can influence a group's ability to progress through either productive or non-productive stages. As demonstrated by Figure 6, groups experience different risks as they progress through their mutual experience, whether productive or nonproductive. Commitment level influences whether a group successfully works through these risks. If a group starts out with productive behaviors and does not deal well with a risk, they can potentially move toward a less effective practice and begin demonstrating the kind of non-productive stages seen in vicious individualism. However as demonstrated in Figure 5, this change is not easy and must overcome the inertia (or learned communication behaviors) developed in either cycle.

In addition to the productive or nonproductive inertia built up in each group, the most important communication behavior was each group's ability to successfully work through two risks that influenced the success or failure of each group. First, they all

NEW COMMUNITIES OF PRACTICE AS THEY PROGRESS OR REGRESS OVER TIME

	COLLECTIVE TASK OR PROBLEM	DELIVERABLE 1	DELIVERABLE 2	DELIVERABLE 3	FINAL DELIVERABLE
SUCCESSFUL COLLABORATION	**INDIVIDUALISM** Singular pronouns Project manager (to get tasks done) Finding common ground	**COALESCING** Realization of Accountability Highly committed so forgive or deal with difficulty	**MATURING & IDENTITY FORMATION** Mutual engagement Helping & teaching Creation of a joint enterprise Shared understanding of task & how to collectively work on it Collection of a shared repertoire Time spent together Artifacts	**PRODUCTION & TRANSFORMATION** Full participation Transformation of speaking & working behaviors Plural pronouns Sitting together & constant work on task Transformation of work = high quality product	
RISKS	**TECHNOLOGY HABITS** Technology distraction Little time spent on collective task Intra-team competition	**CONFLICT & MISUNDERSTANDINGS** Conflict from mistakes & misunderstandings **How individuals' decide to deal with difficulty**	**NEGOTIATE OR GIVE UP** **Ability to negotiate shared understandings** Technology distraction during group time	**TECHNOLOGY AS A WEAPON** Technology used as a kind of retaliatory weapon	
VICIOUS INDIVIDUALISM	**INDIVIDUALISM & NO DIRECTION** No project manager emerges Concern for personal needs	**UNREST & LOW COMMITMENT** Low commitment so do not deal with difficulty Individualistic tendencies emerge again	**LIMITED COMMUNICATION** Limited communication & strategy Inability to negotiate shared understandings	**INDIVIDUALISTIC & RETALIATORY** Technology used to ensure low quality work Attempts at communication ignored Documents & files hidden and not shared	

Figure 6: Community of Practice Development theory (CPDT) model

experienced conflict and difficult behaviors, and how each group dealt with such behaviors was the first step to their productivity or nonproductivity. Second, if a group was able to communicate enough that they developed an ability to negotiate, they eventually developed a shared understanding of the task and how to collectively work on it. How the theoretical model as a whole integrates the risks, punctuated moments, and productive and nonproductive stages is explained in the following text.

A potential community is a group of people who have a common task or problem. Communities of practice are not groups of people who do not collectively work on a shared enterprise. Authentic communities of practice typically start as loose networks of individual people who hold the potential of becoming more connected due to their mutual enterprise. During the early weeks of their time together, group members act more as individuals than as a community. Sitting away from the group and using singular pronouns in their communication demonstrated individualized work and thinking.[14]

They have not yet developed a social practice, so individuals spend the majority of their time getting to know about fellow group members and their skill set, rather than discussing their collective task. As they work to build a relationship, distractions from smartphones and other technologies often interfere and have the potential to delay their progress. Because this community is made up of individuals who initially have trouble collectively working on the project, a member who steps up and sees their potential can become a welcome help to managing their project until they begin working together more

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[14] Singular personal pronouns include words such as "I" and "me," rather than plural ones such as "we."

effectively. However, this project manager must be accepted by all, and some groups find little value in their collective task so they do not accept emergent leadership that can be a potential help.

As members attempt to build connections, they begin coalescing into a community. Following feedback on the first or second deliverable, a community begins changing how they talk about the scope of their domain, either by changing boundaries or redefining them. Included in this discussion is a collective understanding that they are mutually accountable to the project. This beginning to their mutual engagement means that they begin to see other's mistakes and misunderstandings. These difficulties can be found in various places, including code, how members interpret the functionalities of the project, or how the group communicated.

Group members can differ in how they react to any resulting conflict, and it is their response that determines whether they progress or regress. The commitment and energy that groups exhibit differ and impact their reactions to mistakes and misunderstandings. Groups that have not developed enough accountability, commitment, and value for their collective work have the potential to work individually and limit their communication. They never come to a shared understanding of their task because they never develop collective value in it. Those groups that do not deal with mistakes and misunderstandings potentially can cause a dysfunction in their work and regress into a stage of individualism. This might be one explanation why some scholars have reported that some student group work ends with individuals doing most of the work (Drury et al., 2003). It is in this highly dysfunctional stage that members become tempted to find ways to ensure individualism, sometimes resulting in using technology as a kind of retaliatory

weapon for past bad communication behaviors.

However, many communities do deal with difficult behaviors such as mistakes and misunderstandings by either forgiving or looking past problems. Early on, these groups allow and legitimize visionary members who act as project managers for the task. Their leadership helps the others see a value to the project, so members become more committed to it. The commitment that members of the four groups had with one another helped them understand that mistakes and disagreements should not act as a stumbling block to their interaction. Members of these groups chose to forgive or look past any difficult behaviors and communication. It is this critical behavior in working through problems and conflict that helps members of these groups gain experience and understanding in how to communicate with group members despite disagreements. Such an understanding moves the community to the next stage because they are then capable of negotiative practices that deepen their relationships, while discovering collective ways of thinking, approaching a problem, and developing solutions.

During the next stage, the community matures and grows in identity. Individuals gain an identity in their community through layers of participation and reification in which they negotiate meanings of who they are. When members are in such a space, they handle themselves competently. By this time, individuals have used technology skills or some other means to legitimize their competence and they are seen as such. They further their relationships and meaningful practice by helping and teaching each other with the skills they already understand or are working to comprehend. Through their time together and shared artifacts, they build up a history and shared repertoire.

For those communities that have finally achieved full participation and the ability

to negotiate, they often take time to create a shared understanding of the task and how to collectively work on it. It is both of these critical shared conclusions that boost the group's identity and understanding in having a joint enterprise. This shared understanding is also what moves the group into the next stage of production and transformation. When mature, communities often take active roles in working more collaboratively, and this is evident through spending much more time together and speaking as if they identified with the group. These behaviors help the group develop deeper relationships, while discovering collective ways of thinking, approaching a problem, and developing a solution. These more effective practices produce a high-energy cycle, resulting from more commitment, communication, and strategy. These group members develop high aspirations, which lead to higher effectiveness and higher recognition.

During this stage, communities actively take advantage of their knowledge resources to transform their practices to better produce high quality products. They achieve such ends because they have developed a system of full participation due to their mutual engagement, creation of a joint enterprise, and collection of a shared repertoire. By this time, community members arrive early and spend as much time sitting and working together as possible. Because they have developed a shared voice in the community, individuals talk and think in a collective manner by using plural pronouns, such as "we" and "us." These behaviors demonstrate that each individual considers the group's needs and opinions when discussing and working on the task. As a result, the nature of their community changes such that all fully participate in the task to negotiate and improve its development. The resulting final product has the potential to become highly effective and worthy of high praise.

How much each member identifies with and commits to their shared practice and membership in their community pushes them into either a less or more effective practice. Effective practices identify with the enterprise of making their work possible, and at least habitable, by spending more time communicating and planning their project. Their engagement in this shared practice creates a commitment to each other and to their full participation.

Once each community develops a practice of mutual engagement, joint enterprise, and shared repertoire, they transform into highly effective project production. This often results in high quality artifacts that elicit higher recognition. So the essential ingredients to an effective practice are commitment to the community and high levels of communication to mutually understand the task and strategy to plan their collective work. Communities that have had difficulty with less effective practices have the opportunity to change their behaviors by becoming more committed and spending more time talking and working on the task in order to become more effective.

<u>Limitations of the Study</u>

This model is limited by its context and method. I was given the opportunity to study group development within a classroom that attempted to simulate an authentic technology project by utilizing outside clients as stakeholders in the task. This qualitative research space is ultimately limiting in that it does not allow generalizability across all technology learning classrooms or all professional technology design teams. However, my intent has been toward transferability, an ability to gain knowledge that can be applied to similar contexts and settings. I used rich, thick description, using multiple data points, in Chapters 5 and 6 to provide the basis for a claim to relevance in a broader

context.

My research design attempted to address some of its inherent limitation by gathering enough evidence equivalent to a case study. This case study involves a detailed description of a college classroom setting and its student participants. I used the case study method to explore the bounded system of each group's sixteen week interaction, by using in-depth data collection methods, including classroom observation, audio recording of each group discussion, student interviews, group documents and files. Data collection was extensive and allowed for analysis that was holistic. The resulting analysis was meant to use rich description to better understand the themes and complexity of the system. The CPDT model is an outcome of that in-depth analysis.

In an attempt to find broader relevance, I travelled to San Francisco to observe and interview Silicon Valley Web and software designers. I discovered that many of the same communication issues that arose in this study are also present in their work. Within such a research space, I discovered that several Silicon Valley designers are highly interested in this research and would like to see how it might help explain what occurs within their technology design communities of practice.

The journey of this study has taken me from an interest in how students learn Web design work in a team-based setting to one where I see its application in the wider team-based work of professional Web and software design. I now work as a professional technology user researcher. My work involves collaborating on two different communities of practice in which we work together on large enterprise websites and mobile apps. Many of the same events within this study's model are evident within our interaction. Although my view is probably skewed from my personal experiences and

knowledge, the model from this dissertation can be easily applied to the group interactions experienced in commercial and enterprise work places. According to my experience and feedback from several well-known professional Web designers, this research can be applied to many technology-based communities.

<p style="text-align: center; text-decoration: underline;">Invitations for Future Research and Application</p>

My purposes for doing this research began with my applying team-based learning into my own practice as a teacher of ambiguous and complex technology knowledge. It seems natural that all four invitations are a call for better utilizing team-based learning in college classrooms where technology is both content and context, with one also being a call for further research. Invitation one is a request for others to research and write to update team-based learning recommendations to better address the issues with individual choices and use of technology that can impact productivity. Invitations two through four are for those who facilitate groups dealing with or learning ambiguous and complex topics. I first call for allowing or encouraging project managers to help new teams work through the initial struggles of learning to work together. Next, I recommend that instructors and project managers cue for and help group members successfully get through the two critical communication moments of working through conflict and mistakes and later coming to shared understandings about the task and how to work on it together. Finally, I ask that facilitators encourage members' high commitment to the community so they are more likely to give time and energy for the difficult communication events such as conflict and coming to a shared understanding.

Invitation One: Revise Technology Team-Based Learning

Chapter 2 described the many reasons for injecting team-based learning in higher-education classrooms and its increasing growth within those spaces. One major reason for using collaboration when learning technology is to situate learning. Such instruction is needed in design and coding classes because many professional Web designers work in groups due to the complexity and variety of knowledge required for such a project. As a result, classes teaching these skills are beginning to utilize team-based learning. For these and other complex types of classes, collaborative and team-based learning how-to books have increased in number over the past decade. These books are primarily focused on why and how to design team-based learning, without accounting for the dynamics of students due to their own choices and technology's influence.

The class described in this dissertation utilized team-based learning methods in its instructional method. Despite the instructor's best effort to put together effective teams and assignments, students in two groups did not develop enough commitment or find value in each other and the task to become a productive community of practice. Clearly, the how-to books are not representative of what occurs with some learning groups, and they fail to prepare instructors and students for the rigors of community development. I, therefore, invite researchers and teachers of team-based learning to begin addressing the issues that can arise when technology and student agency, such as those nonproductive behaviors reported in this study.

Invitation Two: Encourage Project Leaders

It takes time for each community to develop their relationship enough that they practice full mutual engagement, work on a joint enterprise, and develop a shared

repertoire. However, they are still required to produce artifacts even when not fully functioning as a team. Legitimized project leaders were important members who were early to see the potential to their group's practice. Leaders, even shared leadership, can be important to helping communities to flourish, paying close attention and fine-tuning the process as it evolves. Authentic technology projects are often difficult and complex, which often require the need for a project manager to address issues of development foster the integration of an effective knowledge system, and promote a compelling vision of the final project. Ultimately, all community members have a say in what the project will look like and how they will achieve it. The project manager is necessary to help them initially define the task during the early weeks and then keep them on task as they begin collectively working on it.

<div align="center">Invitation Three: Prepare Students for Critical Communication</div>

Critical to the development of each community are two communication events that deal with the structure of the community and task. These discussion points contribute to their ability to collaboratively produce a high quality product. First, they must learn how to communicate, despite difficulties and disagreements. As community members come together, they often have differing expectations and skills. Although those varied characteristics are a part of the synergy that a community can create, bringing them together can sometimes create clashes and difficulties among members. Community members should be taught and given the opportunity to work through difficult communication behaviors by either dealing with them or learning to forgive. They then need to find a way to move forward, despite their differences. These conversations are not always easy and can sometimes take time and restructuring, yet all members must

decide to work with one another and participate in finding a way to make it work. The potential outcome of these conversations is a growing trust and understanding of others' working and communication methods. Only by learning how to effectively communicate and work through mistakes and disagreements can a community begin negotiating for decisions and completing the task. Once they learn to use their differences to their advantage, they understand the importance of their differences.

Second, once they are able to effectively negotiate about the task, they must come to a shared understanding of what the task entails and how to work on it together. This beginning step to creating a joint enterprise only occurs once a community has developed relationships and trust structures. Once this occurs, they should take time to negotiate their mutual goals and accountability that become an integral part of the practice. This kind of growth often requires restructuring, so coming to a shared understanding about the task can become a difficult negotiation. However, their conversations in creating a joint enterprise are made easier because they are meant to make the place habitable and the task do-able for themselves. Such talk benefits their work and group development while resolving the tensions of participation, identity, and negotiation. The resulting conversation artifacts become coherence and a shared repertoire that help propel a community to transformative production.

Invitation Four: Encourage High Commitment to the Community

Clearly, commitment level to the group and task was a critical component of their success or failure. Level of commitment was most evident when group members were required to negotiate the structure of their community and/or task. Because these conversations can sometimes be difficult and take time, some students in this study were

not willing to give up time from personal needs and distractions to deal with them. Little or low commitment resulted in dysfunctional group productivity and individual work in the end. Those students who worked on the final project alone ended up expending much more effort than they would have if they took time to deal with mistakes and misunderstandings.

In contrast, members of four groups were committed enough to their community that they worked through the difficult conversations. Their resulting taskwork was fully collaborative and took much less effort and time for members than those working individually. They also experienced greater rewards from the instructor and one another because they remained committed to one another.

As I come to the close of this study, I wish to pause for a moment and reflect on the journey. This study is a collaborative effort of myself and the many research participants who generously gave insights and time to share their experiences. The rich stories told in Chapters 5 and 6 reveal the sometimes crazy and exciting behaviors that occur with a community of practice attempting to work on a highly ambiguous and complex task. I hope to rekindle the flame of research into this kind of work because with the growth of computers and team-based work, it is more relevant than ever. Although this was my intent in this work, I believe that I received more from it than I have given. The more I attempted to explain, the more I began to understand so much more. My fondest hope is that all this effort is not for wont and will demystify the process of community of practice development whether in or out of the classroom.

APPENDIX A

GLOSSARY OF TERMS

CSS: Cascading Style Sheets (CSS) is a style sheet language used for describing the look and formatting of a document written in a markup language, such as HTML.

HTML: Hyper Text Markup Language (HTML) is the "hidden" system for tagging text files to display on World Wide Web pages. A markup language is a set of tags that describes different document content.

JavaScript: JavaScript is an object-oriented computer programming language commonly used to create interactive effects within Web pages.

jQuery: jQuery is a fast, small, and feature-rich JavaScript library. It makes things like HTML document traversal and manipulation, event handling, and animation much simpler with an easy-to-use coding library that works across many Web browsers.

MySQL: MySQL is a freely available open source Relational Database Management System (RDBMS) that uses Structured Query Language (SQL). SQL is the most popular language for adding, accessing, and managing content in a database. It is most noted for its quick processing, proven reliability, ease and flexibility of use.

PHP: PHP is a server-side scripting language designed for Web development but also used as a general-purpose programming language.

APPENDIX B

EXAMPLE COURSE SYLLABUS

Comm. 5510: Advanced Web Design

Fall 2011 W 6:00-9:00 pm

Introduction

This course challenges you to communicate visually using the web. Our emphasis is on the act of designing aesthetically pleasing and usable web messages for specific user groups.

Due to the strict enrollment limit and the number of students on the wait list, REGISTERED STUDENTS MUST ATTEND CLASS ON THE FIRST DAY IN ORDER TO RETAIN THEIR SPOTS IN CLASS. Students who miss the first day forfeit their positions and must drop the class or risk earning a failing grade for the class. Those on the wait list will be added as space allows, according to COMM major status and number of credits toward graduation.

Prerequisite: Comm 3550 and completion of COMM 3500 or another "for credit" web design course.

Required Texts

- Smashing HTML5 by Sanders
- The Elements of User Experience by Garrett
- Web Design in a Nutshell by Robbins (recommended)

Other Requirements

- Email account
- Persistence in the face of adversity
- Web site hosted by the U or other host within the first week of class
- Creative thinking and attention to detail
- Beginning Photoshop and DreamWeaver ability
- A USB flash drive

Topics

- HTML5, CSS3 and JavaScript
- User Experience Design
- Developing semantically informed web pages
- Working with clients and teams

Notes

This course emphasizes use of the three core interface design languages (HTML5, CSS3 and JavaScript). This class focused on user centered design and utilizing the core languages of user interface development.

This course is an extension of the skills presented in COMM 3500. Aside from a modest review at the beginning of the semester you will be expected to be conversant will all of the basics presented in the introductory class.

If you are completely comfortable with application-based computing and learn technical concepts easily, you will probably do very well in this course as long as you keep up with

the assignments.

Students are discouraged from taking this course simultaneously with other production/design courses due to the heavy workload typically associated with such courses.

Critical Thinking & Learning by Doing

This course is designed to allow you to actively struggle with hands-on exploration of web design by working with a community client. This material is best learned by doing, you will learn more thoroughly by completing exercises that require you to work with the concepts, theories, and facts. I view my students as critical thinkers with existing and emerging knowledge. I assume you desire new methods for organizing and expressing your creativity and analyses. During the semester I expect you to take in information for analysis, synthesis, and criticism. I expect you to cogently express your analyses verbally, graphically, electronically, and in writing to your classmates and myself. In order to be successful in this class, you will need to work productively and ethically on your own and with other students.

Attendance

Due to the strict enrollment limit and the number of students on the wait list, registered students must attend class on the first day in order to retain their spots in class. Students who miss the first day forfeit their positions and must drop the class or risk earning a failing grade for the class. Those on the wait list will be added as space allows, according to COMM major status and number of credits toward graduation.

Due to the workshop nature of the course, attendance is critical to your success. Being tardy and/or absent will negatively impact your ability to keep up with the concepts presented in class. The natural consequence of missing class time will be poor performance and poor grades. Common courtesy to classmates and the professor demands on-time arrival, and hard work during class.

Students who participate in officially sanctioned University activities (e.g., marching band, debate, athletics) will be permitted to turn work in early and/or make up assignments without penalty. Official absences must be documented at least one week prior to the absence.

Professional Civility

All class members are expected to behave professionally and treat others with civility. Cellular phones must be turned off or silent during class. Students are expected to wait until after class to place and receive calls. Racist, homophobic, and sexist behavior/comments directed at class members are unprofessional and therefore inappropriate. Unprofessional behavior will be politely but immediately and firmly addressed by the professor.

Graded Components

   Skill Building Modules: 40% An extension of the in class presentations and weekly reading where you will develop a page to show mastery of the presented techniques. There will be six skill building modules assigned during the first half

of the semester.

Client site delivery: 60% Post your completed site for review by the course instructor and the client. These groups assignments throughout the semester are meant to help you apply skills taught in class and achieve milestone steps toward your final client redesign.

Project brief: 20% Further described below.
(Due: Sept 14, 2011)

HTML5 – 10% Semantic, structural and navigational markup
(Due Sept 28, 2011)

Responsive design – 10% CSS3 media queries, SVG and other "mobile first" techniques
(Due Oct 26, 2011)

Forms – 10% Markup and validation of forms. This will include the use of HTML5, CSS, and JavaScript techniques for ensuring data quality.
(Due Nov 16, 2011)

Final project presentation and delivery – 10% Present and deliver your finished product to the client.
(Due Dec 7, 2011)

Regarding late work: Assignments are due at the beginning of class on the week assigned. If your work is not complete and ready for review at that time you will not be eligible for full credit for that task. You will be allowed one week to complete the work with a 50% deduction in points available.

Diabetes Program Project Brief (20% of final grade)

The project brief is a multi-document project planning tool. Prepare the following documents and deliver them as a cohesive package. Due in class on Sept 14, 2011.

Statement of purpose: A brief document describing the goals, purpose and function the proposed site. (1-2 pages)

Audience analysis: A document describing in broad terms the intended audiences for the project. Describe the types of audiences that the site is designed to cater to. For each identified audience create a detailed persona to represent the primary users for of the site. Limit yourself to two or three personae. (4-6 pages)

Site Architecture: A document detailing the content that will be delivered on the site. Describe the rational behind the site organization. Include a site map which presents the information hierarchy. (2-3 pages)

Design guide: This document presents detailed layouts for the home page and content pages. Include with the mockups a narrative describing the theme, metaphor and rational behind the design. (3-5 pages)

Project: Diabetes Program Web Site (40% of final grade)

The Utah Department of Health diabetes program needs a new website. We will be managing the redesign. Participants in the class will be broken into design teams. Each

team will be responsible for designing and developing a new site for the diabetes program. Our client will select the design that meets their organizational constrains and best fulfills the goals for their program.

The site will conform to the following general criteria:

- Designed with a DreamWeaver template managing the look of the site
- The template must be compliant with the state Department of Health style guidelines.
- Using an original theme developed by your team
- Valid XHTML 1.0 or HTML5
- Valid CSS 2.1 or CSS3
- Original graphic design that conforms to the department of health style guide
- Maximum page size 200Kb (Including all XHTML, CSS, scripting and images)
- No broken links

Schedule

Date	Topic	Team Assignment Due
8/24	Introduction	
8/31	HTML and CSS Review Dreamweaver fundamentals	
9/7	Semantic Markup	
9/14	Structural Markup	Module 1: Client brief, including an overview of your team's proposed redesign
9/21	Navigation Code and Style	
9/28	Responsive Design	Module 2: HTML5 – Semantic, structural, and navigation of client website
10/5	Responsive Design (2)	
10/12	Fall Break – No Class	
10/19	SVG and other image tricks	
10/26	Forms	Module 3: Responsive design, including CSS3 media queries, SVG, and other "mobile first" techniques for client website
11/2	JavaScript basics	
11/9	JQuery	
11/16	Server-Side Coding	Module 4: Markup and client-side validation of contact form for client site
11/23	Form Processing	
11/30	Lab Night	
12/7	Team Site Presentation to Class	Site Presentation
12/10	Final Team Site Due	Final Client Web Application Due

APPENDIX C

STUDENT INFORMATION SHEET

Student Information Sheet

Name_____ Student ID _____

Email address _____ Age_____

Class Rank: Fresh Soph   Jr   Sr   Grad   Where Did You Grow Up? _____
Think about **your experience** in groups (formal or informal). List a group or team in which you
had (or are having):

A very good, satisfying experience_____
_____
_____

A not-so-good, unsatisfying experience _____
_____
_____

What was the **difference** between these 2 group experiences?
_____
_____
_____

List the First Names and Last Names of **people** in this class **you know and who know you:**

How would you explain your vision for success in this class?

What is your current major or degree area? _____
A psychologist named Rotter suggests that very functional people tend to fall into 2 categories:
those who approach new situations and unexpected events carefully and cautiously with a desire
to avoid making mistakes (**failure avoider**), and those who approach new situations and
unexpected events enthusiastically and energetically with a desire to seize opportunities (**success
seeker**). If you had to choose one of the terms below to describe yourself, which one would you
choose? (circle one):

        Success Seeker   Or   **Failure Avoider**

Why?

We all know that uncertainty is a pervasive part of life. But most of us also prefer less uncertainty to more uncertainty. **Tolerance for Ambiguity** is one way of talking about the natural and acceptable differences between people in dealing with uncertainty. Rate your own level of **tolerance for ambiguity** on the scale below:

O is NO tolerance for ambiguity and **6 is TOTAL tolerance for ambiguity**

0_____1_____2_____3_____4_____5_____6

List one or two **musical artists or groups** or a **kind of music** that you most enjoy?

Eventually, everyone in this class will participate in one or more lines of work that could be called "**a career**." Making a career decisions usually involves prioritizing a number of different and important values.

Please rank order (1 to 5) the following values that you use or would use in making career decisions (from **1 = most important to me** to **5 = least important to me**):

_____ Flexibility, Personal/Lifestyle Freedom

_____ Money, Financial Benefits

_____ Satisfaction, Personal Enjoyment

_____ Significance, Value of the Work

_____ Social Status, Prestige

Please rank your preference for the following website creation responsibilities.

_____HTML/CSS

_____JavaScript/JQuery

_____Server-Side Coding

APPENDIX D

EXAMPLE FIELDNOTE

Comm 5510 Fieldnotes

Wednesday, November 28, 2012

5:40PM

Alex arrived at the door and I let him in through the department doors. He then went into the classroom and I went back to my cubicle to gather my technology and bags meant for note taking.

When I moved into the classroom about 5:45PM, I noticed that some students were coming in and sitting in different seats (unusual for this group) that were closer to teammates. This is the second to last class of the semester, and they were to work on a final project due in two weeks. Their previous group assignment had been due on November 14, before the Thanksgiving holiday. In fact, there was not class last week because it was meant to be held on Thanksgiving Eve, and Alex sees class held that night as impossible for students wanting to spend the next day with family.

6PM – Beginning of Class

Alex started the class on time and asked for questions. He also put on the board:

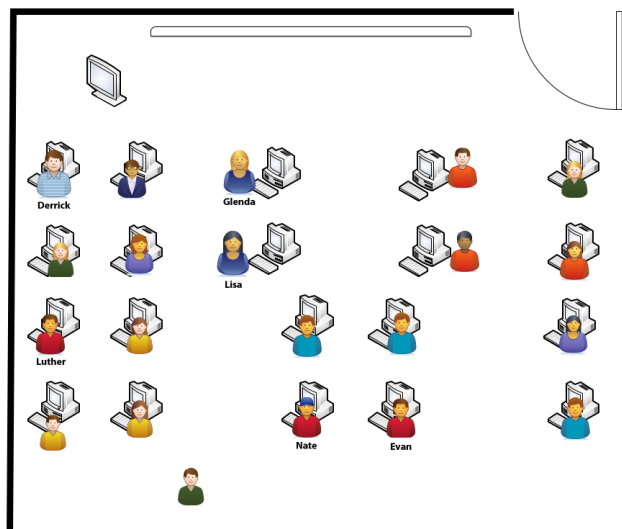- Questions
- The Final
- PHP/MySQL

Figure 1: Initial Student Seating

Alex asked for questions and there were none. During this time, I handed out surveys to each team and asked them to return to me.

Many of the students were sitting as close to team members as possible in this difficult classroom. The following diagram indicates differing seating positions from previous weeks.

Alex's project specification included the following information. He posted this on the screen first.

<div align="center">

Bucky Burger – The online order site

</div>

Background

An idea for a new online hamburger ordering site is being explored. Your team has been asked to develop a working prototype and "look & feel" for the site.

Concept

"Bucky Burger" is a web site for ordering hamburgers for pickup. The idea is that as people's lives get busier, they want to order their dinner over the computer or smartphone. The initial phase calls for a web page that allows a user to view all possible hamburgers as well as provide a way to order for later pickup.

Requirements

Build a single page that both displays as well as receives submitted orders. The menu section must show all possible hamburgers for sale and potential addons. The form must collect all of the following information: name, contact information, date and time of pickup, menu item, number of patties, and potential addons (cheese, mushrooms, onions, ketchup, and mustard).

Technical Details

- The order view needs to show all details

- This needs to be a "single-page application." Form and data display are on the same page

- The form needs to be in "first view"

- Form method: POST

- All form fields are required

o database server - mysql.xxx.org

o database: xxxstudents

o user: xxxstudents

o password: xxxStudent

- Select statement - "SELECT * FROM quote ORDER BY id DESC"

- Insert statement - "INSERT INTO burger (name, burger, addons) VALUES ([name], [burger], [addon])"

- HTML5, CSS3, jQuery are the required UI languages

Design Requirements

The project sponsor is looking for a site that has a classy but memorable look. Design an original logo, color and typographic scheme for presenting the quotes. Provide a clean and simple form for allowing users to add an order.

As Alex discussed this assignment, students were sitting on their own, many with computers on in front of them. Several had Canvas open with the rubric/assignment open. Others were looking at Facebook (Zack and Michael).

Soon after explaining the requirements, several students asked to see an example. Alex then showed an example of a form that submits to a database.

Analog

The Quote Archive

Haste makes waste.

—Benjamin Franklin

Contributed by: Luke Jensen

Quote

Author

Submitted By   Submit

Figure 2: Browser view of MySQL Quotes form (final project)

The code for this page was given to me by Alex. I changed the db connection statement so it would talk to my database and render in the browser without an error.

```php
<?php
    $con = mysql_connect("mysql.xxx.org","xxxstudents","xxxStudent");
        mysql_select_db("xxxstudents",$con);
        if (!$con)
        {
                die('Could not connect: ' . mysql_error());
        }
```

```php
if(isset($_POST['quote']) && isset($_POST['author']) && isset($_POST['contributor'])){
    $insertSQL = "INSERT INTO quote (quote, author, contributor) ".
        "VALUES ('".$_POST['quote']."', '".$_POST['author']."',
        '".$_POST['contributor']."')";
    mysql_query($insertSQL);
}
$getSQL = "SELECT * FROM quote";
$quoteArray = array();
$rs_quotes = mysql_query($getSQL,$con);
while($row=mysql_fetch_assoc($rs_quotes)){
    $quoteArray[] = array(
        quote => $row['quote'],
        author => $row['author'],
        contributor => $row['contributor']
    );
}
?>
<!DOCTYPE html>
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
    <meta http-equiv="Content-Type" content="text/html; charset=iso-8859-1" />
<meta name="keyword" content="Form, Demo, Comm 5510, Advanced Web Design">
<meta name="description" content="Form Module for Comm 5510. Working with forms, jQuery
and more CSS">
<link href="style/module3.css" type="text/css" rel="stylesheet">
    </head>
<body>
<div id="wrapper">
<div id="header">
  <h1>Analog</h1>
</div>
<section id="quotes">
        <h3>The Quote Archive</h3>
<?php for($i=0; $i<count($quoteArray); $i++){ ?>
        <blockquote><?php print $quoteArray[$i]['quote']; ?></blockquote>
        <p>&mdash;<?php print $quoteArray[$i]['author']; ?></p>
        <p><b>Contributed by</b>:        <?php print $quoteArray[$i]['contributor']; ?></p>
<?php } ?>
        </section>
        <section id="form">
                <form id="quoteForm" method="post" action="quote.php">
                        <label for="quote">Quote</label>
                        <textarea name="quote" cols="24" rows="6"></textarea><br>
                        <label for="author">Author</label>
                        <input type="input" name="author" value=""><br>
                        <label for="contributor">Submitted By</label>
                        <input type="input" name="contributor" value="">
```

```
                    <input type="submit">
              </form>
         </section>
         </div>
      </body>
      </html>
```

Bryce asked to see the code, and Alex said no because that would give away the answer to the final assignment. Instead, he then showed a browser rendering of a contact list using a small form on the page to enter more data.

Comm 5510 Roster

Name	Class	Major
Ray Dahl	Other	Communication M.S.
Laura Dahl	Graduate Student	Communication Ph.D.

Name [ ]
Class [Freshman ▲▼]
Major [ ]
[Submit]

Figure 3: Rendered code for roster demo page

Alex told the students that this is a working form and all students were welcome to come up to his machine and add their own information. This is when a couple of students asked him to add their information. Alex then entered two students into the form (one at a time), and the list grew to four names. The important characteristic of this demonstration was to show that the list updates as each new entry is submitted to the database. The PHP page uses an if statement to check if variables must be submitted, and it also selects all data from the table and displays it in the body tag.

He then showed the code for this page in order to teach the MySQL and PHP required for the functioning of this page.

```php
<?php
        $con = mysql_connect("mysql.xxx.org","xxxstudents","xxxStudent");
              mysql_select_db("xxxstudents",$con);
              if (!$con)
              {
                            die('Could not connect: ' . mysql_error());
              }

        if(isset($_POST['name']) && isset($_POST['year']) && isset($_POST['major'])){
              $insertSQL = "INSERT INTO roster (name, year, major) ".
                     "VALUES ('".$_POST['name']."', '".$_POST['year']."',
'".$_POST['major']."')";
              mysql_query($insertSQL);
        }
        $getSQL = "SELECT * FROM roster";
        $rosterArray = array();
```

```php
$rs_roster = mysql_query($getSQL,$con);
while($row=mysql_fetch_assoc($rs_roster)){
                                    $rosterArray[] = array(
name => $row['name'],
year => $row['year'],

    major => $row['major']
);
}
?>
```

```html
<!DOCTYPE html>
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
        <meta http-equiv="Content-Type" content="text/html; charset=iso-8859-1" />
<meta name="keyword" content="Form, Demo, Comm 5510, Advanced Web Design">
<meta name="description" content="Form Module for Comm 5510. Working with forms, jQuery
and more CSS">
<link href="style/style.css" type="text/css" rel="stylesheet">
        </head>
<body>
<div id="wrapper">
<div id="header">
<h1>Comm 5510 Roster</h1>
</div>
<section id="roster">
                <table>
                        <tr>
                                <th>Name</th>
                                <th>Class</th>
                                <th>Major</th>
                        </tr>
<?php for($i=0; $i<count($rosterArray); $i++){ ?>
                        <tr>
                                <td><?php print $rosterArray[$i]['name']; ?></td>
                                <td><?php print $rosterArray[$i]['year']; ?></td>
                                <td><?php print $rosterArray[$i]['major']; ?></td>
                        </tr>
<?php } ?>
                </table>
                <form id="rosterForm" method="post" action="roster.php">
                        <label for="name">Name</label>
                        <input type="input" name="name" value=""><br>
                        <label for="year">Class</label>
                        <select name="year" id="year">
                                <option value="Freshman">Freshman</option>
                                <option value="Sophomore">Sophomore</option>
                                <option value="Junior">Junior</option>
                                <option value="Senior">Senior</option>
```

```
                                    <option value="Graduate Student">Graduate
Student</option>
                                    <option value="Other">Other</option>
                        </select><br>
                        <label for="major">Major</label>
                        <input type="input" name="major" value=""><br>
                        <input type="submit">
                </form>
            </section>
            </div>
        </body>
        </html>
```

Alex explained they could use this example code for their final, but they would need to edit the SQL and variables to match their hamburger data. Alex encouraged students to ask questions because this information is "prudent" and needs to be known. Only Drew asked a question at this point. Many students had downloaded this file and began to update it to connect to my database and to change the code for their final group assignment.

Group time – 7:30PM

Alex announced that students were to spend the rest of class time working on their final assignment. Because this was meant as a group project, he wanted to give them the opportunity to work together in class.

In the beginning of this period, all present students moved together and formed groups.
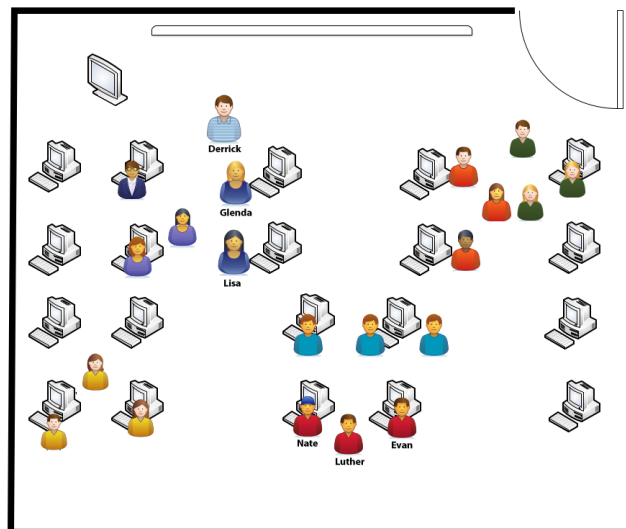

Figure 4: Grouping positions

Although all the students initially grouped in class, not all were committed to working in class. This was often demonstrated by the student standing. For example, Jenna walked over toward Jeremy and Drew to talk with them. She stood while talking with them.

Figure 5: Standing Carly and Derrick

Carly's team also moved close together and talked a while and soon they all left the class. They did not work together in class.

Derrick, of Razzmatazz, also demonstrated a lack of class work commitment. He stood next to Gabbi and Lisa while they talked about their project. After about ten minutes, he also left for the night while Gabbi and Lisa worked on the design aspects of the final assignment. Gabbi and Lisa told me later that they were working on design and CSS, and Derrick was to work on the PHP and MySQL code. Derrick must have assumed they needed to create the page first, and then he would update the smarts of the page later.
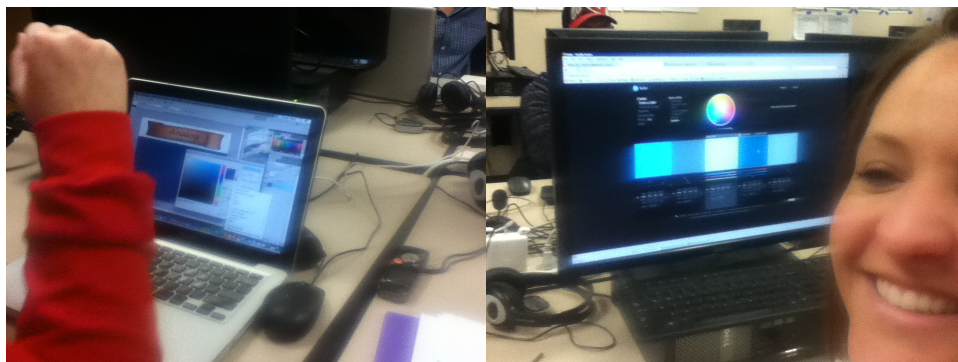
As Gabbi and Lisa stayed throughout the rest of class (until 9PM), their computers reflected the work they were doing as they discussed how they would design the page. Gabbi had Photoshop open on her computer while she worked with a scroll they were discussing for the page header, with the text "Analog." She was preparing an image

for the site. She also usually works on the CSS. Lisa was looking at a Kuler swatch on her screen; she was discussing the colors they should use on their page as related to the scroll image of the header. I also heard her discuss the fonts to be used on the site, and she agreed to find a Google font that would help dress up and be appropriate for this web page.

Team Razzmatazz Discussion

The ladies worked on CSS while making decisions on colors and fonts

Lisa: Flipped it upside down, er, rotated it and then stretched it.

Gabbi: Maybe we can stretch it a different way. That's OK. So I deleted it because I was a ding dong. I always to this to myself. Oh there it is. OK good. Whew! Save image as...and then um I'll just hit save. And then I'll open it in uh...

Lisa: I do well I kinda like the rolling parts at the end though, huh?

Gabbi: Yea. I think it looks really good so let's just let's manipulate that specific image so I'm gonna go here...Open. So there's that. So let's get rid of the white. Right?

Lisa: Um hmm

so what do we want the background color to be?

Gabbi: So OK that's our basic. That's the basic premise. So with that what do we want the background color to be?

Lisa: Do you like this Japanese scroll? Or do we need more color? So is it too bold?

Gabbi: Yea, it's may be. It is really soothing.

Lisa: Yea? I'm afraid those browns are going to conflict, though.

Gabbi: Yea.

Lisa: Almost need to stay away from the browns but still be neutral.

Gabbi: Um hmmm

Lisa: Our neutral colors almost need to have a tint that isn't brown (laughing) like a bluish gray

Gabbi: Yea

Lisa: ...or something

Lisa: Do we want to go back to something bright?

Gabbi: I don't think so.

Lisa: K

Gabbi: Not with...

The Ladies made a decision about placing and styling the form

where do we want the form?

Gabbi: Where do we want the form? Do we want the form like we talked about to be on the right?

Lisa: I think so.

Gabbi: And this will, and then it will wrap around that?

Lisa: Um hmmm

Gabbi: OK so what what do we want the background of the form to just to be white or do we want it to be what's another... oooh well...are...I think we're already using...OK...

Lisa: Yea. These are, these are our colors we're using.

Gabbi: OK

Lisa: ...pretty much

Gabbi: Yea. So do you want to do...what other color do you want to do?

Lisa: Oh, we could even stray away from a blue and do like a...

Gabbi: um huh

Lisa: Pink or like a purple? A deep purple...backdrop and then like a...um like a lighter color in the center?

Lisa: Maybe like even a purply pink? Like a fuchsia looking...? What do you think?

Gabbi: We'd have to make it pretty transparent like here.

Lisa: Yea, and just make it a...

Gabbi: More opaque?

Lisa: Like trans...yea.

Gabbi: Oh yea. (simultaneous)

Gabbi: OK so just make the opacity different.

Gabbi: Do you want to write this one down?

Lisa: yea.

Gabbi: It's 153,30,164.

Lisa: K

Gabbi: So I mean that's the...and these will keep alternating down. I don't know if purple goes.

Lisa: I don't know either.

Gabbi: We could just do like a cream.

Lisa: Yea. Something that will still go with that lighter brown.

Gabbi: Yea.

Lisa: What if we just found a lighter brown like that?

Gabbi: I think that would look nice.

Lisa: What if we take that image and throw it into Kuler?

Gabbi: Yea, let's do that. Oh I can do that right here...I can take a sample. Where is the sample thing? There it is. Which part? This dark brown, this part?

Lisa: Kind of in there? [pointing]

Gabbi: There we go. And change this color.

Lisa: Maybe a little darker...kind of like in there [pointing]

Gabbi: Like right here?

Lisa: Yea

Gabbi: That's (incomprehensible)

Lisa: Yea...but I'm almost thinking it's the purple might be a good contrast but...hmmm

Gabbi: Let me get this opacity back up. That looks really nice.

Lisa: Yea it does.

Gabbi: Kind of breaks it up.

Lisa: It does.

Gabbi: And maybe these can be even more opaque...you know?

Lisa: Yea. I'm thinking like a super subtle...

Gabbi: Just really subtle.

Lisa: Yep

Gabbi: Barely barely...um even more than that really...Maybe just 10%. And then I'll go...yea that looks better.

Would you all like a nut?

would you like a nut? and what tasks will happen over the next week

Gabbi: Would you like a nut?

Lisa: Sure.

Gabbi: Would you like a nut?

Laura Dahl: I'm allergic to nuts.

Gabbi and Lisa: Oh bummer

Gabbi: I don't want to make you allergic [pulling the bag closer to her body]. We won't touch your thing then.

Lisa: Thank you

Laura Dahl: I developed an allergy to nuts in my 30s. Shocked me.

Lisa: Hmmm

Gabbi: Well, you know what I developed an allergy for recently? Gluten, eggs, milk.

Laura Dahl: That's awful

Gabbi: Um, cranberries, sesame seeds.

Lisa: wooh

Laura Dahl: So you depend on nuts.

Gabbi: They're my life.

Laura Dahl: Yea

Gabbi: I have almond milk, almond everything, you know? If I got allergic to these, I'd don't...I think I would just like die. [crunch]

Quick Change in Conversation to Wrapup and Responsibilities

Lisa: Hmmm

Lisa: I don't know. I can play with this then.

Gabbi: OK you play with that. You play with the font. The fonts for each thing. For the...

Lisa: K

Gabbi: I'll mess with this a little bit more to try to get colors for...and I'll put the...you know the form in and the...do you know what I'm saying to make...you know once you give me the things then I'll...the fonts, sorry. [eating]

Lisa: OK

Gabbi: Brain not working.

Lisa: I know mine's starting to turn off, so...

Gabbi: And then I will mess with this, this image and I'll make it work.

Lisa: OK

Gabbi: So, or make one so that it doesn't go so fat. And I'll figure it out. I'll figure out the image part, 'cause I'm good, I can do that.

Lisa: OK

Gabbi: And then do we want something...

Lisa: Unless you know a trick, when we scrunch it.

Gabbi: It goes fat.

Lisa: We don't want that to go fat.

Laura Dahl: Redraw it.

Lisa: Yea. That's what I'll do...I'll just trace it. What can you trace on? Can you trace on...uh AI right?

Laura Dahl: Yea. Illustrator.

Gabbi: Illustrator (simultaneous)
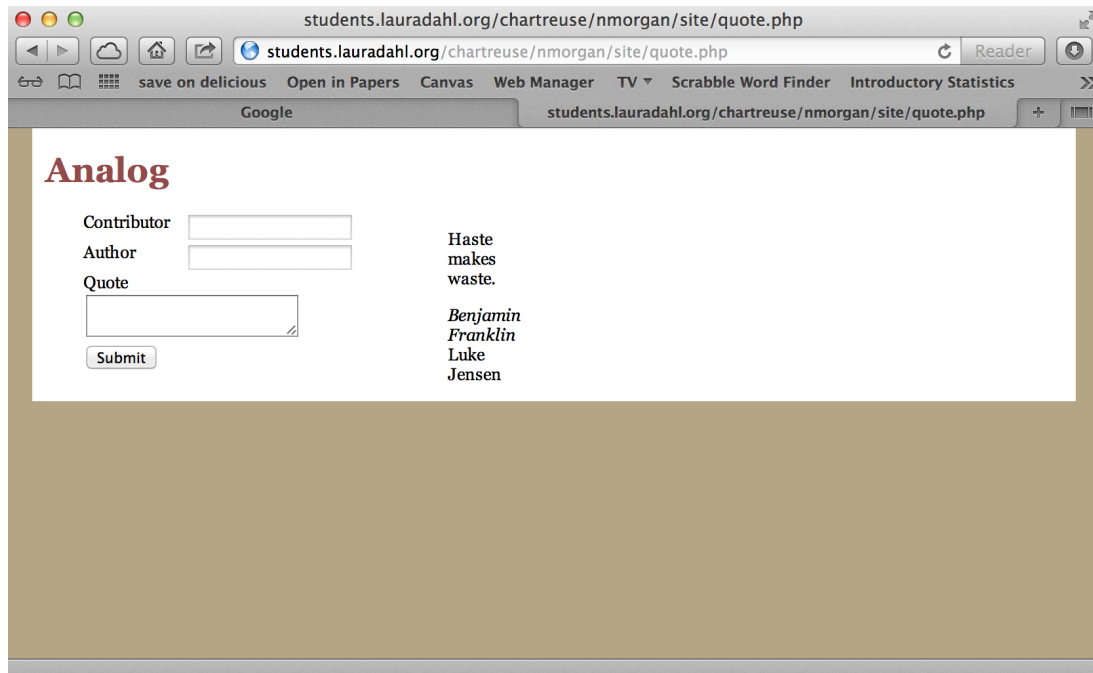
Team Chartreuse

Figure 6: Joshua's team and Team Chartreuse stayed to work

Joshua's team stayed to work on their project throughout the remainder of the class, as did Team Chartreuse. Luke had moved his computer and grabbed my uncomfortable seat in order to sit with his teammates. All three team members had their macs open in front of them, but their interaction with their computers and other team members differed a great deal. I never saw Everest with his screen on throughout the 1.5 hours they were working on their assignment. I have to wonder how much work he does on assignments, and if he loafs on assignments a bit. I did, however, see Luke's computer with Coda and code open. Any questions he asked regarded the MySQL connection and any PHP code. Furthermore, Nick had Photoshop open with a wireframe proposal of what the page would look like. He kept that image up on his computer throughout the entire group time, and he and Luke used it when they discussed the code that Luke wrote throughout the class.
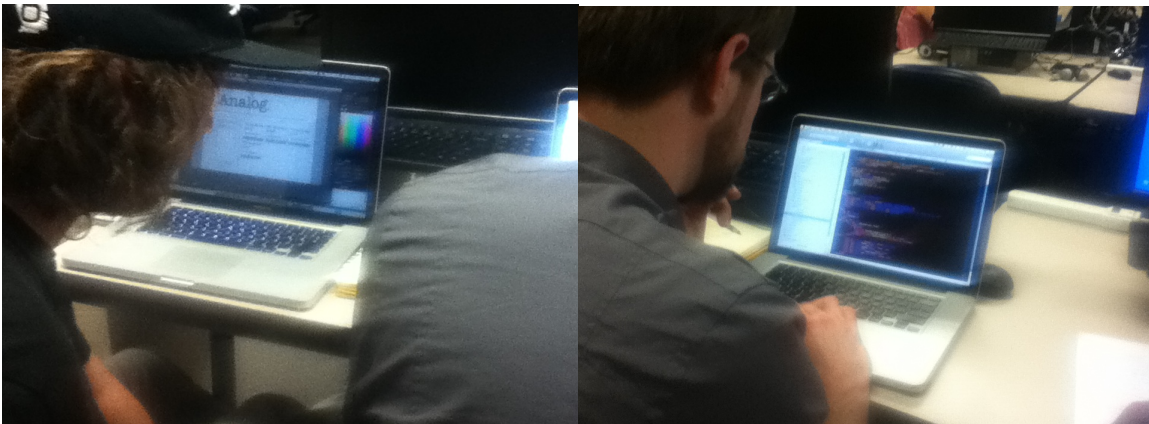
Because only Luke worked on the code at this time, they were able to build the very basics of the page. However, the page does not yet succeed in submitting new data

to the database.

Team Chartreuse Discussion

Nate: I think I went through and pretty much filled everything out with our new stuff as he was talking.

Luke: Oh yea? Cool.

Nate: Do you want to look at that? Um I can't...I don't know what the deal is like I can't connect to this SQL server, though. SQL probably...I can't connect, so I don't know how to like check anything but...

Luke: I found it hard to stay awake when he was talking.

(laughing)

Evan: I wasn't fully successful.

Nate: Yea. K so like as far, so what do we, well what do we really need to tackle as far as this goes? This PHP?

Luke: Uh, PHP, JavaScript,...I guess first the form? The HTML...the PHP to...connect with the SQL database.

Nate: K

Luke: ...and...also print out the results.

Nate: K

Luke: Then the JavaScript to validate and the CSS to style.

Nate: K

Luke: I mean that's four different tasks or...

Nate: Ooook. Are we uh...are we putting everything on that same server that we were using for our last project?

Laura Dahl: Oh yes, because you've gotta run PHP.

Nate: K

Laura Dahl: So yes.

Nate: MmmK

APPENDIX E

INTERVIEW GUIDE

Interview Guide

1. Please describe your own participation in the team project.

2. What were the processes used by your group to plan and complete your project? Why?

3. What experiences, in class and outside of class, where most useful in planning and accomplishing the task?

4. Did you prefer to have group discussions inside or outside of the classroom? Why?

5. When you interacted in class, did the classroom layout make it difficult to have discussions and work together?

6. When did you feel like you were in a working team?

    a. Did it happen all at once or was it gradual?

    b. What events precipitated this feeling?

7. How did working in a group affect your work this semester?

8. How have you felt about group work in this class?

APPENDIX F

CODE BOOK

Group Identity

Global	
Complex and difficult task	52
Excuses_interfere	3
Fear	4
Individualized work	29
Many tasks	18
Mistake	22
No_relationship	2
Not remember	8
Personal_needs	21
Self-disclose	12
Technology Distraction	15
Uncomfortable	9
Unknown	28
Will Not Do	8
Local	
Expectations	1
Group role	7
Groupness	20
Relationship	38
Seating together	4
Sharing info	17
Sitting together	36
Teaching	30
Trust	3

Decision Making and Collaboration

Dominant Member	
Competitive	3
Continue idea	18
Cooperative	48
Describing	17
Designing	5
Discovering	34
Do Whatever - Letting Go	14
Individual choice	3

Interpreting	27
Leadership	31
Misunderstanding	13
No participation	76
Not listening	5
Organization	17
Representing	3
Task responsibilities	29
Voting	2
All Members Participate	
Alternatives	21
Arrange_to_help	4
Change_idea	2
Collaborative	65
Communicate	22
Conflict	10
Group decision	34
Meeting setup	20
Negotiation	45
New idea	47
Producing objects(s)	96
Share the load	24
Voice	11

APPENDIX G

MATRIX REPORTS

Global Identity Matrix Report

	Forming	Conflict and Unrest	Group Identity & Norms
Complex and difficult task	1	52	6
Excuses_interfere	3	0	0
Fear	4	2	0
Individualized work	29	4	1
Many tasks	0	18	2
Mistake	2	22	6
No_relationship	2	0	0
Not remember	0	8	0
Personal_needs	21	3	3
Self-disclose	0	12	2
Technology Distraction	6	15	0
Uncomfortable	0	9	1
Unknown	0	28	2
Will Not Do	0	8	3

Local Identity Matrix Report

	Forming	Conflict and Unrest	Group Identity & Norms
Expectations	0	1	0
Group role	0	0	7
Groupness	2	6	20
Relationship	1	2	38
Seating together	0	0	4
Sharing info	0	2	17
Sitting together	0	0	36
Teaching	1	30	1
Trust	0	0	0

Dominant Member Decision Making

	Forming	Conflict and Unrest	Group Identity & Norms
Competitive	3	2	0
Continue idea	0	3	18
Cooperative	2	7	4
Describing	0	17	3
Designing	0	5	0
Discovering	5	34	14
Do Whatever - Letting Go	0	14	0
Individual choice	0	3	0
Interpreting	1	9	27
Leadership	0	31	8
Misunderstanding	1	13	1
No participation	4	76	12
Not listening	0	5	1
Organization	0	4	17
Representing	0	3	0
Task responsibilities	0	5	0
Voting	0	2	0

All Member Decision Making

	Forming	Conflict and Unrest	Group Identity and Norms
Alternatives	0	9	21
Arrange_to_help	0	0	2
Change_idea	0	1	2
Collaborative	0	8	65
Conflict	0	10	0
Group decision	0	7	4
Meeting setup	0	1	20
Negotiation	2	8	2
New idea	0	10	47
Producing objects(s)	0	19	13
Share the load	0	4	3
Voice	1	11	4

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