CONNECTING CREATIVITY, TECHNOLOGY, AND COMMUNITIES OF PRACTICE:
EXPLORING THE EFFICACY OF TECHNOLOGICAL TOOLS
IN SUPPORT OF CREATIVE INNOVATION

by

Julie Sildé Dixon

A thesis submitted in conformity with the requirements
for the degree of Doctor of Philosophy
Graduate Department of Curriculum, Teaching, and Learning
Ontario Institute for Studies in Education
University of Toronto

© Copyright by Julie Sildé Dixon 2010
Creativity is increasingly becoming both an important issue in our rapidly changing society, and a popular subject of research. Research findings are beginning to conceptualize creativity as a much more complex process and studies are now focusing on the effects of social interaction and collaborative efforts on creativity as well as the potential impact of technology on collaboration and the creative process itself.

This study looks at the influence of both collaboration and technology on the creative process to develop a clearer picture of the way in which they intersect. Due to the complexity of this study, two theoretical frameworks (Communities of Practice and Genex Framework) have been employed to inform the development of the study and to assist in contextualizing the results.

To this end, this mixed-methods study collected data both from fashion design students enrolled in the third year of a Bachelor of Fashion Design program, and from their faculty. Data gathering methods included personal semi-structured interviews.
with both students (n = 13) and faculty (n = 9) and an online questionnaire with a larger group of students (n = 65).

The research questions that framed this study focus on developing an initial understanding of the creative process as experienced by these students and then exploring in depth the ways that collaboration and working in community affect the creative process, as well as the impact of technology in supporting both creativity and collaboration.

Results suggest that technology was indeed a valuable support in the creative process through its ability to facilitate particular kinds of collaborative practices, including brainstorming, developing and sharing ideas, and giving and receiving feedback. Such practices directly affected the creative process by enhancing the development of more professional sketches as well as facilitating the collaborative efforts of the members of the design community.

Finally, the implications of these results for curriculum design and the appropriate choice of pedagogical approaches are discussed. The results presented will help to support curriculum designers and instructors who seek to encourage creative endeavour to focus on effective technological tools as well as strategies that promote collaboration and a sense of community in order to achieve these ends.
Acknowledgements

I am indebted to the following special people:

My committee Clare Brett, Rubén Gaztambide-Fernandez, and Shelley Stagg-Peterson for all their help and support and to Sandy McAuley, the external examiner, for his insights, thoughtful suggestions, and for taking the time to appear in person at the oral!

To the many friends and colleagues who constantly expressed their curiosity in this work, for encouraging me in seeing it through to fruition, and who looked forward to celebrating its completion.

I am especially indebted to my friends Bernie and Jim, learning partners and companions who have accompanied me on this long journey of learning. Without you both this project would never have come to fruition. Stick with it guys, we will soon be three for three!

I owe much to Doug—my husband, partner, and mentor. This would not have been possible without you.

Thank you all.
Power over: Faculty. .......................................................... 214
Group dynamics. ............................................................. 216
Roles in Communities of Practice. ....................................... 217
Need for group or community facilitator. ............................ 219
Gaining consensus within the community. ............................ 220
Theoretical implications of the Genex framework. ................. 222
Searching and browsing digital libraries. ............................ 222
Consulting with peers and mentors. .................................... 222
Visualizing data and process. ............................................ 224
Thinking by free associations. .......................................... 224
Exploring solutions: What-if tools. ................................... 224
Composing artefacts and performances. .............................. 225
Reviewing and replaying session histories. .......................... 225
Disseminating results. ..................................................... 225
Implications for Practice. ................................................ 226
Implications for curriculum design. ................................... 228
Implications for teaching. .............................................. 234
Implications for learning. ............................................... 237
Limitations to the Study .................................................. 237
Directions for Future Research .......................................... 239
References ........................................................................ 240
List of Tables

Table 1 Social Creativity: Turning Barriers into Opportunities for Collaborative Design ....... 21
Table 2 Differentiating Communities of Practice and Communities of Interest .................. 34
Table 3 Potential Threats to the Validity of Sequential Designs in Mixed Methods Research .. 45
Table 4 Developmental Stages of Creativity Research Study Questions ................................. 50
Table 5 Developmental Stages of Collaboration Research Study Questions ......................... 52
Table 6 Developmental Stages of Technology Research Study Questions ............................. 54
Table 7 Creativity Variables and Related Questions ....................................................... 58
Table 8 Collaboration Variables and Related Questions .................................................... 59
Table 9 Technology Variables and Related Questions ....................................................... 60
Table 10 Comparison of Group Work Responses ............................................................ 102
Table 11 Comparison of Views of Collaboration Responses ............................................. 112
Table 12 Comparison of Views on Feedback .................................................................... 122
Table 13 Comparison of Responses on the Benefits of Collaboration ................................. 128
Table 14 Comparison of the Responses on the Issue of Collaboration for Idea Development 131
Table 15 Comparison of Responses in Questions Relating to Technology uses in Creative Work ...................................................................................................................... 165
Table 16 Comparison of Responses to Questions about Comfort Levels in Using Technology 171
Table 17 Comparison of Responses to Questions About the Affects of Technology on the Creative Process and Product ............................................................... 178
Table 18 Number and Percentage of Questionnaire Items in the Category Agree Compared to All Categories ........................................................................................................ 194
Table 19 Number and Percentage of Questionnaire Items in the Category Neutral in Comparison to all Categories .......................................................... 195
Table 20 Collaborative and Technological Supports for Creativity ....................................... 198
Table 21 Number and Percentage of Questionnaire Items in the Category Agree in Comparison to All Categories .......................................................... 203
Table 22 Number and Percentage of Questionnaire Items in the Category Neutral in Comparison to all Categories .......................................................... 204
Table 23 Number and Percentage of Questionnaire Items in the Category Disagree in Comparison to all Categories .......................................................... 204
Table 24 Comparison of Collaboration Data, Communities of Practice, and Interest ............. 213
Table 25 Comparison of Technology Data and Genex Framework ........................................ 223
Table 26 Creativity in the context of learning and teaching: Five foci ................................. 232
List of Figures

Figure 1. Boundary objects: Understanding and sharing across different domains ............. 19
Figure 2. Overview of research process ................................................................. 39
Figure 3. Graphic overview of the two phases of the exploratory design ....................... 44
Figure 4. Responses to the question “Creative inspiration comes from external sources.” ... 72
Figure 5. Responses to the question “Receiving feedback from peers is important in my creative work.” ............................................................................................................. 76
Figure 6. Responses to the question “Receiving feedback from teachers is important in my creative work.” ............................................................................................................. 77
Figure 7. Overview of the faculty who fell into the three schools of creative thought ...... 90
Figure 8. Responses to the statement “Group work is an important part of the creative process.” .......................................................................................................................... 99
Figure 9. Responses to the statement “I enjoy collaborating on creative projects.” ....... 99
Figure 10. Responses to the statement “Working in groups stifles my creativity.” ......... 100
Figure 11. Responses to the statement “A sense of trust is important to be creative in a group.” .......................................................................................................................... 100
Figure 12. Responses to the statement “Creativity is an individual versus collaborative process.” .......................................................................................................................... 107
Figure 13. Responses to the statement “Working alone increases my level of creativity.” .... 107
Figure 14. Responses to the statement “The final product benefits from collaboration.” .... 108
Figure 15. Responses to the statement “Working in groups stifles my creativity.” ........ 108
Figure 16. Responses to the statement, “Receiving feedback from peers is important in my creative work.” ............................................................................................................. 119
Figure 17. Responses to the statement, “Receiving feedback from teachers is important in my creative work.” ............................................................................................................. 120
Figure 18. Responses to the statement “I learn and develop creatively when collaborating with others.” .................................................................................................................. 126
Figure 19. Responses to the statement “The main benefit to collaborating is getting more work done.” .................................................................................................................. 127
Figure 20. Responses to the statement “Collaborating is a great way to spark new ideas.” . 130
Figure 21. Responses to the statement “Creative inspiration comes from external sources.” 131
Figure 22. Responses to the statement “Computer technology is helpful in collaboration.”. 143
Figure 23. Responses to the statement “Computer technology is a full partner in the creative process.” .................................................................................................................... 149
Figure 24. Responses to the statement “Better technology tools are needed to support creativity.” ....................................................................................................................... 150
Figure 25. Responses to the statement “Computer technology restricts my creativity.” ..... 150
Figure 26. Responses to the statement “Computers and technology tools add to my creativity.” ............................................................................................................................. 151
Figure 27. Responses to the statement, “I usually begin the creative process online.” ....... 161
Figure 28. Responses to the statement, “I use computers and computer technology in all phases of the design process.” .................................................................................... 162
Figure 29. Responses to the statement, “Computer and technology tools are appropriate for only some of the creative process.” ............................................................................ 162
Figure 30. Responses to the statement, “I prefer mechanical tools such as pencil and water colours when being creative.” ...................................................................................... 163
Figure 31. Responses to the statement, “I am comfortable with most computer technology and software.” ............................................................................................................. 169
Figure 32. Responses to the statement “I need to develop better computer related skills to use technology more effectively.” ............................................................... 170
Figure 33. Responses to the statement, “Computers and technology are value tools in the creative process.” ................................................................. 176
Figure 34. Responses to the statement “The use of computer tools changes the creative process. ................................................................. 177
Figure 35. Responses to the statement “The use of computer tools changes the final outcome of the creative process” ................................................................. 177
Figure 36. Graphic representation of the relationships between creativity, collaboration, and technology. ................................................................. 207
Figure 37. Conceptual map of creativity in learning and teaching. ................................................................. 231
List of Appendices

Appendix A  Letter of Introduction (Students) ................................................................. 248
Appendix B Letter of Introduction (Professors) ............................................................... 250
Appendix C Information Letter and Informed Consent Form ........................................... 252
Appendix D Interview Questions for Students ................................................................. 255
Appendix E Interview Questions for Faculty ................................................................. 257
Appendix F Written permission from Sage Publications ............................................... 258
Appendix G Written permission from G. Fischer ......................................................... 259
Appendix H Written permission from P. Kleiman ......................................................... 260
Appendix I Samples of presentation boards ................................................................. 262
Chapter One

Introduction and Purpose of the Study

Human creativity represents an enigma to the research community: it is all but impossible to describe the process in unequivocal terms, yet there is a strong desire to promote and encourage this uniquely human activity. Within the realm of human-computer interaction, the challenge is to understand in what ways technology can enhance the creative process. (Mamykina, Candy, & Edmonds, 2002, p. 96)

Current research on the creative process is beginning to paint a more complex picture of creativity, highlighting the importance of social interaction and collaboration in creative work and developing collaboration models and tools as ways to bring individuals together in community to support the creative process. While there is a large body of research and support for the fact that technological tools can effectively support social learning theories and assist in the development of effective learning communities, few studies have examined the ways in which community might support creativity, and fewer still have explored the impact of technology on the creative process. There is a paucity of research in this area with few empirical studies; for the most part the work has been speculative with researchers hypothesizing about how technology might support the creative process (Edmonds, Weakly, Candy, Fell, Knott, & Pauletto, 2005; Fischer, Giaccardi, Eden, Sugimoto & Ye, 2005; Johnson & Carruthers, 2006; Shneiderman et al., 2006; Zhang & Candy, 2007).

Following a comprehensive series of studies on creativity enhancing technologies, Edmonds et al. (2005) point to a concern in understanding the opportunities and limitations of computer technology for creativity, “a key question that the research from the creativity research community does not answer is whether or not the use of computer tools makes a difference to the process or its outcomes or both” (p. 455). They go on to say that while the use of computers in the creative process is well recognized, the true value of computers in enhancing creativity is still often unclear.
Purpose and Background of the Study

This study explores this gap in the research, employing the experiences of a group of fashion design students working collaboratively using computer technology in the design process. It will determine, through the use of comprehensive interviews and questionnaires, the effectiveness of technology in supporting collaboration and whether the use of computer technology tools was perceived to change the nature of the creative process, and if so, how and why. In essence, this body of research seeks to explore the gap identified by Edmonds et al. (2005) and to address Johnson and Carruthers (2006) call for further research to determine if computers and computer mediated technology are of value in enhancing the creative process.

Wenger’s (1998, 2002) Community of Practice model provided the main theoretical framework for this study in terms of framing the research questions and in the analysis of the research data. The Community of Practice model sees learning as a process of social participation by group members and the knowledge building characteristics of facilitation, reflection, negotiated meaning, trust and the emerging structure of collaboration were useful in framing the research questions relative to collaboration and the way in which it supported the creative process. Also helpful in developing the interview and questionnaire items and in the analysis of the data is Shneiderman’s (2000) Genex framework which is closely aligned with the Communities of Practice model but which goes further in helping to identify the ways in which computer technology may not only support collaboration but also enhance creative work.

This research project thus explores how collaborating in community affects the creative process and further attempts to determine how the use of technology (a) supports collaboration and creativity, and (b) supports the various aspects of the creative process.

Overview of the Study

To explore this topic I selected a group of third year university undergraduate students studying fashion design and fashion communications for this study, who were
working collaboratively using technology in their creative work on a seven week competition for the McGregor Corporation who offered prize money to the winners of the competition. I employed a mixed methods approach to the research, and in the initial phase conducted in depth personal interviews to explore the experiences these students had in using computer technology in their collaborative design work. Personal interviews were chosen as the main research vehicle because a richer and more in depth understanding of the participants experience situated within the context in which they occur would be required to begin to answer the research question. An online questionnaire was then developed based on the findings from the interviews and helped to determine the generalizability of the findings with a larger group.

This study was bounded in time, dictated by the beginning and ending of a course project that ran over a 7-week period in which students were working collaboratively through the use of technology on an original design product for a competition for the McGregor Company. Of particular value to this case study was the use of experts in the field, professors and representatives from the design community to judge the final products—this expert determination being a major factor in many definitions of creativity.

**Context of the Study**

This study was conducted at a large university located in the downtown core of Toronto, a city in southern Ontario. The participants were third year university undergraduate students from a School of Fashion, and the research was conducted in the spring of 2008. These students were studying fashion design and fashion communications, working towards either a Bachelor of Design in Fashion Design or in Fashion Communications. This case study was based on a 7-week period where these students were taking part in a course titled Integrated Design.
Educational Implications

The implications of this study for education are substantial. First of all, the results may be important in informing the research community how computer technology might make a difference to the creative process or its outcomes or both. We have come to rely more and more on technology in all aspects of work, and students from the Net Generation—those who have grown up with internet technology, see the use of computers and digital media as essential to their thinking and learning. These students expect to employ technology in their learning environments and this is reflected in the expectations of the current workplace, namely that employees are able to seamlessly use computers and technology in their work. Phillip (2007) speaks to the need for effective use of technology in educational environments, pointing out that “the Net Generation is growing up in a tool-rich environment and this needs to be taken into account in designing pedagogical systems” (para. 6). Once we gain a better understanding of technology, we can begin to implement its use in the learning environment in a more effective and learner-centered manner.

A second educational implication relates to collaboration, which is increasingly seen as a vital part of all work organizations, many of which are restructuring as learning organizations, environments in which new learning and innovation are prized, and which require employees to work collaboratively in teams in the search for new ideas, products, and services. Where better to have these employees learn about and experience collaborative activity than in our schools and colleges?

The final thread in this tapestry is imagination, innovation, and creativity. Albert Einstein spoke to the importance of imagination over mere knowledge in his oft-cited quote, “Imagination is more important than knowledge. Knowledge is limited, imagination encircles the world” (as cited in The World as I see it, Watts, London, 1940). Ignatius (2006) in Time magazine spoke of Google’s expectations for employees, further highlighting the importance of imagination:

Innovation tends to bubble up from these bright young minds ... every employee is meant to divide his or her time in three parts: 70% devoted
to Google’s core business, search and advertising; 20% on pursuits related to the core; and 10% on far-out ideas.

Thus we see a full 30% of an employee’s time focuses on new learning and the development of innovative ideas, aligning with Einstein who said, “If at first an idea is not absurd, then there is no hope for it” (Philosophers Notes, n.d.).

While understanding creativity itself is important to those educational institutions whose functions clearly relate to creativity, such as schools for art and design, we must also remember that creativity is important in all educational environments and that there are many ways in which we can be creative and in fact, need to be creative in order to support innovation in many fields of study.

To summarize, each of the threads of this study, creativity, collaboration, and technology have a number of implications for education. This study will explore the interaction of these three areas in this specific context for a clearer understanding of how we might be able to support learners in gaining skills in all three fields of study through the development of effective curriculum and the employment of teaching and learning strategies to support creative work.

Researcher’s Interest

My interest in technology and the use of computers reaches back to the early 1980s, when personal computers were becoming common in work and academic environments but long before they were commonplace in the home. Working with computers over the years I have gained an understanding and respect for the way in which they have dramatically changed the world of work. During my graduate studies I became involved in research exploring the ways in which technology and specifically online learning were changing educational environments. I moved on to explore perceptions of the value of online learning, working with teachers as participants.

Following completion of my Master’s work I went on to teach university undergraduate students, both face to face and online, which led to a deeper curiosity about online learning and the ways in which technology can be employed in face to face learning environments as well. Doctoral studies in these areas helped me to gain
experience in the areas of online teaching and learning and technological supports for learning both from a practical as well as theoretical approach.

This background has instilled in me a positive approach to technology in education and an understanding of the value it can have in supporting learning if implemented in pedagogically effective ways. In fact exploring the concept of community through research studies and seeing its effect applied in my online teaching has led to me to understand how this concept of community links to knowledge creation and richer learning experiences when effectively supported by computer mediated communication.

Much research has taken place that helps us to understand the importance of collaboration, and how technology successfully fosters this, such as the work done by Garrison and Anderson (2004), and Palloff and Pratt (2005). However little is known about how the use of computer technology may affect the creative process and even less work has been done in developing an understanding of the ways in which to redevelop curriculum to enhance student creativity. I approached this research with an expectation that there existed a positive relationship between the effective use of technology and creativity.

**Significance of the Study**

There are few bodies of research that have explored the use of computer technology tools in the support of creative work, however there is a small but burgeoning interest in how such technology might support the creative process, especially in regard to the collaborative aspects of creativity, in particular through the concept of Communities of Practice (Csikszentmihalyi, 1996; Fischer et al., 2005; Shneiderman et al., 2006; Ye et al., 2004). There is much speculation about the virtues of computer technology in the creative process with little empirical research to support these claims. This study will shed some light on how communities utilize technological tools in the collaborative process of design and how this may affect the creative process.
Limitations of the Study

One of the main limitations of this study lies with the fact that it was conducted at one institution, and the findings therefore are not necessarily generalizable to other universities. Further studies could be conducted in universities where there is emphasis on a creative component, such as Colleges of Art and Design to compare and contrast the responses. The study is also limited by the self-selection of the participants and perhaps even further by the strongly homogeneous demographic makeup of these participants. Further, the sample size could be seen as another limitation of this study, and perhaps further research could attempt to explore the topic with a larger research base, particularly in the case of the quantitative phase, perhaps the online questionnaire could be employed with participants at more than one institution and a demographic comparison employed.

As with any case study, the results are provided along with the researcher’s interpretations. While researcher bias is likely, the findings will be reported as they occurred, in many cases reported verbatim in an effort to help to situate the reader within the research context and hopefully provide an opportunity to gain some insight into the phenomenon being studied.

Chapter Summary

Chapter one presented an introduction to this proposed study, an overview of the impact of technology, and the purpose of the study. Following this is an overview of the proposed research study, and the researcher’s personal and professional interest in completing this research and, finally, the overarching research questions that guided the study.

The following chapter will include a review of the relevant literature on the topic of creativity as well as background on the individual and social nature of creativity, a discussion on the barriers to social creativity and the ways in which technology can help to overcome these barriers. Also presented in Chapter two is the theoretical frameworks for the research. Chapter three will lay out the
methodological foundations and research approach and explain in detail why a mixed methods approach was determined to be an effective approach to this study.

Chapters four, five, and six will provide the findings from the three overarching areas of the study, respectively the results on creativity, collaboration, and technology. Chapter seven offers concluding remarks, implications that have emerged from the research, and recommendations for future study.
Chapter Two
Theoretical Framework and Review of the Literature

Introduction

An extensive review of the literature relative to the three overarching areas of this research, that of creativity, collaboration, and technology was conducted and current literature about these areas is presented in this chapter. The main theoretical assumptions that form the underlying basis for the development of the research instruments were taken from the concept of Communities of Practice as a method of constructing knowledge and learning through collaborative experiences. The chapter will end with a more detailed discussion of the Community of Practice framework as presented in Chapter one.

Conceptions of Creativity in the Literature

Of interest from the review of the literature relative to creativity and fostering it through the use of technology tools are the ways in which creativity has been viewed by researchers. On the one hand there is the conceptualization of creativity as the big C, (Csikszentmihalyi, 1996; Gardner, 1993) or revolutionary creative approach, which stands in contrast to Kuhn’s (1996) concept of the small c of evolutionary creativity, that focuses on refining and applying existing paradigms. Using the small c or evolutionary view of creativity suggests one thinks of creativity defined not so much by the revolutionary breakthroughs such as Einstein’s Theory of Relativity, or Handel’s Messiah, or even Monet’s Impression: Sunrise, but rather focusing on all the other creative work done by many individuals in their day to day work that move our lives and communities forward. Viewing creativity in this evolutionary way was particularly important in terms of this study, helping to put into perspective the small but important increments that occur in creative work, particularly within the fashion industry.

Also emerging from some of the more recent work on understanding creativity is its conceptualization as a collaborative rather than individual activity
(Csikszentmihalyi, 1996; Fischer et al., 1998; Fischer et al., 2005; John-Steiner, 2000; Levy & Murnane 2004; Schön, 1983; Shneiderman et al., 2006). This body of research has begun an exploration of ways to support the collaborative nature of creativity through technological tools and to develop an understanding of the impact of computer technology on the creative process. The work done by these researchers was particularly important to this study and in effect, helped to frame the approach to the research, as well as providing a starting point for developing concepts used in a number of the questions employed in the personal interviews. The contributions of the various researchers to this work will be discussed in more detail in the following sections that explore the various schools of thought on creativity, the individual versus social nature of creativity, and the small body of existing work on computer technology tools and their role in the creative process.

Fischer, Scharff, and Ye (2004) explored the concept of social creativity and in particular, looked at fostering social creativity by increasing social capital. They define social capital as “characterized by the interpersonal relationships that an individual has with other members in a community, providing the basis for analyzing sense of community and the degree to which the individual is connected with others in the community” (p. 4). The concept of social capital is an established one, appearing in the writing of Hanifan in 1916 (as cited in Fischer et al., 2004) who described it as goodwill, fellowship, sympathy, and social interactions. This concept has since been developed and incorporated into a number of disciplines such as political science, sociology, education, business management, organizational theory, and collaborative software construction. Of particularly importance in this study was the way in which social capital helps us to understand how individuals relate to and work with one another in collaborative environments. Having a clear understanding of this was critical as I began the process of exploring the ways in which collaboration in creative work would be supported through the use of computer technology, and informing the questions that would be employed in this research.

A useful framework for understanding the role of social capital in fostering social creativity and ways to increase it emerged from the work of Nahapiet and
Ghoshal (1998) who defined it as the sum of the actual and potential resources embedded with, available though, and derived from, the network of relationships possessed by an individual or social unit. They identified three operational dimensions in social capital as (a) the structural dimension—a relationship network connecting people and helping individuals to find help and collaborate, (b) the relational dimension—the sense of trust individuals have with each other, and (c) the cognitive dimension—the bonding force such as shared understanding, interest or problems that connect and hold communities together.

In all, the social capital of a group is based on the social capital held by each of its members within a given social context, and an individual’s social capital is the actual and potential resources that the individual could draw on to acquire cooperation from other members. As Fischer et al. (2005) point out “in systems that require user participation and collaboration, social capital, by its definition, is an important factor to consider” (p. 5). This concept was instrumental in understanding how individuals working collaboratively come to view other members of their group and in fact, how some groups were formed based on these potential resources.

Much of Fischer’s work focuses specifically on complex design problems requiring the contributions of many stakeholders and points to the importance of socio-technical settings in amplifying the outcome of group processes and developing social capital through exploring a number of reusable software repositories that allow software developers to share and reuse source code. Again this was instrumental in the development of the concepts explored in this body of research relative to computer technology, specifically in how the participants employed this technology.

Fischer (2005) sums up his and his colleagues’ research as pointing to the importance of integrating individual and social creativity. He says “our work has only scratched the surface of exploiting the power of collective minds equipped with new media … the challenges of the complex problems that we all face make a collaborative approach to creativity less a luxury and more of a necessity” (para. 32). Indeed the collective approach of the student participants working on the projects which constituted the basis for this research clearly demonstrated the need for
collective minds; looking at how technological media supported the collective was a large part of this study.

Shneiderman et al. (2006) also looked at creativity and how technology might support it, and point out the growing interest in creativity and the promise of making more people more creative more of the time through technological support tools. The outcomes of a National Science Foundation sponsored workshop pointed to the fact that much in the way of support tools for creativity is lacking a solid research base and put together a workshop of leading researchers and graduate students, creating a Community of Interest to investigate creativity support tools for communities from a more rigorous research approach “in an effort to develop appropriate benchmark tasks, replicable evaluation methods, and strategies for in-depth longitudinal ethnographic studies” (p. 68).

The main outcomes of the workshop focused on the importance of (a) accelerated research and education on creativity support tools, (b) promoting rigorous multidimensional evaluation methods, and (c) rethinking user interfaces to support creativity. While there has been some early work, there remains a paucity of research in this area, with only a handful of researchers exploring the concept of social creativity and how it may be fostered through the use of technology (Fischer 2005; Garrison & Anderson 2004; Johnson & Carruthers, 2006; Shneiderman et al., 2006; Vass, Carroll & Shaffer 2002). This thesis sets out to contribute to the emerging research on the relationship of computer technology to collaboration and creativity.

Definitions of creative work.

When most people think of creative ideas and artefacts, they often think in terms of work that is fundamentally novel relative to the historical body of human work. However it is also important to recognize that creativity is everywhere. It happens in day-to-day problem solving, not only in research labs, artist’s studios, or other exceptional pieces of work. According to Shneiderman (2000) “not every artwork, novel, photo, or digital product is creative, but facilitating broad access to
powerful tools expands the potential ... information technologies could be harnessed to make creativity more common” (p. 115).

Fischer, Giaccardi, Eden, Sugimoto and Ye (2005) argue that the nature of creativity is made up thus: (a) originality, (b) expression, (c) social evaluation and, (d) social appreciation within a community. They tell us that originality refers to unique ideas or applying existing ideas to new contexts. However these ideas or new applications are of little use unless they are expressed and externalized so that social evaluation can occur—which other people can understand, reflect, and improve upon them. Finally, social appreciation refers to the effects of social rewards, and acknowledgement by others that motivate further creative activities. Further delving into the nature of creativity was particularly critical to this body of research in terms of exploring technological supports—breaking down creativity into the four components discussed above allowed me to determine if only some or all of these components were suitable for technological support and thus were instrumental in informing a number of the interview questions.

**Refining an exploration of creativity.**

Not all knowledge work or art is creative; in fact many products represent repetitive application or copying. This study seeks to explore tools that support creative versus merely original work, and rather than looking at revolutionary breakthroughs as a model of creativity such as the work done by an Einstein, a Stravinsky, or a Picasso this study will explore what Kuhn (1996) termed evolutionary creativity which refines and applies existing paradigms, and which is more likely to be assisted by computer software tools.

One important point to make at this juncture is that when we look at the body of creative work to date, technology or tools have always been a part of it. The artists’ paint and canvas, the researchers’ microscopes, and the musicians’ instruments are all tools that have moved the creative process along. New and more sophisticated tools such as computers and computer technology may merely be a new iteration or level of tool available to support the creative process. This study
also sought to differentiate between computers and computer technology as mere tools in the creative process and ways in which these tools might be seen as a full partner in the creative process. To explain this difference more fully, I explored the extent to which the participants in this study viewed their use of technology as an integral part of the creative process, what Philip (2007) describes as a cognitive prosthetic, simply as being useful for certain aspects of creativity but not integral to the entire process.

**Schools of thought on creativity**

In Shneiderman’s (2000) review of the literature on creativity, he identified three main schools of thought or perspectives. The *inspirationalists* emphasize the “Aha!” moments in which a major breakthrough seemingly appears, although they also feel that *luck favours the prepared mind*; in effect, it is preparation and incubation that lead to moments of illumination. The inspirationalists recognize that creative work starts with problem formulation and ends with evaluation and further refinement. They acknowledge the balance of 1% inspiration and 99% perspiration—a flash of insight followed by much hard work to achieve the final result!

According to Shneiderman (2000) those emphasizing this model promote and employ techniques for brainstorming, free association, divergence and de Bono’s (1971) lateral thinking. These strategies help to break existing mindsets and force individuals to see problems with fresh eyes (Boden, 1991; Couger, 1996; Gardner, 1993).

The playful nature of creativity suggests that computer software support for the inspirationalist school of thought should emphasize free association using textual or graphical prompts in the development of novel ideas. This leads inspirationalists to employ visual techniques for facilitating relationships and looking at solutions, using visualization strategies that help users to understand previous work and to explore potential solutions. Mind mapping software for example, encourages users to avoid linear or hierarchical structures.
The second group Shneiderman (2000) identified is the *structuralists*, who emphasize a more orderly methodological approach, and while the use of libraries and other repositories of previous work are important, key computer software support lies with spreadsheets, programmable simulations, and domain-specific models that offer what-if modelling. These people are often visual thinkers who prefer tools for drawing flow charts, decision trees, and structured diagrams. Their methodological techniques would indicate a preference for step-by-step exploration, with further opportunities for revision.

The third group Shneiderman (2000) identified is the *situationalists* who emphasize the social and intellectual context as key to the creative process. In fact they see creativity as being situated within a Community of Practice with changing standards, and which requires a social process for approval. This group requires tools that support access to previous work in the domain, for example, models and templates, along with opportunities for consultation and sharing of work with members of the field, as well as opportunities to share this work with their community (Csikszentmihalyi, 1996; Fischer, 2005).

Understanding these three schools of thought also helped to inform my approach to the research. The ways in which each school of thought viewed creativity and how this influenced their use of technology was critical in contextualizing the research participants approach to, and understanding of, the use of computer technology in this study. For example, the faculty and student participants who fell into the situationalist school of thought would stress the importance of collaboration in the creative process, and value the various tools to support collaboration; the structuralists would value and rely strongly on technology tools in the creative process as well as using these tools for collaboration and dissemination of results. The inspirationalists would value computer technology for providing brainstorming opportunities.
Individual and Social Nature of Creativity

The power of the unaided individual mind is highly overrated. Although society often thinks of a creative individual as working in isolation, intelligence and creativity result in large part from interaction and collaboration with other individuals. (Fischer et al., 2005)

Individual creativity emerges from one’s life experience, culture, education, and background knowledge, and, while creative individuals can make a huge difference, individual creativity still has limits because the individual human mind itself is limited (Campbell, 1969; Shneiderman, 2002). Fischer et al. (2005) concur and further the discussion by stating that: “individual knowledge, imagination, inspiration and innovation are the bases for social creativity; without inspirational sparks from the individual, social creativity simply has no chance to flare up in the first place” (p. 485). Creative activity emerges from the relationships between an individual and his or her Community of Practice; in fact much human creativity comes to life from activities that take place in a social context where individuals interact with each other. Creativity does not happen inside a person’s head, but in the interaction between a person’s thoughts and a socio-cultural context (Csikszentmihalyi, 1996).

In reality, creativity takes place in the relationship between an individual and society, and between an individual and his or her technical environment. The mind, according to John-Steiner (2000), rather than driving on solitude, is clearly dependent upon the reflection, renewal, and trust inherent in sustained human relationships. To facilitate this, we need to recognize the importance of community and provide tools that are open and transparent, so people can be aware of and easily access each other’s work, relate it to their own, share and use existing artefacts, and contribute the results back to the community.

Individual and social creativity can be achieved through using or developing effective collaboration models and tools, developing or locating appropriate communities, and through sharing or developing artefacts in support of the creative process. To support social creativity, situations need to be open-ended and complex, where users will encounter new, unpredictable conditions, and eventually experience
breakdowns, which, according to Schön (1992) and Fischer et al. (1998), offer unique opportunities for reflection and learning, demonstrating the importance of back-talk within collaborative situations.

**Barriers to social creativity.**

The National-Research Council (2003) believes that information technologies have come a long way, and have, in fact, reached a level of sophistication, maturity, and cost effectiveness that enable them to go beyond enhancing productivity and open up new creative possibilities. There are, however, barriers to social creativity. According to Fischer (2006) these can be (a) spatial, (b) temporal, (c) conceptual, or, (d) technological. Following is a more in-depth discussion of each of these barriers with an overview of the core limitations of each, how they can be addressed through computer technology, and the resulting challenges. Also included is a table that takes these four barriers, outlining their core limitation, showing how these limitations can be overcome, and offering suggestions from collaborative and technological methodologies for doing so.

**Spatial barriers.**

While the National Research Council suggests that information technologies have reached new heights and are able to open up new creative possibilities, collaborative design remains difficult to support at a distance (Olson & Olson, 2001). They suggest that critical stages of collaborative work require some level of face-to-face interaction. Brown and Duguid (2000) weigh in on the topic presenting a similar perspective and feel that “digital technologies are adept at maintaining communities already formed; they are less good at initiating them” (p. 226). What is important is for computer technologies to help overcome the challenges of spatially distributed community members and assist them in overcoming the inherent problems in working at a distance.

**Temporal barriers.**

Much of the work in ongoing design projects, which often take place over many months if not years, allows users to work, collaborate with, and to master knowledge
of a domain. Long-term collaboration, while critical, is difficult to achieve (Fischer, 2006). Fischer goes on to point to the need for a design support system that can successfully foster long-term indirect collaboration among a community and support communication about (a) evolving artefacts, (b) background context, and (c) a rationale about the artefacts themselves. This is critical, especially when members of the community have not participated in the community since the onset of a project and are unable to communicate with the original designers (Fischer, 2001, 2006).

**Conceptual barriers.**

Design communities, much like any other form of group work are becoming increasingly characterized by a division of labour which is often necessary due to the unique experiences and abilities of the community members and the large sophisticated projects they are often involved in and thus require the use of different knowledge systems. Developing a shared understanding that in turn supports collaborative learning and working requires that the members become actively involved in construction of a knowledge system where meanings of concepts and ideas can be debated and resolved (Fischer, 2006). Fischer’s work focused on supporting communication across two conceptual dimensions: (a) the expertise gap within a homogeneous community, in effect the barriers that occur within groups such as Communities of Practice, and (b) the conceptual gap between stakeholders from different practices, in effect the barriers that occur between heterogeneous communities of different groups, and characterized as Communities of Interest.

Differentiating between these two communities was quite helpful in contextualizing the results of this study in terms of the various groups and their members. Some groups had a mixture of students from the separate streams of design and communications, whereas other groups chose members only from their own stream. I looked at which issues might emerge within these different groups as laid out in Table 2 which differentiates, on a number of dimensions, between Communities of Practice and Communities of Interest and explores both the strengths and weaknesses of each model. I attempted to be aware of the issues inherent in
each type of community and recognized that some of these issues might emerge within this study.

Boundary objects as characterized by Bowker and Star (2000), and Wenger (1998), and demonstrated in Figure 1 by Fischer et al. (2005), are externalizations of ideas that provide for shared understandings across spatial, temporal, conceptual or technological gaps or barriers.

Figure 1. Boundary objects: Understanding and sharing across different domains.


Specifically, in creative design communities, boundary objects can be useful in establishing shared contexts for communication while providing referential anchoring, they can be pointed to and named and are useful in increasing shared understanding among community members.

Technological barriers.

Creative design is, in part, a reflective conversation between designers and the designs they create, as they use materials to construct and then reflect on what has been developed, listening to what Schön (1983) calls the “back-talk” of the situation. Fischer (2006) feels that computational design materials are able to interpret the work of designers and actively talk back to them as opposed to the passivity of manual tools such as pen and paper. Barriers emerge when the “back-talk” is
incomprehensible to users or when it is insufficient and other tools need to be employed” (para 38).

Ultimately technological media alter the nature of learning and communication in design and it is hoped that new media will continue to improve both individual and collaborative design by transcending some (or all) of the barriers that limit knowledge and collaboration in creative work.

Having a good understanding of these barriers to social creativity as laid out by Fischer (2006) was particularly helpful in informing both the discussions I had with participants as well as in understanding the challenges these participants faced during their creative work. Table 1 identifies the various barriers to social creativity, organizing them along the dimensions of (a) spatial and temporal barriers, (b) conceptual issues with and between domains, and (c) issues relative to technology. It then goes on to describe the main limitations of each dimension, providing strategies to address the limitations, and then identifies technologies for overcoming these limitations, along with the challenges inherent within each of the dimensions.

For example, the dimensions of conceptual issues within and between domains speaks to the limitations resulting from group think (within) and the problems of finding a shared understanding (between) that emerged from this study, and which will be discussed in much more detail in subsequent chapters.
Table 1

Social Creativity: Turning Barriers into Opportunities for Collaborative Design

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Core limitation</th>
<th>Addressed by</th>
<th>Media Technologies</th>
<th>Challenge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spatial Barriers</td>
<td>Participants are unable to meet face-to-face; low local density of people sharing interests</td>
<td>Computer-mediated</td>
<td>E-mail, chat rooms, video conferences, local knowledge in global societies</td>
<td>Achieve common ground, behaviour needs to be adjusted to the limitations of the technology</td>
</tr>
<tr>
<td>Temporal Barriers</td>
<td>Design and use time: Who is the beneficiary and who has to do the work?</td>
<td>Long-term, indirect communication; meta-design</td>
<td>Group memories, organizational memories</td>
<td>Design rationale, reflexive computer-supported cooperative work</td>
</tr>
<tr>
<td>Conceptual within domains (different expertise levels)</td>
<td>Group-think</td>
<td>Communities of Practice, legitimate peripheral participation</td>
<td>Domain-oriented design environments</td>
<td>Innovation</td>
</tr>
<tr>
<td>Conceptual between domains</td>
<td>Establishing a shared understanding</td>
<td>Communities of Interest; boundary objects</td>
<td>Envisionment and discovery collaboratory</td>
<td>Common ground: To bridge different domain semantics</td>
</tr>
<tr>
<td>Technological</td>
<td>Requires fluency in interacting with digital media</td>
<td>Distributed cognition, social-technological environments; meta design</td>
<td>Agents, critics, simulations</td>
<td>Formalization: support human-problem domain interaction</td>
</tr>
</tbody>
</table>

Technology Tools and the Creative Process

Over the last decade, ways to facilitate creative processes and improve the resulting artefacts has become a topic of concern for human-computer interaction (Johnson & Carruthers, 2006, p. 998). They call for further research and analysis to address the issue of developing a theoretical account of collaborative creativity, and the role of the supporting computer technology tools. Much of the literature points out that given the rapidly expanding numbers of computer users, the role of computers in creativity is relatively new and largely unexplored (Candy & Hori, 2003; Edmonds et al., 2005; Shneiderman, 2002). Generally the literature on creativity and technology appears to fall into two main overarching areas—community and technology, with some work overlapping in each area.

Fischer et al. (2005) delved into the social nature of creativity, as did Edmonds et al. (2005) who conducted research into the general context of art and technology-based creativity looking at (a) online creative communities, (b) interactive art environments, and (c) support for collaborative creativity. Preece (2002), and Fischer, Sharff and Ye (2004) focused on supporting community, building social capital, and exploring how innovative computer systems might support social creativity.

Early work by Schön (1992) on the social nature of design has provided a basis for much subsequent research such as that done by Yamamoto and Nakakoji (2005) who looked at reflection in action and subsequently claimed that we need to change the way we view computers and technology relative to creativity.

Finally, Mamykina et al. (2002) in reviewing the work of researchers such as Amabile, Candy and Edmonds, Csíkszentmihalyi, and Klemmer et al., believe that recent research has begun to paint a more complicated picture of creativity that highlights the importance of social interactions and collaboration in creativity work. Indeed efforts to create alliances between information technology and creative practices clearly indicate the importance of community (Fischer, 2006; National Research Council 2003).
Collaboration in creativity and technology to facilitate this has been the focus of work by Arias, Eden, Fischer, Gorman and Scharff (2000), Candy and Edmonds (2000, 2002), Csikszentmihalyi (1996), Edmonds et al. (2005), Fischer (2000, 2006) and Fischer et al. (2005), Hartnell-Young (2006), John-Steiner (2000), Luff et al. (2003), and Mamykina et al. (2002). In fact Hartnell-Young’s work focused closely on the roles of computers in Communities of Practice. Her study looked at the roles of teachers in classrooms using computers, from the perspective of Communities of Practice (Wenger, 1998), and found that teachers appropriated technology in a range of ways to help them create classroom communities that build knowledge together, and thus allow students to take creative control over their learning and, at the same time help teachers to develop innovative practice. Given the rapidly expanding numbers of computer users, it is surprising that the role of computers in creativity remains relatively unexplored (Shneiderman, 2002; Candy & Hori, 2003).

Research to investigate ways in which creative tasks can be supported by computers conducted by Sedivy and Johnson (2000) and Lubart (2005) indicate a lack of support for technology tools in the earlier stages of the design process and Vass, Carroll and Shaffer, (2002) stress that computer technology should not restrict creativity but rather partner in the process. Indeed Candy and Edmonds (2000) feel that “for technology to play any part in extending boundaries of human thought, one of the critical issues is discovering how to design technology systems in such a way as to foster creativity” (p. 63). I incorporated this concept of technology as partner versus tool into the participant interviews and found it particularly helpful in exploring how the participants viewed and approached their use of computer technology.

If the technology is to play any part at all in extending the boundaries of human thought and actions, and to be an effective partner in the creative process, it is then critical to employ technology support tools in a way that fosters creativity. The problem with this is that technology tools have traditionally focused on productivity, mechanizing manual work, and maintaining a linear approach. De Bono’s (1971) work on lateral thinking identifies the importance of avoiding vertical thinking,
proceeding directly from one state of information to another. If computer software technologists are to support artists, they need to be understanding and empathetic collaborators with the artists (Candy & Edmonds, 2000).

One often-overlooked aspect of tools for creativity is the need for users to communicate within the technological tools “in the language of the problem, not in the language of an operating system, programming language, or network protocol” (Vass et al., 2002, p. 31). When an individual or group is able to seamlessly move among the information and connect to the community, the chances for creativity are at their highest. According to Vass et al., computer technology should not restrict the creative process, or even act as a mere assistant, rather it should partner fully in the creative process. I incorporated many of these issues into this body of research, and found some answers; others continue to remain elusive.

**Genex framework.**

The purpose of Shneiderman’s (2000) framework of Genex (generator of excellence) built upon Csikszentmihalyi’s approach of supporting access to the domain and consultation with the Community of Practice. The genex framework is helpful in suggesting improvements for Web-based services and personal computer software tools by ensuring data representations and functions become more congruent with problem-solving strategies, in effect putting users in control, and providing them with a sense of mastery by focusing on the four phases of creativity: collect, relate, create and donate.

Early iterations of Shneiderman’s Genex framework focused on a slightly different set of phases: collect, create, consult, and disseminate. Expanding upon this early work he wished to be more precise about what user interface tools are needed, and also to look at educational philosophy that emphasized collaborative teams working together, emphasizing creativity to support learning, and learning to support creativity.

The foundational beliefs that underlie Genex’s four phases were:

- New knowledge is built upon previous knowledge
- Powerful tools can support creativity
- Refinement is a social process
- Creative work is not complete until it is disseminated.

Shneiderman felt that social processes characterized as support for refinement are important at all stages of the creative process. He went on to explore the computer software tools that can facilitate creative acts and to recognize the close relationship of learning and creativity, which led to a revised four-phase Genex framework.

- Collect: learn from previous works stored in libraries, on the Web, etc.
- Relate: consult with peers and mentors at early, middle, and latter stages
- Create: explore, compose, and evaluate possible solutions
- Donate: disseminate the results and contribute to the libraries or other repositories of ideas and samples.

It is important to point out that the phases as laid out above are not a linear sequence—in fact creative work may require returning to earlier phases many times. For example, using libraries and various other resources would probably be necessary at all phases, and discussions with peers and mentors may take place repeatedly during the process. When dealing with difficult problems the benefits of building on previous work and consulting with peers and mentors can be enormous.

Improved user interfaces will provide benefits to many users for any number of tasks and Shneiderman (2000) suggests that the following eight activities that emerged from the Genex phases should be incorporated into creativity support tools. I also incorporated some of these activities into the development of the discussion questions for this research to inform an understanding of the creative work investigated in this research project. Due to their importance to this work, I will discuss each briefly here.
**Searching and browsing digital libraries.**

Digital libraries provide the user with support in searching and filtering, and are continually being improved upon. Some recommendations might be providing users with more control over relevance ranking, range of sources, and in the presentation of the results (Koenemann & Belkin, 1996; Marchionini, 1995; Shneiderman et al., 2006). Searching is a vital part of a larger creative process and it would certainly facilitate this process if results could be saved in various ways such as into a spreadsheet, included in email for consultation, or pasted and saved for later use.

**Consulting with peers and mentors.**

Asynchronous tools for looking at previous work and sharing new ideas such as email, listservs, newsgroups, blogs, and threaded discussions all offer opportunities for sharing within a community. Synchronous tools such as chats and Skype, or more sophisticated communications systems such as Breeze with its video conferencing ability, and Elluminate which supports voice and visual media are valuable tools for allowing geographically diverse communities to come together to share and discuss ideas in real time.

**Visualizing data and process.**

Visual representations are becoming quite useful in creativity work, and are well supported in virtual learning environments through the use of white boards, where users can upload existing ideas and pictures, or draw freehand, either synchronously in real time with other designers or asynchronously, to be viewed by others when convenient. These files can be shared and worked on or commented upon by all members of the practicing community. Improvement in this area is needed so that users then can take the visualization and ideas developed and embed them into various other media such as reports, slide presentations, and in other domain specific formats.

**Thinking through free association.**

When a creative new idea is born, it usually consists of associations linked together in a way that has not been thought of before. Computer software that
supports brainstorming, mind-maps, concept maps, and other drawing strategies can be quite useful in drawing out ideas and looking at new associations and relationships. As Shneiderman (2000) points out, “the gift of the computer is the capacity to quickly create and easily manipulate diagrams” (p. 127).

**Exploring solutions: “What-if” tools.**

There are many existing tools that support what-if modelling and there are many other simulations for piloting, traffic flows, weather models and so forth, and many are into successive generations and have become richly featured and support explanatory text, collaborative usage, and more. Their limitation comes from the lack of ability to be integrated with other software, a critical aspect of creativity support. The software needs to work in the language of the designer in a seamless manner. The concept of the ease of use of computer technology tools was an important aspect of the research questions I formulated and was also quite helpful contextualizing the data that emerged from this body of research.

**Composing artefacts and performances.**

As with what-if tools, many composing software tools exist— for example word processors have developed into flexible tools that have become increasingly easy to use with many features that support the creative use of documents. There is, however, always room for improvement. Web-based, collaborative word processing software exists such as Writely, now Google Docs, although it is still in its early stages of development and use, with little research on its effectiveness as yet.

**Reviewing and replaying session histories.**

Reflection is a critical aspect of improvement, and necessary in the creative process. Producing histories of work can be difficult and requires involved software design to ensure that the results are not only comprehensible and useful, but also easy to access and retrieve. Further development is necessary so that objects can be saved and shared with peers or mentors within the community.

**Disseminating results.**

Email, listservs, digital libraries, blogs and the Web are all useful in disseminating results, but could all be improved. Currently there are many systems in
place where anyone looking for a product, whether it is a book or specific journal can register to participate in a discussion with a like-minded community. These online discussions groups can also stimulate creative work.

One of the main purposes of looking at computer driven creativity tools is to suggest improvements to these software tools that will reduce the distraction caused by poorly designed user interfaces, inconsistencies across applications, and unpredictable design aspects, all of which may distract the user from attending to the task at hand.

These eight activities that emerged from Shneiderman’s Genex framework were particularly helpful in informing this study and a number of discussions relative to the use of technological tools in the creative process touched on many, if not all, of these activities and the need for improvement in each of these areas.

**Theoretical Framework for an Exploration of Creativity**

The Fischer et al. (2005) framework for creativity was particularly helpful in informing this research about the nature of creativity. Fischer et al.’s work which explores the barriers of social creativity and ways to turn them into opportunities for collaborative design was summarized previously in Table 1, which presented an overview of the various dimensions of social creativity along with suggestions for computer technologies to meet these challenges. It is their belief that there is an *and* rather than *versus* relationship between individual and social creativity. They go on to say, “Creativity is an interactional process occurring in the relationship between an individual and society, and between an individual and the technical environment” (p. 486). Supporting this process where individual and social creativity mutually reinforce each other is necessary to enhance creativity. The mind, rather than driving on solitude, clearly depends upon the reflection, renewal, and trust inherent in sustained human relationships (John-Steiner, 2000), driving home the importance of supporting the distributed nature of interactions by incorporating diversity, making sure all voices are heard, and increasing the back-talk of the situation (Fischer et al., 1998; Fischer 2001; Fischer et al., 2005; Schön, 1983). To support such social
processes we must provide systems that are open and transparent, and where members of the community can see and access each other’s work.

Fischer et al. (2005) believe that individual and social creativity can be integrated through the use of effective collaboration models, developing good community structures, objects, and process models that will support the continual development of artefacts, and meta-design. In effect, these elements can enhance the creative process by providing the right environment and interactions.

Also critical in supporting the work of this study was Shneiderman’s (2000) Genex framework presented earlier which focuses on supporting access to the domain and in consultation with the Community of Practice. This framework specifically looks at the various computer technologies available for collaborative creative design, with a keen eye to educational philosophy that employs collaborative team work, and emphasizing creativity to support learning, and learning to support creativity. This framework was instrumental in developing much of the technology portion of this body of research, particularly the aspects of this framework that clearly point to and deal with collaborative issues such as consultation with peers, opportunities for brainstorming, and visualizing and sharing data. Chapter seven explores the technological themes in relation to the components identified within Shneiderman’s Genex framework.

**Models of collaboration.**

In this section I explore models of collaboration such as the division of labour model discussed here, and follow with an exploration of the Community of Practice and Community of Interest models. The traditional model of collaboration, frequently used by students, is based on a division of labour. This model of collaboration sees individuals engaging in specialized tasks within a given framework whereas social creativity is a matter of emergent interactions and collaborative meaning among the community’s members (Levy & Murnane, 2004).

Thus the division of labour model divides tasks among a group of people so that the outcome is *equal* to the sum of individual efforts, whereas the social creativity
model produces an outcome that is *greater* than the sum of the individual efforts. Foxell and Mitchell (2008) feel that a rigid division of labour and responsibility that this entails—although somewhat sensible and useful for detailed design development is the enemy of conceptual innovation (p.41). The rigid division of labour keeps students working in one role that they have mastered with an eye to completing the project rather than allowing group members to work in a true Community of Practice where they have opportunities to learn new skills from other, more central members.

*Communities of Practice.*

Communities of Practice (CoP’s) are made up of individuals who work as a community within a certain domain, undertaking similar work (Lave & Wenger, 1991). Learning within a CoP takes the form of legitimate peripheral participation (Lave & Wenger, 1991), which is a type of apprenticeship model where newcomers to the community enter from the periphery and move toward the centre as they gain skill and become more knowledgeable. Members participate within the community according to their interests and skill levels. As they become more skilful through interacting with more experience members of the community, they move beyond the periphery of the community, toward the centre, gradually taking on more active and responsible roles. In this way products evolve, and people grow (Ye, Nakakoju, Yamamoto, & Kishida, 2004) and the community develops. “Sustained engagement and collaboration lead to boundaries that are based on shared histories of learning and create discontinuities between participants and non-participants” according to Fischer et al. (2005) and that highly developed knowledge systems (including conceptual frameworks, technical systems and human organizations) “are biased toward efficient communication *within* the community at the expense of acting as barriers to communication with outsiders—boundaries that are empowering to the insiders are often barriers to outsiders and newcomers to the group” (p. 488).

Communities of Practice focus on efficient communications by taking advantage of members’ shared backgrounds; they benefit from the existence of an accepted, well-established centre of expertise with a clear path of learning that leads toward this centre, allowing for differentiation of members into novices,
intermediates, and experts, and providing the foundation for legitimate peripheral participation as a workable learning strategy.

Raelin (2008) describes Communities of Practice as typically being innovative on the periphery of standard practice, where innovation lies often evolving informally with members who are experts and who wish to share or communicate new ideas and practices with one another (p. 94). However, he describes another version of Communities of Practice that arise out of necessity with “their absolute need to commit to one another in order to perform their function” (p. 95). In one sense, the team represents a collective mind and it may be difficult to detect individual work, yet a major benefit is that each member possesses partial knowledge or expertise to contribute to the team so that, in aggregate, the team has all the information and skills necessary to complete the project, and are able to work and learn together.

Further, as Raelin (2008) points out the situated learning literature proposes a progressive learning model, where members learn from different sources and through a variety of methods. They may learn from observing and interacting with one another, sharing skill sets or through individual experimentation where they can receive feedback from one another. This again became obvious in the ways that student participants in this study viewed feedback as one of the benefits of their collaborative efforts.

Of particularly interest to the data analysis portion of this study was the concept of virtual Communities of Practice. Raelin (2008) explores the value of virtual communities and electronic communication in support of collaboration. What keeps Communities of Practice together tends to be their focus on function or interest, rather than physical proximity. Because technology can be quite successful in overcoming geographical distance, allowing members to virtually connect when there is need, it can thus eliminate travel and allow the saving and archiving of materials. Further benefits that can accrue from virtual Communities of Practice are (a) the widespread sharing of information for handling divergent-thinking tasks, (b) reducing barriers such as domination by high status members or inequality of participation, and (c) removing the distractions of irrelevant stimuli (Valacich &
Schwenk, 1995). The data from this study did identify the issue of power differential among members, as well as removing the distractions of face to face connections—the so-called social chit chat referred to by the participants in this study.

However as Raelin (2008) points out, without some initial and then quite frequent face-to-face meetings, members may not be able to sufficiently warm up to each other. He goes on to say that, “dialogue is often impeded by a lack of nonverbal cues and a reduction in the exchange of social-emotional information” (p. 103). Thus while virtual communities or groups can handle task oriented exchanges well, they often are slower to develop relationships among members based on trust, cohesion, and group identify. Raelin’s view here is directly aligned with earlier work by Brown and Duguid (2000) who had observed that while technology may be good at maintaining existing Communities of Practice, it is not always successful at starting them.

This was quite helpful in informing some of the discussion questions I put to the interview participants who offered some quite interesting observations about social relationships in virtual community work. One interesting theme emerging from this dissertation study that has not been explored in the literature relative to technological or virtual communities was that student participants in this study reported the opposite of Coutu’s (1998) suggestion that when people cannot interact directly with one another, virtual teams need to begin online communications with a series of social messages; further details are discussed in chapter five.

**Communities of Interest.**

Communities of Interest, a term coined by Fischer (2001) bring together stakeholders from different Communities of Practice, and focus on a collective concern with the resolution of a particular problem. The benefit of Communities of Interest is that they bring together individuals with a wide variety of skills and abilities that cut across domains but that share an interest in a specific problem or situation. An example of a community of interest could be a group of artists made up of individuals with various and different skills and backgrounds such as visual artists, musicians, performers, designers, architects, engineers, and computer
scientists—imagine the various domains that would be necessary to put together the Cirque du Soleil.

The point here is to identify patterns of practice and helpful technologies. We need to be mindful as well that people can participate in more than one community and that one community can contain attributes of both a Community of Interest and a Community of Practice, in effect integrating aspects of both forms of communities, depending upon the needs of the community.

Table 2 explores the differences between Communities of Practice and Communities of Interest based on several dimensions, suggesting the benefits and weakness of each.
Table 2

**Differentiating Communities of Practice and Communities of Interest**

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Communities of Practice (CoP’s)</th>
<th>Communities of Interest (CoI’s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nature of problems</td>
<td>Different tasks in the same domain</td>
<td>Common tasks across multiple domains</td>
</tr>
<tr>
<td>Knowledge development</td>
<td>Refinement of one knowledge system; new ideas coming from within the practice</td>
<td>Synthesis and mutual learning through the integration of multiple knowledge systems</td>
</tr>
<tr>
<td>Major objectives</td>
<td>Codified knowledge, domain coverage</td>
<td>Shared understanding, making all voices heard</td>
</tr>
<tr>
<td>Weaknesses</td>
<td>Group-think</td>
<td>Lack of mutual awareness</td>
</tr>
<tr>
<td>Strengths</td>
<td>Shared ontology/understanding</td>
<td>Diversity; social creativity; new insights</td>
</tr>
<tr>
<td>People</td>
<td>Beginners and experts; apprentices and masters</td>
<td>Stakeholders (owners of problems) from different domains</td>
</tr>
<tr>
<td>Learning</td>
<td>Legitimate peripheral participation</td>
<td>Informed participants</td>
</tr>
</tbody>
</table>


Table 2 demonstrates how both communities have their strengths and weaknesses. Communities of Practice focus on efficient communications with the same people by taking advantage of a shared background; they benefit from the existence of an accepted, well-established centre of expertise with a clear path of learning that leads toward this centre and which allows for differentiation of members into novices, intermediates, and experts, and providing the foundation for legitimate peripheral participation as a workable learning strategy. One of the
barriers that can be imposed by Communities of Practice is that of group-think which can suppress both exposure to, and acceptance of, outside ideas. A positive strength of Communities of Interest, on the other hand, is their potential for creativity because different backgrounds and different perspectives can lead to new insights (Campbell, Bennis & Biederman, as cited in Fischer et al., 2005). In fact Communities of Interest have a great potential to be even more innovative and more transforming than a single Community of Practice if the community is able to exploit the skills and abilities of all the members by creating a common ground and shared understanding.

Chapter Summary

Chapter two has presented a review of the literature as it relates to the main theoretical framework of this study, Communities of Practice. Connected to this main theoretical framework, and also supporting the study development and data analysis are Fisher et al. (2005) social creativity framework, and Shneiderman’s (2000) Genex framework.

The review of the literature on creativity, focusing on the social or collaborative nature of creativity, explored current research on the importance of collaboration in the creative process and discussed the barriers to social creativity and the ways in which these barriers may be overcome. Included also was a discussion presenting Shneiderman’s (2000) review of the literature relative to creativity in which he discussed the three schools of thought or perspectives, the Inspirationalists, the Structuralists, and the Situationalists.

The theoretical frameworks that will guide this research study were presented including the two models of collaboration, Communities of Practice and Communities of Interest as developed by Wenger and Fischer respectively, and Shneiderman’s Genex framework.

The chapter then reviewed some of the technological tools and studies that focus on their effectiveness in the creative process. The next chapter presents a detailed description of the methodology and procedures that will be used for this study.
Chapter Three
Methodological Foundations and Research Approach

Purpose and Overview of the Study

The shared assumption of the 25 research leaders and graduate students who were brought together by the U.S. National Science Foundation sponsored workshop on creativity tools is that “creativity can be studied using scientific methods to produce replicable outcomes, taught in a reliable way that enhances an individual's or a group’s creative potential, and supported with tools that have validated benefits” (Shneiderman et al., 2006, p. 63).

The purpose of this study was to bring together three main overarching areas: collaboration, community, and technology tools to investigate the role of collaboration and computer technology in supporting creativity to determine how they support the creative process and whether they change that very process. This study explores three areas: (a) how effectively creativity is supported through collaboration and community, (b) whether collaborative technological tools are effective in achieving successful Communities of Practice, and (c) if the use of technology has a significant impact on the creative process. Ultimately, results from this research may suggest aspects of technology tools that are particularly effective, as well as ways to support creative achievement through curriculum design.

Methodology

Creswell (1998) describes five different qualitative approaches to research; (a) biographical life history, (b) phenomenology, (c) grounded theory, (d) ethnography, and (e) case studies. For this research project I have situated the approach to the topic within the last approach, opting to employ a case study approach using Creswell and Plano Clark’s (2007) case study structure, focusing on the problem, within a specific context, exploring the issues involved, and looking at the lessons learned in relation to the original hypothesis. In a case study the researcher looks to develop a richer and more in depth understanding of the participants’ experience of the
phenomenon, and through the use of mixing methods, the addition of a quantitative approach asking specific, narrow questions and collecting numeric data from the respondents, attempts to conduct a portion of the inquiry in a more unbiased and objective manner (Creswell, 2005). This would be useful in determining the strength of the respondent’s opinions, and extrapolating the qualitative results to a larger group.

To ensure the results would be a useful contribution to the scholarly literature on the topic, I felt that an in depth case study of a specific group as they worked collaboratively using technology would be the most appropriate approach to take and which would provide data from multiple sources and ultimately offer an in depth picture and overall rich exploration of the topic (Creswell & Plano Clark, 2007).

This case study was based on the collaborative design experiences of a group of third year university undergraduate students studying fashion design and fashion communications who were, as an assignment in their course in Integrated Design, preparing for a design and marketing competition for the MacGregor clothing company and which made up 50% of their mark for course work.

This section of the course as the basis for this case study was a seven week period where these students worked collaboratively to research, create designs, and develop plans to market them. This case was a particularly effective choice for this study merging as it did collaboration and the use of computer technology in creative work. It added a further depth to the study as the group of students in this course came from two streams of study and some groups were formed entirely of students from one stream of study and thus the Communities of Practice model was helpful in exploring the experiences of these groups. Other groups however formed from members of different streams of study and the Communities of Interest model was a more appropriate framework for studying the collaborative experiences of these groups. Further richness in terms of understanding emerged from a comparison of the issues and benefits of these two models of collaboration.
Mixed method design.

Traditionally research has been conducted within one of two research paradigms; quantitative research which strives to be free of bias, where the researcher remains emotionally detached and uninvolved with the objects of study and providing access to larger populations, and qualitative approaches which recognize that there are multiple-constructed realities, and which may provide for rich, thick, and descriptive observations. However Johnson and Onwuegbuzie (2004) call for a third research paradigm where researchers move beyond the either or, quantitative versus qualitative approach, towards a new paradigm employing both methods, drawing strengths and minimizing the weakness of each into a single study (p. 15).

Morse (2003) argues that the strength of using mixed methods in a study is to allow the research to develop as “comprehensively and completely as possible”, and providing a deep and rich understanding of the issue at hand (p. 189). Notwithstanding Smith and Heshusius’ (1986) argument against mixed methods designs, the literature supports the use of mixed method designs because collecting multiple sets of data using different research methods may provide complementary strengths and non-overlapping weaknesses (Creswell, 2003; Creswell & Plano Clark, 2007; Greene, Caracelli & Graham, 1989; Johnson & Christensen, 2004; Morse, 2003). As well, each method can help to develop or inform the other or, alternatively, one method can be nested within another to provide further insights into varying levels or units of analysis. Ultimately mixed methods may help researchers develop a fuller understanding of the phenomenon (Creswell, 2005; Greene et al., 1989; Tashakkori & Teddlie, 1998). Yin (2003) makes the point that all good qualitative designs have some quantitative aspects to them.

Creswell and Plano Clark (2007) describe mixed methods research as “a research design with philosophical assumptions as well as methods of inquiry” (p. 5). As a methodology it involves philosophical assumptions that provide the researcher with guidance in the collection and analysis of data and the appropriate way to mix the qualitative and quantitative approaches in various phases in the research process.
As a method, it focuses on collecting, analyzing, and mixing both quantitative and qualitative data in a single study or series of studies. Its central premise is that the combination of both qualitative and quantitative approaches support a more in-depth understanding of the research problem than either approach alone would be able to do (p. 5)

Creswell and Plano Clark (2007) go on to tell us that there are three ways to mix data: merging the two datasets, connecting the two datasets by having one build upon the other, or embedding one data set within the other. They strongly suggest that the researcher avoid a simple connection and analysis of two disparate types of research but rather mix both methodologies together in such a way that they form a more complete picture of the problem than either would do alone (p. 7). For this research project I adopted the approach of connecting the data sets, beginning with the qualitative research data which in turn helped to develop the quantitative research questions, and the final results were explained and analyzed using both sets together, the first providing a deep richly informative understanding of the phenomenon, and the second allowing the extrapolation of these results to a broader group. In Figure 2, I use this graphic organizer to show the approach I took to merging the data from this study.

![Figure 2. Overview of research process.](image)

There are some specific benefits to be gained in this manner, particularly in terms of overcoming the weakness inherent in each of the approaches. Specifically, quantitative research alone generally provides little insight into the context and setting of the problem and individual voices and participant’s perceptions are not directly heard. Further, the researcher does not develop an understanding of the
individual’s personal biases or an understanding of how participants interpret the context.

Qualitative research, on the other hand, attempts to make up for these weaknesses while at the same time presenting its own, such as potential researcher bias in interpretation, and limited sampling, issues generally avoided in quantitative approaches. Mixing the two approaches allows for both in depth understanding and familiarity with the context, and further, provides a larger sampling for interpretation.

Further the researcher is not restricted to each methodology’s typical types of tools for data collection. In this research project, I was able to use both in depth personal interviews and questionnaires, rather than be limited to only one or the other approach. Also of benefit is being able to answer questions in different ways, for example personal interviews help in developing a rich and deep understanding of context and personal bias, allowing the researcher to find out the why and how of the phenomenon while the quantitative explorations of the same phenomenon allows the researcher to determine the extent of agreement with a larger group. Finally, employing both qualitative and quantitative methodologies encourages and supports the use of multiple worldviews or paradigms rather than the more narrow views that often are associated with just one approach (Creswell & Plano Clark, 2007, p. 10).

In the preceding discussion, we see that quantitative research emphasizes the measurement and analysis of relationships between variables; qualitative approaches on the other hand, stress the socially constructed nature of reality and how the participant’s experiences are developed and given meaning (Silverman, 2005). I based the initial phase of this research on a qualitative approach employing semi-structured personal interviews which formed the main body of this study on the creative process and the perceptions of the individuals involved, situated within the context in which they occur (Punch, 2000). In fact Blum and Muirhead (2005) tell us that case studies are driven by the questions: how, why, and when certain phenomena are considered with very specific case situations, people, organizations, or industries. Creswell (2003), Creswell and Plano Clark (2007), and Leedy and Ormrod (2010) warn than an
important part in determining what type of case study to use is to determine which will be most promising and useful.

Heeding these recommendations, I conducted the research for this study at a local university and situated it within a faculty focused on creative work. The actual case study itself focused on a project students were preparing for a larger organization that is part of the industry these students will eventually join. Finally, I should note that the research for this study was conducted at a local university with which I had no affiliation. “Researching in one’s own back yard”, according to Glesne and Peshkin, (as cited in Creswell, 1998) “should be avoided!” (p. 114). While intimate knowledge of the setting and phenomenon may provide some advantages, there are dangers involved such as having predetermined expectations that may compromise the data and this is a critical point in qualitative approaches to research. According to a number of experts in the field, studying within one’s own institution or ‘backyard’ should be avoided unless there are compelling reasons to do so (Creswell, 1998; Glesne & Peshkin, as cited in Creswell, 1998).

For the purposes of this research study I had no compelling reason to conduct the research within my own institution. In fact the population most likely to supply good solid research data relative to creativity and technology was at an institution that I was, for the most part, unfamiliar with. I began this research with a pilot study to become familiar with the institution, the students, and the overall creative context and issues.

This site was a particularly good case for four reasons. First of all, the competition portion of the course ran for a specific period of time, second both the institution and focus of the student work was on creativity, third, the students were working collaboratively and using technology in their creative work, and, fourth, the final products were evaluated not only by an experienced faculty member, but also by judges from the organization underwriting this competition. All the main ingredients of an effective case study, as laid out by Creswell and Plano Clark (2007) were clearly in place.
Finally, all researchers must make a realistic assessment of the research context in terms of undertaking research and access to participants for their studies. In this case, I had a long term colleague who is a faculty member in the School of Design at this institution, willing to introduce me to the administration to seek permission to undertake the research and who was instrumental in connecting me with the faculty member who was delivering the course in which this competition, the basis of the study, was a part. This individual was willing to support my research by providing an introduction to the students to solicit volunteers for the study.

_The exploratory design._

Of the four major types of mixed methods designs, triangulation design, embedded design, explanatory design, and the exploratory design, the exploratory design was chosen for this project, which intends to employ the results of the first method (qualitative) to help develop or inform the second method (quantitative) and is based on the premise than an exploration is needed for several reasons such as the lack of measures or instruments, unknown variables, or in the absence of a guiding framework or theory, and when the researcher wants to explore a phenomenon in depth and then measure its prevalence (Creswell & Plano Clark, 2007).

The exploratory design is a two-phase approach and is often referred to as a sequential design. This starts with a qualitative approach which helps to develop an instrument identifying variables for subsequent testing quantitatively. Then, because the design begins qualitatively, often a greater emphasis is placed on the initial (qualitative) phase, which was, in fact, my approach to this case study. There are three procedural considerations that need to be explored in determining which type of mixed methods design to employ, the timing or sequence (in effect the temporal relationship between the quantitative and qualitative components) the order in which the data are gathered and analyzed, the weighting decision, which method will carry more weight than the other, and the procedure for mixing the data.

The structure of this study was based on the need for qualitative interviews to be conducted and the results analyzed before the quantitative questionnaire was developed, thus a sequential, two phase approach was required. The two phases were
temporally close in order to take advantage of using the same overall group for both the qualitative and quantitative phases. However I would like to note that the participants from the qualitative interviews did not take part in the quantitative research questionnaire, although the participants of both methodologies were all derived from the same overall group. The close relation between these groups provides justification for extrapolating the findings from the first to the second group. I also felt that if the results of the interviews were generalizable to the second larger group, that this would be a first, albeit small step in attempting to generalize the results to other groups at different institutions.

Morse (2003) suggests that the theoretical drive, or worldview, used to guide a study should determine its weighting and Morgan (1997) argues that the weighting in a study be based on the strength of which data collection method (quantitative or qualitative) is best suited to address the study’s goals or purpose, the research question(s) and the use of procedures from each tradition. In this case I believed that the results of the qualitative case study interviews would provide a richer and more in-depth understanding of the phenomenon and most likely answer the problem and thus should carry more weight; whereas the questionnaire used in the quantitative phase would more likely shed light on whether or not the results could be extrapolated to a larger group.

Figure 3 provides a graphic overview of the two phases of this exploratory design, including the approach in each phase, and the procedures and products of each.
There are strengths as well as challenges in the exploratory design approach, according to Creswell and Plano Clark (2007). The strengths of the separate phases are that they support describing, implanting and reporting, taking advantage of both research mindsets—those of qualitative and quantitative methodologies. On the other hand, there are challenges inherent in an exploratory design, the main one being the extra time required to implement an additional phase. Receiving ethics approval may be particularly challenging when one phase, in this case the quantitative questionnaire is dependent upon the first phase and thus has not been developed at the time of ethics review. Another challenge is determining whether the same individuals should serve in both phases. I was guided by the recommendations of Creswell and Plano Clark (2007) for minimizing the threats to validity in sequential, exploratory designs, by employing different individuals for each phase. Table 3 is adapted from Creswell and Plano Clark (2007) identifying potential threats to the validity of sequential designs in mixed methods research and ways to minimize these.
Table 3

Potential Threats to the Validity of Sequential Designs in Mixed Methods Research

<table>
<thead>
<tr>
<th>Sequential Design</th>
<th>Minimizing the Threat</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Data collection issues</strong></td>
<td></td>
</tr>
<tr>
<td>Selecting the same or different individuals for the qualitative and quantitative data collection</td>
<td>Select the same individuals for an Explanatory Design and different individuals for the Exploratory Design</td>
</tr>
<tr>
<td>Using the same sample sizes for the qualitative and quantitative data collection</td>
<td>Use large sample for quantitative and small sample size for qualitative</td>
</tr>
<tr>
<td>Not choosing participants for the follow-up who help explain significant results</td>
<td>Choose same individuals for the qualitative follow-up and the quantitative first phase</td>
</tr>
</tbody>
</table>

| **Data analysis issues** | |
| Choosing weak quantitative results to follow up qualitatively | Choose significant results or strong predictors to follow up |
| Choosing weak qualitative findings to follow up quantitatively | Use major themes as the basis for the quantitative follow up |
| Not addressing validity issues | Address both quantitative and qualitative validity |


The suggestions provided in Table 3 for minimizing the threats to the validity of the sequential designs were instrumental in addressing validity in this mixed method study. For example, in dealing with data collection issues, different individuals should be selected for the qualitative and quantitative data collection and a much larger sampling size was employed in the quantitative questionnaire data collection, while a smaller sampling made up the personal interviews that were part of the qualitative
phase of the study. The suggestions for minimizing the threat to validity in data analysis indicate that significant results should be followed up and major themes should provide a basis for the secondary, quantitative phase of the study. I employed the strong themes that emerged from the personal interviews in the development of the statements employed in the questionnaires, providing a clear correlation to the interview topics, and allowing for clear comparisons between the two different groups employed in each sequence of this research.

Rossman and Wilson (as cited in Greene et al., 1989) outline three functions for mixed methodology: (a) corroboration, helpful in establishing convergence; (b) through elaboration, providing richness and detail, and (c) initiation, which prompts new interpretations, suggesting further areas of exploration (p. 257). Greene et al., (1989) also looked at a complementary versus triangulation mixed-method study, where qualitative and quantitative methods are used to measure overlapping but different facets of a phenomenon, yielding “an enriched, elaborated understanding of the phenomenon” (p. 258). They suggest that the use of a qualitative interview might determine the nature and level of participants’ perceptions; while the quantitative questionnaire might measure the nature, level, and perceived ranking—the two measures are then assessing similar, as well as different, aspects of the phenomenon.

To complete the discussion on the importance of and benefits to be accrued from mixed-methods research it is important to remember “a tenet of mixed methods research is that researchers should mindfully create designs that effectively answer their research questions” (Johnson & Onwuegbuzie, 2004, p.20) and finally, to keep in mind that the research problem always drives the choice of the initial methodology (Creswell, 2005; Johnson & Onwuegbuzie, 2004). In terms of the approach to this study, I felt that the mixed methods approach taken here was particularly effective in answering the research questions. The initial methodology, the qualitative phase of the research, was necessary to develop an understanding of how the participants viewed and experienced the creative process, their perceptions of creativity in collaborative group work, and the ways in which they employed technology both in collaborating and creative work. A rich and deep exploration of these concepts was
critical to developing my understanding of the phenomenon. The second methodology, administered as an online questionnaire, provided a larger sampling to determine if the results from the personal interviews were supported by a larger and different group of participants.

**Sampling.**

Another issue relative to an exploratory design is in determining the sampling of same or different participants. As discussed above, Creswell and Plano Clark (2007) believe that for exploratory designs, researchers should employ one group of individuals for the first stage of data collection and these individuals should not take part in the second phase. In this case, the quantitative questionnaire was used as a means to generalize the results of the initial qualitative results to a larger and different population, although of course the sampling sizes, due to the inherent natures of the different approaches will be different. This issue of unequal sizes is generally not considered problematic in exploratory designs because the intent is not to merge or compare data, but rather use one data set to develop the second.

**Participants.**

In this research project, a group of approximately 60 students was approached to take part in this study. Of this group 13 volunteered to take part in the case study interviews in phase one and the remaining group from year 3 and another group of approximately 60 students from year 4 were invited into the second phase. Purposefully, in light of Creswell and Plano Clark’s (2007) recommendation to use different populations for each phase, no participants who took part in the semi-structured interviews also took part in the online questionnaire.

**Developmental Process of the Research Instruments**

The research process began with a pilot study with 4 student participants. The purpose of the pilot study was to provide the researcher with an opportunity to develop a familiarity with the school, students, the program, and most importantly an understanding of the issues to help in developing questions to begin the qualitative phase of the research. Each of the 4 students who took part was asked 12 questions in
all, 4 in each of the areas of creativity, collaboration, and technology. The responses were invaluable in helping to situate me in the field of study i.e. creativity within the domain of fashion design, and students’ use of collaboration and technology in the creative process. The questions used in these interviews emerged from the research on collaboration and creativity, and were developed to explore technology in an attempt to answer the driving question of the research which was to determine how effectively computer technology supported collaboration, and if the use of computer technology changed the creative process or the final product, or both.

Creativity.

The pilot study employed five main areas about creativity:

- What is creativity?
- What makes something a creative work?
- Who decides something is creative?
- How does creativity happen, what is the process?
- Are mechanical [manual] skills necessary in the creative process?

As noted previously the questions emerged from a review of the literature on creativity, and from my desire to begin an exploration of what creativity meant to these individuals. I also hoped to tease out the various components of creativity to provide an overall picture of how they viewed creativity. The first question asked the participants to share their understanding of what creativity is and to define it. The responses indicated that each had a unique perspective of what constitutes creativity, employing a variety of words such as unique, new, different and so on. Asking this question helped me to situate the participant relative to their own perspectives and inform and contextualize subsequent discussion. This was an effective question and thus it was added to the later interview questions.

The second question asked the participants to share their feelings or perceptions about what makes something a creative work. Responses to this question
raised other, deeper analyses of what factors participants considered creative, and was also included in the larger set of questions.

The third question asked participants who, in their opinion, decided what was creative. The fourth question, how does creativity happen or what is the creative process, started to tease out the components of this process. I believed that if I could discover discrete parts or steps, these would be helpful in determining if these steps could be supported through collaboration and technology. The participants generally referred to a starting point outside of them, some sort of stimulus such as an idea or thought or even picture that began or sparked the process off. Some participants then spoke of moving from here to drawing, others to researching, or brainstorming, but generally gathering further ideas and then beginning to develop them was a common response.

The final question employed in the pilot study interviews asked participants whether manual skills were important in the creative process. The following is a chart organizing and outlining the development of the pilot study questions, the subsequent main study interview questions and the quantitative questions used in the online questionnaire.

Table 4 demonstrates the developmental stages of the questions relative to creativity as they emerged from the pilot study, to the main study results, and the development of the online questionnaire:
Table 4

*Developmental Stages of Creativity Research Study Questions*

<table>
<thead>
<tr>
<th>Pilot Study</th>
<th>Interview Questions</th>
<th>Questionnaire statements</th>
</tr>
</thead>
<tbody>
<tr>
<td>What is creativity</td>
<td>Define creativity</td>
<td>N/A</td>
</tr>
<tr>
<td>What makes something creative</td>
<td>What makes something creative</td>
<td>N/A</td>
</tr>
<tr>
<td>Who decides</td>
<td>Who decides</td>
<td>Receiving feedback from teachers is important to my creative work</td>
</tr>
<tr>
<td>What is the process</td>
<td>Where does creativity start and how does it flow</td>
<td>My creative inspiration comes from external sources</td>
</tr>
<tr>
<td>Are specific skills necessary</td>
<td>Are certain skills necessary to the creative process</td>
<td>Receiving feedback from peers helps me be creative</td>
</tr>
<tr>
<td></td>
<td>Are faculty creative in curriculum design</td>
<td></td>
</tr>
</tbody>
</table>

**Collaboration.**

The pilot study employed a further five questions on the concept of collaboration and Communities of Practice in support of creativity:

- What is the importance of giving and sharing ideas?
- Do you see creativity as an individual or collaborative process?
- How effective is collaboration in terms of developing new ideas?
- How importance is receiving feedback from peers and professors?
- What is your overall perception of the importance of collaboration in creative work?
Overall the goal here was to gain an understanding of the ways in which the participants viewed collaboration as part of their creative process and, specifically, how they experienced it working in teams on the McGregor competition. The first question asked participants how important they felt it was to collaborate in terms of giving and sharing ideas. The second question sought to discover whether they viewed creativity as an individual or collaborative activity or process, while the third question attempted to assess the effectiveness of collaboration in the development of new ideas.

The fourth question explored feedback and the importance participants attached to this in their creative work. The last question asked each participant to identify the main benefits of collaboration in creative work.

Table 5 organizes the questions in sequence from the pilot study, through to development of the main study questions for the qualitative and quantitative portions of this research project.
Table 5

*Developmental Stages of Collaboration Research Study Questions*

<table>
<thead>
<tr>
<th>Pilot Study</th>
<th>Interview questions</th>
<th>Questionnaire statements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Importance of sharing ideas</td>
<td>Is collaboration important in the creative process?</td>
<td>Group work is an important part of the creative process</td>
</tr>
<tr>
<td></td>
<td>What is your perception of the importance of collaboration in creative work?</td>
<td>I think the final product is more creative when I work with others</td>
</tr>
<tr>
<td></td>
<td></td>
<td>My creative inspiration usually comes from external sources</td>
</tr>
<tr>
<td>Importance of receiving feedback</td>
<td>How important is receiving feedback?</td>
<td>Receiving feedback from my peers helps me to be more creative</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Receiving feedback from teachers is important to my creative work</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I need to feel a sense of trust before I can be truly creative in a group</td>
</tr>
<tr>
<td>Effectiveness in developing new ideas</td>
<td>How effective is collaboration in developing new ideas?</td>
<td>Collaborating and brainstorming is a great way to spark new ideas</td>
</tr>
<tr>
<td></td>
<td>What benefits do you gain collaborating?</td>
<td>The main benefit to working in groups is getting more work done by dividing it up among group members</td>
</tr>
<tr>
<td>Is creativity individual or collaborative in nature?</td>
<td>Is creativity individual or collaborative?</td>
<td>I see creativity as an individual rather than a collaborative process</td>
</tr>
<tr>
<td></td>
<td>Are you asked to work collaboratively often?</td>
<td>I enjoy collaborating with others on creative projects</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Working alone increases my creativity</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Working in groups stifles my creativity</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I learn and develop as a creative person when working in collaborative groups</td>
</tr>
</tbody>
</table>
Technology.

Finally, the other questions used in these interviews emerged from the research on technology and creativity, and focused on technology related research questions: how effectively could computer technology support collaboration and the creative process, and if the use of computer technology changed the creative process or the final product, or both.

The responses to these questions in the pilot study referred to a broad range of computer technology related issues such as the need to be introduced to and trained in a number of software applications, the importance of being knowledgeable about the use of computer technology to increase employability, the value of technology in locating ideas quickly, sharing them with colleagues, and getting feedback, and, finally, how the computer software tools can help in the actual design process.

The pilot study employed four main questions about the effectiveness of technology in supporting collaboration and the creative process:

- How effective is technology in support of collaboration?
- Did you use computer technology more as a repository of ideas, models, or templates rather than a communication tool?
- How comfortable are you in terms of computer technological skills?
- What is the overall value of technology in creative work?

These questions allowed me to gain an understanding of the ways these participants viewed and used technology in their creative work, specifically in the collaborative work on the McGregor competition.

The first question attempted to determine whether or not the participants viewed technology as an effective tool in support of collaborative work.

The second question asked about the ways participants used technology. There were several references to the various uses in the literature and this question focused on whether the participants used technology merely as a source or repository of ideas
and models or more fully, treating it as a partner in all phases of the creative process. The third question asked for participant views of the value of technology in the design context in relation to their skill level in the use of computer and other technology tools. I believed that there would be a correlation between higher skills levels and the ability to be more effective in the use of computers and computer technology.

The final question asked the participants to identify any further benefits to be accrued through the use of computers and computer technology. Table 6 organizes the questions in sequence from the pilot study through to development of the main study questions for the qualitative and quantitative portions of this research project.

Table 6
Developmental Stages of Technology Research Study Questions

<table>
<thead>
<tr>
<th>Pilot Study</th>
<th>Interview questions</th>
<th>Questionnaire statements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effectiveness in supporting collaboration</td>
<td>How effective is computer technology in supporting collaboration?</td>
<td>I feel that computer technology is helpful in collaborating</td>
</tr>
<tr>
<td>Use as a repository</td>
<td>Do you use technology as a repository of models and templates?</td>
<td>Computers and technology are valuable tools in the creative process</td>
</tr>
<tr>
<td></td>
<td>Where do you see computers and technology in the creative process?</td>
<td>I begin the creative process online</td>
</tr>
<tr>
<td></td>
<td>I use computers and technology in all phases of the design process</td>
<td>I see computer technology as a full partner in the creative process</td>
</tr>
<tr>
<td>Skill level</td>
<td>Are you comfortable with computers and computer software?</td>
<td>I prefer manual tools when being creative</td>
</tr>
<tr>
<td></td>
<td>I am comfortable with most computer technology</td>
<td>We need better technology tools to</td>
</tr>
</tbody>
</table>
Do you feel that the curriculum is designed to help foster creativity?  support creativity

I need to develop better computer skills

Value of technology in creative work

How effective was technology in your collaboration on the McGregor project?  The use of computer tools changes the creative process

Computers and technology tools add to my creativity

What is your overall perception of the value of technology in creative work?  Computers and technology are appropriate for only some of the creative design process

What benefits do you gain by using technology in the creative process?  The use of computer tools changes the final outcomes of the creative process

Computer technology restricts my creativity

---

**Phase one interview questions.**

The interview questions were developed from the initial review of the literature and the goal of these questions was to elicit a discussion about if, and how, technology supports collaboration and whether the use of computer tools makes a difference to the creative process or its outcomes, or both. A few questions from the pilot study were divided into three overarching themes of creativity, collaboration, and technology. Tables 4 (creativity research questions), table 5 (collaboration research questions) and table 6 (technology research questions), show the developmental stages from pilot study to interview questions and online questionnaire statements.

**Phase two questionnaire developments.**

A Likert-type five scale questionnaire was developed from the major themes that emerged from the interviews and asked participants to respond to these
statements. It was hosted online through SurveyMonkey, allowing the participants to take part virtually.

Qualitative data analysis traditionally produces three forms of data; participants’ quotes, codes developed by the researcher, and themes made up of groups of codes. Some of the quotes from the participant responses can be developed into questionnaire items, codes can be used as variables measured by multiple items, and the themes can represent the larger scales of an instrument (Creswell & Plano Clark, 2007). The approach I took to developing the questionnaire that made up the second phase of this research was twofold; using participant quotes, and rephrasing some of the original interview questions into statements.

For example, some of the more common and repeated quotes from the participants’ responses in the interviews were rephrased into a statement and used in the questionnaire that made up the second phase. The participants were asked to rate their agreement or disagreement with the statement. The following examples came from quotes or comments from the participant interviews: “Working alone increases my level of creativity” or “I need to feel a sense of trust before I can be truly creative in a group”, and “We need better technology tools to support creativity.”

In other cases, statements were taken from the original questions put to the interview participants such as, “Is group work an important part of the creative process?” or “The use of computer tools and technology changes the creative process,” or “Computer tools and technology restrict my creativity.” Overall, two major themes were employed in the questionnaire, statements that related to collaboration, and themes that related to technology.

The scale employed was a five point Likert-type scale which provided a range of potential responses from strongly agree through to strongly disagree. I took particular care to ensure that a neutral response was provided for in the questionnaire to ensure that participants would not be forced to choose an option that they neither agreed nor disagreed with.
Further, some questions were included to assess response bias and reliability, such as repeated questions using slightly different language. For example, I believed that the following two statements would return a similar response, “Computers and technology are valuable tools in the creative process” and, “Computer and technology tools add to my creativity.”

Another example of statements that should in theory return similar responses is: “Collaborating with others and brainstorming is a great way to spark new ideas” and “My creative inspiration usually comes from external sources such as the Internet, magazines, and brainstorming with others.”

The following three tables organize the above questions relative to the variables that emerged from the personal interviews. Table 7 shows the creativity variables that emerged from the participant interviews such as definitions of creativity, the importance of skills in the creative process, and the issue of feedback, and then shows the questions that were employed in each, Table 8 organizes the questions relative to collaboration, and Table 9 the technology related variables.
### Table 7

**Creativity Variables and Related Questions**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Related Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Definitions of creativity</td>
<td>Define creativity</td>
</tr>
<tr>
<td></td>
<td>What makes something creative?</td>
</tr>
<tr>
<td>Creative process</td>
<td>How does creativity start for you: How does it flow?</td>
</tr>
<tr>
<td></td>
<td>Can you teach people to be creative?</td>
</tr>
<tr>
<td>Skills</td>
<td>Are certain skills necessary to be creative?</td>
</tr>
<tr>
<td></td>
<td>Can you teach students to be creative?</td>
</tr>
<tr>
<td>Perceived value of</td>
<td>Teachers’ approach to curriculum design</td>
</tr>
<tr>
<td>feedback</td>
<td>Do you see your curriculum as exemplifying a creative process?</td>
</tr>
<tr>
<td></td>
<td>How important is it for students to receive feedback from peers or faculty?</td>
</tr>
</tbody>
</table>

Table 8 organizes the questions relative to collaboration variables such as the participant’s opinion of the value of collaboration, and how much they enjoyed having opportunities to collaborate in the creative process. It also shows the related questions about the issue of feedback from peers and faculty members and, finally, some of the related questions that were developed from the theme of personal development and their creativity.
### Table 8

**Collaboration Variables and Related Questions**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Related Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived value of collaboration</td>
<td>Group work is an important part of the creative process</td>
</tr>
<tr>
<td></td>
<td>I see creativity as an individual vs. collaborative process</td>
</tr>
<tr>
<td></td>
<td>I think the final product is more creative when I collaborate with others</td>
</tr>
<tr>
<td></td>
<td>Collaborating with others and brainstorming is a great way to spark new ideas</td>
</tr>
<tr>
<td></td>
<td>The main benefit to collaborating is getting more work done by dividing it up</td>
</tr>
<tr>
<td>Perceived enjoyment of collaboration</td>
<td>I enjoy working in groups - collaborative with others on creative projects</td>
</tr>
<tr>
<td></td>
<td>I need to feel a sense of trust before being creative in a group</td>
</tr>
<tr>
<td>Feedback</td>
<td>Receiving feedback from my peers helps me to be more creative</td>
</tr>
<tr>
<td></td>
<td>Receiving feedback from my teachers is important to my creative work</td>
</tr>
<tr>
<td>Personal Development</td>
<td>Working alone increases my level of creativity</td>
</tr>
<tr>
<td></td>
<td>Working in groups stifles my creativity</td>
</tr>
<tr>
<td></td>
<td>My creative inspiration comes from collaborating or other external sources</td>
</tr>
<tr>
<td></td>
<td>I learn and develop as a creative person when collaborating</td>
</tr>
</tbody>
</table>

Finally, table 9 organizes the questions that related to the technology variables such as skills levels with computer technology, perceptions of the effects of technology on the creative process and, finally, overall views on the value of using technology in the creative process.
Table 9
Technology Variables and Related Questions

<table>
<thead>
<tr>
<th>Variable</th>
<th>Related Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skill level with technology</td>
<td>I use computer technology in all phases of the design process</td>
</tr>
<tr>
<td></td>
<td>I prefer manual tools in the creative process</td>
</tr>
<tr>
<td></td>
<td>I am comfortable with most computer technology and software</td>
</tr>
<tr>
<td></td>
<td>I need to develop better skills in the use of technology</td>
</tr>
<tr>
<td>Effects on the creative process</td>
<td>The use of computer tools changes the final outcome of the creative process</td>
</tr>
<tr>
<td></td>
<td>We need better technology tools to support creativity</td>
</tr>
<tr>
<td>Perceptions of the value of technology in support of creative process</td>
<td>Computers and technology tools add to my creativity</td>
</tr>
<tr>
<td></td>
<td>Computers and technology tools are appropriate for only some of the creative process</td>
</tr>
<tr>
<td></td>
<td>Computer technology restricts my creativity</td>
</tr>
<tr>
<td></td>
<td>I see computer technology as a full partner in the creative process</td>
</tr>
<tr>
<td></td>
<td>Computers and technology are valuable tools in the creative process</td>
</tr>
<tr>
<td></td>
<td>I feel that computer technology is helpful in collaborating</td>
</tr>
</tbody>
</table>

Data Analysis

I began the qualitative data analysis by transcribing and reviewing the transcripts against the electronic file for accuracy. I then copied the responses to the questions posed during the interviews into a new document that organized the responses to each question together for ease of analysis and coding. I explored the responses a number of times in an effort to determine if certain observations surfaced several times and until common themes emerged. These responses were then broken down into smaller units, mainly brief sentences and small paragraphs, and labels were assigned, using the participant’s exact wording and/or terms from the literature.
The second (quantitative) part of this study which was based on a Likert type 5 scale questionnaire which employed statements that emerged from the interviews. In all 27 items made up this questionnaire which was hosted online through SurveyMonkey. SPSS 17.0 software was used to calculate frequency tables using the questionnaire data obtained from SurveyMonkey.

Due to the apparent overall homogeneity of the population that took part in the online questionnaire (all female, same age category, ethnicity etc.) demographic and experiential data were not gathered and as a consequence further statistical testing was not possible because population factors could not be numerically assessed. This second part of this mixed methods study was conducted to determine whether the views of the somewhat larger population who participated in the questionnaire were consistent with the themes that emerged from the interviews.

Creswell and Plano Clark (2007) present three ways in which mixing of qualitative and quantitative data can occur: (a) *merge* the data from either methodology into the results, (b) *connect* the data, starting with qualitative data moving to quantitative data and developing the results, and (c) *embedding* the data, including the quantitative data within the qualitative data and developing results (p. 7). The approach I took to organizing the results was to connect the data, starting with the qualitative data and moving to quantitative data and developing the results. This approach mirrored the actual research approach itself, and therefore the results from the interview discussions which took place in the qualitative phase of this research in phase one are presented first, followed by the results of the applicable questionnaire items.

**Role of the Researcher**

As the sole investigator in this research project, my role began with developing the initial pilot study questions and administering the interviews. From there I started to develop more comprehensive interview questions which I administered to faculty and students. Following that, based on the themes which emerged from the
interviews, I went on to develop the quantitative questionnaire and administered it electronically, via SurveyMonkey.

In the data analysis, I conducted transcript analysis and attempted, as the interpreter of the results to relate them to specific examples from the data in an effort to support objective reader inference from the direct quotes provided. The reader therefore is able to review my analysis of the data as well as develop their own inferences as well.

**Participant Selection**

The initial contact at this institution was the professor who was teaching the course and who welcomed me into all three sections under his supervision. He introduced me to the students and provided me with an opportunity to share with them my research plan and to invite them into the study. He allowed me to observe during the initial weeks of the project competition when he was reviewing certain concepts as he felt it would be a good grounding for my subsequent research. He also allowed me access to the students once again at the end of the seven weeks to solicit volunteers to take part in the research. After the course was over, I conducted the personal interviews, at the participants’ convenience, with 13 students during the spring of 2008.

Following the student interviews, I went on to interview 6 faculty members including the course professor as a basis of comparison. I felt it might be informative to see in what ways the faculty responses may or may not align with the student participants’ views. I also felt that adding this new dimension into the research project would further provide for a richer and more in-depth understanding of certain creative phenomena and possibly help to contextualize certain of the student responses such as views about faculty approaches and curriculum design. Finally, I took care to ensure that only the responses of students who did not take part in the personal interviews were included in the data collection from the online questionnaire.
I maintained confidentiality throughout the study by stripping names from the interview transcripts and using fictitious names in the transcripts, notes, and the final report. All electronic files have been maintained on the University of Toronto servers housed under my password protected Blackboard portal and paper transcript copies kept in my home office under lock and key.

Validity and Generalizability of the Study

Yin (2003) tells us that the quality of a case study research design is judged on four criteria: (a) construct validity, (b) internal validity, (c) external validity, and (d) reliability. The first, construct validity is based on the degree to which correct operational procedures are followed to measure concepts being studied. For the purposes of this study, I established construct validity through the use of multiple data sources, in this case personal interviews with faculty and students and also quantitative questionnaire responses, and by establishing a chain of evidence which the reader can retrace the process and observe verbatim quotes from participants. Internal validity was tested in the data analysis phase, exploring the data for recurring patterns that emerged from multiple sources of data.

External validity attempts to determine whether the study’s findings are generalizable beyond the immediate case study (Yin, 2003). While generalizability is not a goal of qualitative research, employing a mixed methods approach to this study and including a second phase with a quantitative questionnaire allowed me the opportunity to attempt to extrapolate the findings to a larger population and in doing so, I was able to determine external validity. External validity of the qualitative research portion was tested by carefully selecting criteria and procedures for categorizing information and themes that emerged from the personal interviews.

Finally, reliability is the degree to which the findings from one research study can be replicated. This may be possible through the case study protocol documented here and the extensive documentation throughout this study. However due to the unique nature of the university program and content, the reliability of future studies would mostly likely only apply to a school and program with a creative basis.
Deviations from the case study approach

Case studies, based on Creswell and Plano Clark’s (2007) structure call for focusing on the problem within a specific context and exploring the issues involved. These were all guiding approaches for this study. I had planned to go beyond personal interviews with the participants, and had hoped to further add to the rich and in depth understanding of the phenomenon through (a) videotaped focus group discussion, (b) following one or two groups quite closely as they worked through the creative project, and (c) observations of other groups. Unfortunately none of the study participants volunteered to take part in the focus group aspect of the research.

I was unable to observe groups as they worked through the design process. After two or so sessions in the computer labs scheduled for the course, virtually all students chose to take advantage of the anywhere and anytime benefit of computer technology. In fact, most students never appeared again in class, and instead relied on various computer technologies to solicit developmental feedback from the course professor and other technology solutions for collaboration. I found it ironic that the use of computer technology that I had hoped to observe was itself the vehicle for supporting collaborative work outside the classroom and eliminating this avenue of the research. The many computer technology tools available to the students such as email, Facebook, trading USB keys, and virtual white boards allowed these students to work individually and share work virtually, working from home, others places in the school, and in some cases from other countries.

Chapter Summary

With complex research questions, Creswell (2005) believes that mixed methods research is often the best approach to addressing this complexity. Creswell and Plano Clark (2007) go on to say that “mixed methods approaches allow a researcher to measure trends, prevalences, and outcomes, and at the same time, examine meaning, context, and process” (p. 175). Through a combination of qualitative and quantitative data, I attempted to provide a more complete analysis of the problem; where numbers can be situated in the context of participants’ words to frame trends
(Denzin & Lincoln, 2005). I believed that particular value in this research was the attempt to generalize the findings to a larger group, one of the benefits of mixed methods research according to Bazely (2003), who call it the "third methodological movement" (p. ix).

This chapter describes the importance of mixed methods studies, their benefits and weakness and how these were addressed in this research. Chapter Three also provided an overview of the methods and procedures I used in this study. It describes the participants’ selection, the methods of data collection for both the qualitative and quantitative data along with the study design and data analysis.

In the following chapters, Four through Six, I present the results of the research, using the three overarching areas of this research, creativity, collaboration, and technology. Each chapter begins with the faculty interviews and provides a comparison with the student interviews and the quantitative questions applicable to each theme are included within the student discussion areas. In the final chapter, I begin to weave together these three overarching areas of this research project, and to conclude the discussion with implications for curriculum design and teaching, and recommendations for further research.
Chapter Four
Creativity Interview Results

Creativity is an act of defiance. You are challenging the status quo. You are questioning accepted truths and principles. You are asking questions that mock conventional wisdom. (Tharp, 2003, p. 133)

Introduction

The concept of creativity as situated within the domain of fashion design was not the main focus of this research; however understanding the lived experiences of the study participants was an important place to begin. In order to identify if certain components of the creative process could be supported by collaboration and technology, questions such as, “Where does the process start” would, I thought, be helpful in understanding how the participants used the computer and Internet to inform their work. I also asked participants if specific skills were required in the creative process to explore how key computer technological supports for specific skills such as illustrating and designing were used. In all, the discussions with faculty and students on the topic of creativity yielded a good grounding in and understanding of creativity as viewed by the participants.

The remainder of this section will present the results of the personal interviews with faculty and students. The faculty interviews included the program coordinator and the professor teaching the class. I felt it important to interview faculty to get a sense of their understandings and approaches to the creative process to inform my understanding of student approaches.

Main Study Results

In this section the results will be presented based on the portion of the interviews and quantitative questions that focused on creativity. Each question that was asked is shared here and will introduce the faculty responses, followed by student responses and end with the quantitative data from the questionnaires completed by
the students. Participants are all identified by pseudonyms. Data for each question will then be discussed.

Definitions of Creativity

This first question, asking each participant for their definition of creativity, investigated how the participants viewed the concept of creativity within their context of fashion design and communications.

Faculty responses.

There was a strong commonality among these six faculty members in the terms they used to define creativity. They consistently used words such as unique and new. Where they differed slightly was in how they defined the process. For example Michael said, “I would define it as the ability or the process of being able to bring things together to create something new or something different” and Bridgett believed creativity to be “someone taking an idea, modifying it, brainstorming to create new ideas and new combinations, and altering the original idea and creating something that is unique and original,” and Phil’s definition of creativity was, “the use of imagination to find unique solutions to situations or problems and having the vision to find a unique solution to something.” Both Michael’s and Bridgett’s responses viewed the creative product as being made up of things already in existence and thus the new product was a kind of modification of the existing one(s)—in effect an adaptation or amendment of the original. This indicates a practical application within the domain of fashion design where products generally are an adaptation or reapplication of an existing product. Phil’s response was framed more from a theoretical approach to problem solving in a more general, rather than an applied way.

Student responses.

As with the faculty, I began the student interviews asking the participants to define creativity and to tell me what they thought made something creative. Terms such as individual, original, new and unique appeared in most responses. Pat defined
creativity as, “an individual’s ability to innovate beyond their own capacity, going beyond what they actually are aware of and think of and to push the boundaries into other areas that aren’t yet explored.” Kristen also viewed creativity as something new and different but that “it came more from the heart than from logical application, something entirely unplanned.” Donna and Andra’s responses included a visual component, saying that creativity was a visual expression of them as a designer and both participants added a new dimension to the discussions on the creative process by citing the expression of emotions as a critical component of creativity.

Innovating, thinking out of the box, seeking new solutions, and just doing something new and different were common responses in defining creativity. Brandy felt that creativity “is just trying to come up with something new, putting a new spin on ideas, adding your personality into them and making things relevant.” Brandy went on to say that, in her opinion, in fashion design, everything had been done and that nothing was ever brand new, the goal then was to take something existing and add a new component to it. This response reflects a common experience in our North American culture, where older fashion elements are brought back into current designs, usually incorporating small changes, such as colour, fabric, or texture. Brandy recognized this use of old ideas and products as the basis for new ones and responded thus when asked what made something creative. “I think it needs to be relevant, like with the times, it has to be in line with current trends, using old things for inspirations and making them new by redoing them, that’s still creative.” Eye catching and original, unique and different, something that catches your eye and grabs your attention, out of the norm, and things you have not seen before were some of the other defining characteristics students identified as characterizing a creative product.

In reviewing the responses of both faculty and students’ definitions of creativity, similar responses emerged. Terms such as new, unique and different were common. Also common were catch phrases such as “thinking outside the box,” or “developing new solutions,” and “putting a new spin on things.” A few students spoke of the emotional side of creativity, but for the most part, the definitions were
pragmatic in nature. This primarily pragmatic view of creativity demonstrates that the students are not focused on fashion design for creativity’s sake, but rather keeping in mind the financial demands of the fashion industry which would strongly influence the creative work through links to saleability.

The Creative Process

The next question examined how the participants viewed the creative process, and identifying how the process began and what it looked like. In particular, I wanted to break down the process into discrete areas to facilitate further explorations of how collaboration and technology might support these participants’ creative work.

Faculty responses.

Half of the faculty participants spoke of inspiration and developing an idea which most closely reflected the views from the literature of Shneiderman’s “Inspirationalists”. “Inspiration starts the process,” according to Bridgett, “they [students] sift through data to come up with an idea, looking though magazines, but mainly the internet—they do a lot online at the outset, searching out new fabrics, and doing trend research and so on.” The rest of the faculty reflected the views of the “Perspiration vs. Inspiration” camp of Inspirationalists identified by Shneiderman (2000), in that they saw the process as involving a balance of 1% inspirational and 99% perspiration—that flash of insight followed by much hard work to achieve the final result. The faculty participants felt that process and problem solving formed the larger, more critical part of the creative process. Phil believed that his colleagues highly valued a thoughtful process over huge intuitive leaps, although he understood this analytic process as taking place at varying points in the research and problem solving stages. Bridgett’s response also reflected this approach, where creative work starts with problem formulation. She explained that the following was a commonly used approach employed by students:

They research the situation problem, and discover avenues to resolve it through reading, looking at things, even dreaming—things that stimulate the imagination which in turn support the ability to resolve things.
Making leaps to intuitive solutions or even dredging things up from memories or previously stored information.

Student responses.

Phillip’s (2007) work on cognitive prosthetics informed the development of this question which explored whether students viewed computers and computer technology as merely another tool of their trade, or as a full partner used in all aspects of the creative process. I asked each participant to relate how the creative process began for them and a large number of participant responses included the term Inspiration, which was not of itself surprising as it would make sense that the process needs to begin with some sort of idea that would most likely emerge from something that inspires the process and helps formulate the idea. What was notable was the fact that most of the time these participants turned to the Internet for this spark, this inspiration to develop a workable idea and begin the creative process.

Donna noted that she usually found some sort of inspiration from an image, “something I might see on the Internet or in a blog,” which was similar to Andra’s approach who usually began the process looking for visual references for inspiration, “I go online, on my computer” she said, “looking for images and colours, silhouettes or graphic designs and combine them all into a starting point.” Kristen also started the creative process online, turning to the Internet to spark some ideas.

The other term that was common in a number of the responses was the term, brainstorming, which is where Brandy started the process, “usually on my own but sometimes in a group. I take a word or idea, or even an object and then I make a web of words, ideas, and colours and try to put it all together. My second step is looking on the Internet for images and ideas.” Karen’s approach was similar: “I start brainstorming ideas, draw sketches, write down words, and skim through images, so generally something in the external environment, usually the Internet, starts me off and I tweak these ideas further.”

Lindsay was one of the few who took a different approach and started with her sketchbook, as did Bonnie and Sandi. Drawing sketches, and writing down words were
common responses from these three individuals. Bonnie felt that she could not do anything if it was on the computer right away nor could she talk about it, she needed something visual to start with, making sketching a logical start in the process for her. Once she had some ideas on paper, the next step was talking with someone about it to see if her ideas made sense and to gather some suggestions. Julia’s approach was quite similar and she shared the process in the context of a recent design she had developed:

For most of my projects, I usually start with a concept space. For example I had to do a design for a Fifty’s diner. So I began the process with the words Fifty’s diner and then wrote down anything that popped into my head that tied to this concept. From there I started gathering images and this is where I began using the Internet.

Thus we see that not all respondents turned initially to the Internet to begin the creative process although for those students who began the creative process with pen and paper, the next step for them, usually in the image gathering stage, was to go online and search the Internet for these images and ideas. Pat viewed the process in much the same way; her starting point was usually the sketchbook. “For me, it starts with paper and pencil— I draw things and often one page will have a thousand things on it ... and then I just start working on one idea, I mould it and keep working until finally I have something that’s amazing.”

The following questionnaire item shows the frequency of use of external sources at the outset of the creative process and was framed as, “My creative inspiration usually comes from external sources such as the Internet, magazines, and brainstorming with others.” From Figure 4 we see the bulk of the responses fell into the category “Agree” (52.4% or 33 participants), with a further 16% or 10 participants in the “Strongly Agree” which is clearly in line with the interview participants.
In discussions about the creative process, virtually every respondent spoke of inspiration as the starting point with most identifying the Internet as a common starting point, using fashion blogs, online fashion magazines, and Google images. One student however began the process through brainstorming. Brandy and Karen took a slightly different approach and spoke about how they would take a word or idea, or even an object and make a web of words and colours, then turn to the Internet for images and further ideas. A few students such as Lindsay, Bonnie, Sandi and Julia began with manual sketches and written words as ideas. For those who began the process manually, away from the computer and using traditional design tools such as pen and paper, the next step was to move online to search for further ideas, or gather images to continue on. Therefore right at the outset of the process we see that not all students turn to the use of technology or collaboration in their creative work, although approximately 70% of this group of participants did.

**Assessing Creativity**

During the pilot study interviews, the participants were asked who decides what makes something creative and the responses spoke to the issue of assessment. It appeared that trying to determine a mark for creativity might be subjective on the part of faculty members so this question was also employed in the final research in an effort to examine how the faculty participants understood this issue.
Faculty responses.

Faculty members were asked what, in their opinion, made something creative and to share some of the ways they went about assessing it in students’ work. Not surprisingly, it was considered by most to be quite difficult and subjective at best and, further, that creativity for its own sake was insufficient, because products also required a marketability factor. Again, this pragmatic approach to creativity is most likely domain specific, dictated by the fashion industry’s need to develop designs that will sell. Teddy felt that assessing a creative product was “very, very difficult to do” however he did go on to stress the importance of practicality:

We need to remember that just because something is creative and unique and one of a kind, if it isn’t practical, it’s useless. You need to merge creativity with commercial marketability— that’s what McGregor and the rest of the fashion industry wants, something new and innovative but at the same time marketable.

Teddy also shared an example he uses with students to explain this point and put into perspective the additional challenges the fashion designer works under:

Creating something can be easy, however in the design field it can be very challenging … if you want to create something that is one of a kind, you can create a pair of pants with eight legs and we could call that octopus pants and you have never seen such a thing before. This is very creative. This is unique. This is one of a kind but it’s not sound and it’s not practical. Who will wear these pants? So you can see that being creative as a designer is quite different than being creative as an artist. You need to balance the creative with the practical.

Samuel also felt that assessing creativity was difficult, “you define the criteria [for the assignment], and look at the process work. I have projects divided into several stages and build into it some ways that I can evaluate each stage, and then apply some gut reaction and so, yes, it is subjective although we all hate to admit it.”
Phil was quite frank in his response. “It is very subjective! Oh my God, it’s subjective! It is one of the hardest things about teaching in an environment like this.” Phil explained how it is often difficult to understand where a student is coming from in their design projects and with 87 different students, each with their own points of view, he ends up looking at everything from his own set of precepts which he says, “can be really dangerous because there are many differences and, additionally in my case generational differences, especially as I am light years away from the target markets, so that is very challenging.” His approach to solving this dilemma is to take each situation or design and evaluate it on its own merits and own set of criteria: “In effect I look at the situation, who is resolving it, and what context they are doing this within, and finally evaluate how well they are meeting the criteria for the design project.”

When Phil was also asked how effective the use of a rubric or marking template might be in supporting more objective assessment, his response suggested he had considered and tried this: “When I use a rubric I find it difficult to give good marks. When you break it down into some nitty gritty points, no one really does well, whereas if you look at it sort of from a more Gestalt kind of perspective, it’s way more positive.” Phil went on to say that, “I like to use a rubric or share with students the marking criteria but I don’t assign specific marks to those criteria—it takes too long, it’s really hard to do and then I find I am constantly going back and fixing the numbers because the final marks seem so unfair.”

Three other instructors preferred to use definite objectives and criteria in their assessment of creative work. Mike believed that as he became a more experienced teacher it was becoming increasingly easier to assess creative work, generally because he was able to use parameters and objectives. He considered that innovation and creativity meant going above those objectives to get the A+. James was quite emphatic that assessing creativity was not, in his opinion, completely subjective and had this to say. “I never grade creativity, I grade how successful a student has achieved the objectives—creativity becomes part of that and certainly the best solutions are almost always creative.” James also said that, “I don’t think assessing
creativity is completely subjective or else I wouldn’t be doing what I am doing [teaching], so grading creativity specifically isn’t really something I do. I look at the original concept, how good is the colour sense, all the pragmatic things I can look at.” Bridgett was of a similar mindset. She shared her approach to assessing creative work:

I look at whether they have addressed all the criteria that was laid out for the assignment so when assessing creativity I am actually assessing the quality of the work, saleability of the concept, and otherwise assessing the mechanics as the work progresses such as the sketches, their design book, technical drawings and generally looking at the overall quality of the work.

Student responses.

When asked who decides if something is creative or not, the term subjective permeated the responses, largely mirroring the faculty responses. Darlee talked about the fact that there was no set formula to apply to creative work, and that the determination of creativity would of necessity be entirely subjective. Tess put it this way when asked about how professors marked creative work:

This is an issue with all classes, a subject that comes up over and over … and we wonder how do you mark a creative work in communication or design or anything else … the teacher would have to be really informed, and really follow your process because that can be very creative, the approach taken leading up to the final product.

Tess went on to say that there is often a sizeable difference between what she and her peers often felt about their work, and how it was viewed by their professors. For example they might feel on one occasion that their work was wonderful and creative, yet the feedback from the teacher failed to reflect this, while conversely some work was perceived by her as, “… a piece of crap and yet the teacher loved it—sometimes teachers see something completely different in the work than we do, so the subjectivity of perception occurs even in faculty evaluations.” In all, the student participants had a number of stories about feedback that they perceived to be
subjective, and commented that often it was difficult to try to achieve creative design because of a fear of losing marks by straying too far from the project guidelines and from what everyone else was doing.

Subjectivity has huge implications for faculty approaches to evaluation, but perhaps even more importantly in the way faculty encourages students to think critically and apply creative solutions to problems and is therefore an important finding of this research. This theme is discussed in substantially more detail in the final chapter of this thesis.

The following two items focused on investigating how the larger group of students who completed the online questionnaire perceived peer and faculty feedback. The first item containing the statement “Receiving feedback from my peers helps me to be more creative” elicited a strong response. From Figure 5 we see that 61.5% or 40 of the participant responses feel into the category “Agree,” with a further 22% or 14 participant responses in the category “Strongly Agree.”

![Figure 5. Responses to the question “Receiving feedback from peers is important in my creative work.”](image)

On the other hand the next item from the questionnaire framed as “Receiving feedback from teachers is important to my creative work” demonstrates that the teacher’s feedback was also strongly valued. In Figure 5 the “Agree” category was lower than the category “Agree” in Figure 4, suggesting that students valued their peer feedback slightly more than teachers; however student’s responses were substantially higher in the “Strongly Agree” category of valuing teacher’s feedback. In
Figure 6 the participants returned a much higher than student response in the strongly agree of 35.4% or 23.

![Figure 6](chart.png)

*Figure 6. Responses to the question “Receiving feedback from teachers is important in my creative work.”*

The issue of assessment, especially in light of the varied definitions of creativity is worth further exploration. The faculty spoke of the difficulty inherent in assessing creative work and several mentioned the subjective nature of assessment, and Samuel went so far as to say that, “it is subjective, although we all hate to admit it” and this was supported by Phil’s comment, “oh my god, it’s subjective! It is one of the hardest things about teaching in an environment like this.” The lone dissenting voice on the topic of the subjectivity of assessing creativity came from James who was quite emphatic that assessing creativity was not completely subjective because he focused on assessing the *mechanics* of a project instead. One common criterion however did emerge, and that was the marketability factor, as Teddy put it, “you need to merge creativity with commercial marketability—that’s what McGregor and the fashion industry wants, something new and innovative but at the same time marketable.”

The students clearly felt that teacher assessment of their creative work was subjective at best, particularly when the guidelines for assignments were vague. One student participant, Darlee, spoke to the difficulty of developing a formula to apply to creative work, and this was evident in Phil’s comments about the difficulties he has experienced in attempting to develop marking templates and the problems inherent in using them in assessment.
**Importance of Skills**

This question of interest in relation to creativity-related skills is that if discrete steps were inherent in the creative process, and within these steps the need for specific skills became apparent, this might be an area where computer technology could support or enhance, or even replace the manual skills required in the creative process. The specific skills involved would depend upon the particular domain of the creative enterprise, and it was a question of interest in this study, how those might be identified within the fashion industry context.

**Faculty responses.**

The faculty responded quite strongly that in order to be a successful designer, knowledge of the various skills involved would be critical. Bridgett, an experienced and award-winning designer herself, with many years of experience in the fashion industry provided this response which, in effect, summed up the replies from the other faculty:

You can design a dress without knowing how to sew or draft patterns, however sometimes there are technical problems in the design because the designer did not recognize potential problems. Often the pattern drafter needs to let the designer know that the sketch does not work technically and that the design needs to be altered. Knowing how to sew, draft a pattern, and work on a product are assets in the creative process of fashion design and fashion designers who have sewing and drafting skills often are able to recognize potential problems before they happen and can incorporate techniques into the design to deal with these issues. As well, learning new techniques in fashion design helps designers to make their final product unique and knowledge of textiles helps these designers understand the drape and appropriateness of the fabric to the design. This skill is difficult for students to develop and understand.
From their comments, instructors appeared to believe that non-computerized, manual technical skills in the creative process were quite important. In some cases the technology can assist individuals with undeveloped skills in certain areas, and this was mentioned again when I asked faulty if they could teach someone to be more creative or develop methods to foster this ability. The two main themes that emerged here were teaching through improving mechanical, non-computerized skills in the use of creative design tools, and through fostering an environment conducive to creativity.

In terms of the need for non-computerized technical skills, Teddy felt, “that is why we have the program right? The students definitely need technical skills to create a prototype, or at the very least, draw a sketch, so we need to teach them the mechanics.” Phil suggested that, “you can support their creativity in part by giving them the tools to make the best use of the creativity” and James responded that, “I am not so sure we can teach it, but rather we can set up a situation where they can learn to become more creative, all we can do is give them the tools and show them how to use them.”

All faculty participants felt that the classroom environment was critical in supporting creativity. Further to James’ response about support tools, he also thought that an environment conducive to learning needed to be in place to support creative activity, and he often accomplished this through challenging students to think in different ways and supporting them in doing so. As well, he suggested that students would need clear guidelines to work from and receive feedback on their work on a regular basis. Most importantly he emphasized the need for giving students a lot of room to explore what they wished. Bridgett was also quite emphatic about the importance of fostering creativity through providing the right environment, and suggested the effectiveness of allowing students to define the problem for themselves and letting them make mistakes in a supportive venue. Phil also felt that you could support student creativity by, “giving them the freedom and encouragement to explore—giving them the means to make the most of what they have got.”
Student responses.

The student responses also strongly recognized the importance of skills in the creative process. While Brandy felt that a creative mind was more important than being adept at the mechanics, the skills involved in the design and creation process. She also added, “I think you can take inspiration and design a garment without having knowledge of the process,” although the rest of her colleagues felt that the underlying skills were helpful if not critical to design successfully. Donna shared her epiphany, the ‘aha’ moment that emerged during a design project in her third year.

During first and second year, learning the various tools and processes felt so useless. I wondered why I was being asked to paint 45 little squares of colour. I felt it was stifling my creativity. I finally realized that we needed to work through these small steps; I realized as I was working on a design project that this process of learning the basics, the manual skills actually helped me to develop my creativity later on.

Kristen, in her response to the importance of developing the underlying skills in the field of design, spoke to the issue of practicality, pointing out the need to know or at least understand what is involved in sewing, which fabrics lent themselves to certain designs, how material draped, and so on. She shared the following:

In fashion design, you need to understand the work involved in the entire process from design to manufacture—not only do you need to be able to use the technology tools in the brainstorming, design, and collaborative process but also in creation of the design. You can be creative and draw a wonderful image of say a beautiful dress, but if there is no way to manufacture that dress, then it is just a nice dress, but it’s not practical. It can be fancy and creative, but if you can’t make any money out of it, then what’s the point?

Sandi and Karen helped in putting this topic into context. In their first year, they were not exposed to any kind of computer technology: “You had to do everything by hand and that was a good strategy because we were learning the foundations.”
They went on to say how that changed in their third year: “then it’s all centered on computer technology with few projects hand-rendered. That’s when we recognized that the foundations of different elements of design and creativity were essential, providing us with choice in applying those skills later on in subsequent projects.”

The responses to this question point out that there are a number of important skills required in the creative design process and outlined some of these skills. I was able to use this information in the next two parts of the research, looking at the factors of collaboration and of technology. The faculty responses indicated a strong agreement about the importance of skills in successful design and this is the reason the first two years of the program are focused on teaching the students the manual skills of drawing, sketching, sewing, knowledge of textiles and colour, draping, and pattern drafting. Students then move on to learn computer technology, gaining skill using programs such as Computer Aided Design (CAD) software, and design software packages such as Adobe Photoshop, and Illustrator.

The Role of Curriculum

A strong body of evidence for the need to develop curriculum in support of creativity is emerging (Foxell & Mitchell, 2008; Gomoluch & Whittaker, 2007; Hargreaves, 2007; Hill, 2007; Kleiman, 2007; Martin & Florida, 2009) along with an even stronger recognition of the need for developing creativity in students (Caridad Garcia-Cepero, 2008; Foxell and Mitchell, 2008; Lewis, 2005; Martin & Florida, 2009; Powell, 2007). In fact, Hill (2007) calls creativity the currency of the new millennium. In asking this question about curriculum design, I aimed to find out what sorts of activities, assignments, or instructional strategies faculty employed in support of the creative development of their learners.

Faculty responses.

The faculty participants were asked to evaluate their curriculum in terms of how it exemplified a creative approach to design—did they keep in mind ways to help students be creative? Most responses indicated that this was in the forefront of their intentions when designing and developing their various curricula. As well, a number of
the responses reinforced issues mentioned earlier such as the importance of skills, having an open and flexible environment, providing opportunities for feedback and encouragement, and a willingness to challenge the students. The following begins to explore how these faculty members challenged their students.

“The approach you take depends on what you want to emphasize,” according to Teddy. “Some projects are designed to teach students skills while others provide an opportunity to be creative. The creativity is more important because in most cases, I assume they know the technical skills, so when I develop courses I feel I need to give the students most of the tools they will need to be creative.” James also commented on the need to make sure students have the tools they need, and understand how to use them, while Phil felt that creating curriculum that allowed students to build on their existing skills as well as develop new ones to build their confidence was a critical component of the creative process. Bridgett, an experienced creativity researcher concurred. Some common strategies were to avoid making the assumption that all students were competent with the use of tools but rather to try to discover if remedial work was indicated with certain students and to ensure they received any necessary instruction to develop a comfort level with the tools required for the project and course. Some faculty made themselves available after class to conduct any necessary remedial work with students.

Flexibility in terms of expectations was another important factor in curriculum design and pedagogical imperatives, because it supported the development of creative tendencies in students. Mike liked to keep projects a little open-ended, allowing his students to bring their own intentions or experiences into the project and proceed from there. He said, “I like to give them the opportunity to be flexible and to challenge themselves” factors that he maintained supported their creative development. In the following excerpt, James brings together the themes of tools and flexibility; he said:

Yes, absolutely that’s certainly my main goal to help students learn to be more creative. I refuse to give them specific steps; I simply give them a challenge, give them the tools and let them meet the challenge. I am
clear in setting the project objectives, but I am deliberately vague as to how they should get there. I encourage them to explore widely.

Bridgette also felt that it was important to avoid being rigid in her expectations. She went on to talk about the importance of the environment, a critical part of which is the professor’s expectations and flexibility. Here is what she had to say about environment and flexibility:

I’m not rigid in my expectations. I think the design of curriculum can have an impact on creativity. You really need to provide an environment that supports creativity and students need to be encouraged to expand on project expectations and add whatever they want into a project but the freedom to do so needs to be clearly communicated to them.

Challenging students was another theme that emerged from many of the faculty interviews, and while some clearly referred to critical thinking as a component of challenge, others tacitly assumed that critical thinking would be the outcome. Bridgette has conducted a number of research projects on creativity, and talked about the concept of critical thinking that has emerged from her research as one of the key aspects of creativity. She has identified the need for faculty to support and encourage development of this skill as one of the main stepping-stones to developing creatively. James often began a project with a challenge to the students and let them meet that challenge in their own ways. Samuel openly discussed his reasoning for challenging students:

I like to challenge students to get them to think outside the box ... to get them to explore various perspectives and look at subject matter in a new light and connect images, shapes, and colours together in different ways, to break down preconceived notions, and to get them to think critically ... to do this I talk about divergent and convergent processes. In all, I try to get them to break with expectations to help their creativity develop.
Finally, Phil was able to bring these themes together and emphasize a key issue: “I certainly try to create curriculum that builds on skills and experience which in turn, helps to develop the student’s confidence which is a critical part of being creative.” He added that he has often been amazed at what students can achieve if you truly believe in them: “It’s difficult for many to take a critical stance and be willing to try new things out especially when the issue of grades is involved—trying new things gets risky but we need to reward courage.” He also explained how giving grades sometimes restrains people, and often gets in the way of collaboration. The impact of collaboration on the creative process will be discussed in Chapter five.

Student responses.

Students were asked whether they felt that curriculum design was helpful in supporting their creativity. Most student participants felt that flexibility and having a lot of leeway, and freedom to explore were, perhaps, the most important aspects of curriculum design in support of their creativity. In fact, all participants but one agreed on this. Darlee felt that she became almost overwhelmed by too many opportunities and thought that a bit more structure would be helpful. She said:

One of our professors likes to give assignments where he feels he is allowing for the maximum creativity by simply providing a starting point and from there you could do anything. For example we were designing an advertisement for a perfume company—it could be whatever size product, whatever type of perfume, and any target market and advertised through any media you chose. In his eyes, that allows for the maximum creativity but what I find is that it actually works the opposite way … it actually ends up the opposite of creativity because instead of finding a solution for a challenge, you are constructing a problem around your solution.

Kristen generally found that flexibility and opportunities to explore were helpful, however she shared the objectives of an assignment she found somewhat
difficult which illustrated how the lack of structure and expectations could be problematic for some students, and, in some cases, even paralyzing:

In one project we were given a word as our focus and we couldn’t use the word but you had to take pictures of it and make it into something. It was so difficult and we really tried to figure out how to do this and meet the assignment parameters. I guess someone thought that was a creative approach but I think it frustrated, rather than supported, our creativity.

Several participants talked about how the professors made them learn the foundations of colour, elements of design, and ways to employ technology in the process. Using those basics, those supports for the process, or as Donna put it, “learning the foundations” the resulting balance supported creativity. Sandi had a similar response and added that learning the basic skills makes it easier for her to find things out for herself. Julia thought that the curriculum had been designed to “help us become more creative, learning the basics, how to brainstorm and so on which provides the underlying support and then the freedom and flexibility to explore really sets the stage for creativity to blossom.” Andra felt strongly that flexibility in support of her creative work was important, “I find having open ended projects, and lots of flexibility allowed me to be more creative” having the freedom to explore apparently made her more willing to try new approaches and in general, more enthusiastic about the process. Andra provides this telling example:

We were working on building our first Web site, it could be on any topic, a social cause, environmental issue, graphic design ... but what was important is the project really needs to be open-ended. As long as you meet the criteria, you could do whatever you wanted and this freedom was critical for me to be successful. Having the opportunity to work on a project based on something that is important to me, something I am passionate about, and not something that’s been forced on me is a wonderful way to allow me to explore my creativity.
Brandy raised the issue of feedback, and spoke about how it is a critical ingredient in the creative process. She felt that there is room for improvement in terms of curriculum design and faculty involvement and said that, “for professors to really improve upon what they are doing, what is really helpful is constructive feedback, especially when that professor has the credibility to back up their feedback” and by this she was referring to how feedback was valued relative to the professor’s experience in the fashion design industry. Andra believed that next to the freedom and flexibility to explore topics of interest, the feedback from her professors was an important part of the process. “There is a fine line between pushing me to be more creative and leaving me alone!” Andra also said, “I had a few teachers who really push you creatively, they are brutally honest, and encourage you to expand your idea, to make it your own, while others don’t seem to want to influence your creativity so they hold back on purpose.” She felt that it was a difficult job providing feedback because many students, especially weaker ones, would do exactly whatever the professor said and simply make the recommended changes, ending up with a product quite different from the original creative idea. As she put it, “you have to find a balance between achieving a creative goal, having the courage to develop as a creative person and getting the marks you want … sometimes you listen to your professor if you are searching for good grades.” She clearly acknowledged the issue of the power that faculty has in the assignment of grades and how this often is a factor in the creative work that students do.

Pat believed that, in terms of curriculum design and the importance of giving feedback, there was always room for improvement. However as she pointed out, a lot of the professors were quite amazing, providing really constructive feedback that she and most of her fellow students valued because the faculty were creative people in their own fields, and thus had the credibility to support their suggestions. However, she thought it was important they critique and evaluate on the assignment criteria, the outer structures, the layouts and so on, the things that they have been taught, and not on the actual creative aspect of the project or product. This was quite an interesting distinction, and it connects to a comment made by one of the faculty who
stressed the fact that assessment should focus on the process and meeting the assignment expectations and not on the final product.

In all, the faculty verbalized their intentions to design and develop curricula that fostered creativity and supported students in the creative process. They spoke of the importance of developing an open and flexible environment where students were encouraged to solicit feedback both from peers and their instructors, and the importance of challenging students to do the best work possible. Providing the tools necessary to do the job along with appropriate training in their use was another important aspect of curriculum design, as was flexibility of expectations.

Students spoke to the need for flexibility and freedom to explore as the most important aspects of effective curriculum, although one learner, Darlee, cautioned that you can become overwhelmed by too many opportunities and too much freedom and therefore some structure is helpful.

Discussion

Defining creativity has been somewhat of a contentious issue among experienced creativity researchers. However, some agreement has been achieved and one of the key components, according to creativity researchers, is that for an item or product to be determined as creative it must cover four areas: (a) originality, (b) expression, (c) social evaluation, and (d) social appreciation within a community (Fischer et al., 2005). Fischer and his associates tell us that originality refers to unique ideas or applying existing ideas to new contexts. However these ideas or new applications are of little use unless they are expressed and externalized so that social evaluation can occur, where other people can understand, reflect, and improve upon them. Finally, social appreciation refers to the effects of social rewards, that acknowledgement by others that motivate further creative activities.

Results from this exploration of creativity clearly align with the four areas of creativity that researchers have identified as the key components. The first area, originality, referring to unique ideas or the application of existing ideas to new contexts were referred to by many of the participants, both faculty and students,
when defining creativity, used terms such as unique, and new, either based on something completely original, or making sufficient changes to an existing item to modify it into something unique.

The second area, expression, speaks to the need for the creative artefact to be expressed and externalized in some manner so as to make it public. This could take a number of forms such as web sites, digital or paper designs, or even a tangible item such as a dress, or some other piece of clothing. In this study, the student participants created actual designs and presentation boards (pictorial representations of the actual designs. A sample is found in Appendix H), and display racks. They also created written marketing plans outlining the research they conducted, the target markets for the products, and production and marketing suggestions. Some even created their own advertisements and input them into these marking plans.

The third component of a creative item is social evaluation. This involves the externalized expression of a creative idea in the form of a physical or virtual artefact. Social evaluation involves others reflecting on, understanding, and possibly improving the artefact. In the educational context, as opposed to the marketplace, this sort of social evaluation would occur in two ways, feedback from peers and feedback from faculty. Another element of social evaluation occurred in this case study through the McGregor Company judges. The fourth criteria, social appreciation within a community, refers to the effects of social rewards, and acknowledgement by others, which can be a product of feedback from the social evaluation process, or within the context of this study, marks apportioned by the professor and, of course, by the awarding of prize money by the McGregor judges in the competition.

In looking at the creative process, most participants pinpointed the process as starting with some sort of inspiration, some sort of spark that initiated the process and that was followed by a lot of hard work! Using Shneiderman’s review of the creativity literature and subsequent organization of creative work into three main schools, it would appear that the participants in this study would likely fall into the Inspirationalist school of thought. As with this study’s participants, this school of creative thought, while emphasizing the “aha!” moments also believe that luck
favours the prepared mind, and sees creativity as 1% inspiration and 99% perspiration. Brainstorming, free association, and divergence strategies force individuals to see problems with new eyes. Faculty members such as Bridgette clearly spoke to this inspirationalist perspective as illustrated by her definition of creativity, “taking an idea, modifying it, brainstorming to create new ideas and new combinations, and altering the original idea into something unique and original.” Innovating, thinking out of the box, seeking new solutions, and just doing something new and different were common responses to defining creativity. Karen, one of the student participants, spoke of brainstorming for new ideas, looking for that spark of inspiration that began the creative process for her, after which the manual work or searching for images, drawing sketches and so on completed the process.

Structuralists on the other hand, emphasize a more orderly methodological approach. These visual thinkers prefer the use of libraries and other repositories of previous work—domain-specific models and step-by-step exploration. Brandy talked about, “putting a new spin on ideas, making them relevant. Nothing is really new” she commented, “The goal of fashion design was to take existing things and add a new component.” She went on to clearly situate herself as a structuralist with her comment, “using old things for inspiration and making them new by redoing them, that’s still creative.” This approach was also taken by other students such as Lindsay and Sandi, who started off with some sort of sample as a starting point in the design process, and then moved on to redeveloping it through the various steps in the process.

The third group, the Situationalists, emphasize the social context as key to the creative process, visualizing creativity as being situated within a Community of Practice, and requiring social approval as well as tools supporting access to previous work in the domain, along with opportunities for consultation and sharing of work with members of the field and their own communities. Michael’s definition of creativity as “the ability or the process of being able to bring people and things together to create something new or different” lies clearly within the Situationalists approach to creative work.
A number of the students spoke to the importance of feedback as a key element of working in communities, in this case with peers and professors. They viewed feedback as essential to their development as creative individuals and felt that feedback was critical in not only keeping them on track but also in validating their ideas and spurring them on to being more creative. This will be discussed further in the chapter on collaboration, where we will see that a majority of students believed that collaboration was a critical component in the creative process.

Brandy, a student participant, spoke of starting the creative process off by brainstorming, often with others, relying on the community to spur her work along. Karen also worked in much the same manner, and identified brainstorming as the starting point in most of her work as did Bonnie, who started the process with the development of some sort of visual design, but whose next step was to share it with others before developing the idea further.

![Pie chart showing proportion of participants in different schools of creative thought]

*Figure 7. Overview of the faculty who fell into the three schools of creative thought.*

In Figure 7, it would seem that the participants’ responses in this study fell fairly evenly into either the Inspirationalist, or Situationalist schools of thought, and a smaller percentage of responses falling into the Structuralist category.

**Implications for Teaching, Learning, and Curriculum Development**

Exploring the educational implications of these discussions identified the importance of being aware of the characteristics and differences among the three main schools of thought on creativity, and to ensure curriculum design supports a variety of approaches to creativity. For those who work within the inspirationalist school of creative thought curriculum designers need to remember the 99%
perspiration and 1% inspiration rule and ensure that students have the tools and knowledge to support the hard work that is part of the creative process while also providing them with the opportunity to connect and brainstorm with others, in search of that spark that begins their creative approach.

The structuralists’ need for repositories of previous work and a step-by-step approach to creative design can be supported through the use of libraries exploring solutions, the use of faculty supervision, and by providing students with direction to various locales where they can gain ideas and locate possible templates to begin and inform the creative process. Building assignments into the curriculum that have discrete steps and opportunities for frequent feedback would also be of value to these individuals.

Creating opportunities for collaborative work clearly aligns with the needs of those students operating within the situationalist school of creative thought. Social context is critical to the creative process for these individuals who see creativity as situated within a Community of Practice, where there are opportunities for consultation and sharing work, and getting feedback from their peers. Csikszentmihalyi (1996) defines creativity as a process that happenings in the interaction between a person’s thoughts and a socio-cultural context. Creativity emerges from relationships between an individual and their Community of Practice; it comes to life from activities within a social context where individuals interact with each other. John-Steiner (2000) points out that the mind and subsequent creative thought is dependent upon the reflection, renewal, and trust inherent in sustained human relationships. In support of this faculty need to recognize and facilitate collaboration and develop practice fields for students, where they can share and develop artefacts in support of the creative process. Faculty need to develop open-ended and complex instructional situations where learners encounter new and unpredictable conditions while at the same time recognizing that students need some context, direction, and guidelines.
Chapter Summary

The preceding section situated the research in the creative context of this School of Fashion, sharing the perceptions of creativity of both faculty and students. The chapter explored definitions of creativity, looked at the creative process itself, touched on the issues relative to assessment, the importance of skills in the creative process, and ended with a discussion of the ways curriculum development affected students’ creativity.

The following chapter will cover the second part of this research project, collaboration and its impact on the creative process, followed by chapter six, which concludes with the results from the technology section of this project.
Chapter Five
Collaboration Research Results

It doesn’t matter what genre you work in, you will need to rub up against other people. Somewhere along the line, you are going to need the contributions and judgement of other people. (Tharp, 2003, p. 38)

Introduction

Current research on the creative process is beginning to paint a more complicated picture of creativity, highlighting the importance of social interaction and collaboration in creativity work and looking at developing effective collaboration models and tools and ways to bring individuals together in community to support the creative process. While there is a large body of research and support for the fact that technological tools can effectively support social learning as well as assist in the development of effective learning communities, few studies have gone on to look at the ways in which collaboration might support creativity. This issue is an important focus of this research project, and the results from the portion of this study that focused on collaboration will be presented in this chapter.

Main Study Results

Exploring the concept of collaboration was a large part of this research project for two reasons, first of all to determine participants’ views of collaboration as part of the creative process, and to understand how the study participants worked together on their collaborative projects, using the McGregor project as the basis for this case study.

The major themes that emerged from the faculty interviews were the importance of collaboration in the creative process, its significance in preparing students for employment in the fashion industry, and the benefits to be accrued from collaborative work such as feedback, learning to work together, developing an understanding of diverse working styles, communication approaches, and the understanding that each individual has different perspectives on problem solving.
Finally, one of the main benefits of collaboration or working in community is that of learning skills from each other through shared activities, and illustrates aspects of Lave and Wenger’s Communities of Practice model, where members work and learn together through practicing and developing the necessary skills of their domain.

**Importance of Collaboration**

The participants were asked to share their perceptions of the importance of collaboration in the creative process. I felt that the topic of collaboration lay at the heart of this study and in light of this the Communities of Practice model informed much of this research. I believed it was important to understand to what extent this group of participant’s responses would be consistent with the existing body of research that recognizes the value of collaboration in the creative process (Csikszentmihalyi, 1996; Fischer et al., 1998; Fischer et al., 2005; Fischer, Sharff & Yee, 2004; Shneiderman et al., 2006; Tharpe, 2003). Further, should the participants be positive about the importance of collaboration in the creative process, determining why, and in which steps of the process, would be invaluable in informing the issue and in potentially identifying some discrete aspects that technology might be able to support.

**Faculty responses.**

For the most part, faculty viewed collaboration as an important part of the creative process; although two faculty members did point out that students can also be creative on their own. Generally they found that when group members worked well together, they invariably come up with more creative work. Bridgette suggested further benefits, in particular pointing out that the students were able to take on substantially more aspects of the creative process and thus be exposed to a broader experience of this process than they could have had they worked alone. She speaks to this here:

Although I have seen creative work coming either from individuals or groups, it is the groups that tend to develop much more creative work, at a substantially higher level. For example this year I had a team
working together on a collection and they decided on their designs and worked through the entire process of creating them and if I showed you their work, it is very impressive. Both they and I felt that they were able to plan a bigger, stronger collection together than the smaller parts of it they would only have been able to achieve individually.

Phil, an experienced and long term faculty member was positive about the benefits of having students work together and collaborating on creative work, especially on large projects in professional situations; in fact he believes that, “everything is collaborative.” He went on to say that he often felt sorry for students because they frequently ended up doing something alone that would be a collaborative process in the real world of fashion design: “I would tell them that it is going to be so much easier when you start working—you won’t be having to do everything yourself.”

Teddy also saw collaboration as important in the creative process, although he did say that students could still be creative working individually. He observed that sometimes groups can take an inordinate amount of time to reach consensus, and that to keep peace in a group, people sometimes compromised on their ideas, and the final product was not as good as it might have been, had members been willing to be more open to new ideas. Collaborative groups that are comfortable and trust each other can be much more successful. He believed that collaborating can be more difficult, and may take more time; however it is good for the students because when they begin work in the fashion industry, they will need to work with other people on teams, and therefore it is important that they develop collaborative skills.

Mike also thought that there were potential problems inherent in collaborative work: “Sometimes it is unfocused—sometimes it is about personalities and compromise” but often the students working on large projects such as the McGregor project, work quite well together and thus are able to harness the benefits of effective collaboration and put their strengths to work and contribute where appropriate, but they also learn more about areas in which they are weak.
Student responses.

There was a strongly positive student response to the importance of collaboration in the creative process, with many of the student participants recognizing that collaboration would be a required skill in the fashion industry, others adding that the ideas that are developed are much more sophisticated and creative, and that collaboration supported opportunities for feedback, as well as providing opportunities for learning new skills and to practicing weaker ones. With support from the community and with more participants in a group, students can take on larger multi-dimensional projects and thus practice and learn more about their field. Donna and Sandi both thought that it was important to gain the skills of working with other people as well as gaining skills of a technical nature by collaborating with others and having access to other skilled members.

Notwithstanding all the benefits of collaboration, there were some concerns, mainly with the time it takes to brainstorm and finalize ideas, the need for people to be willing to take on various group roles, and the need for a group leader or facilitator. Pat felt that collaborating was important in the creative process because, as she put it:

It is the real world, and whatever creative field you will eventually work in, it will definitely require some sort of collaboration. One or two people might actually execute the work, but the brainstorming of ideas is almost always collaborative … knowing how to work in a group and being able to be creative in a group is a good thing.

A member of one of the winning groups in the McGregor competition, Karen, raised the point that any sort of creative design worker would need to share ideas with others, in order to understand and work with those ideas and therefore it is not only important to gain skills in working collaboratively, but perhaps more important to be able to explain or demonstrate those ideas. As she pointed out, “you can have the best idea but if you can’t get it across to others, it isn’t going to be successful.”
Bonnie also felt that collaborating was an important part of the creative process, mainly because everyone has different views and when you look at someone else’s idea, you add a different element to it, and thus the creative work keeps growing, often becoming better than the original. She identified an energy that emerges from collaborating with others that she felt was a positive aspect of creative work. I found this reminiscent of Csikszentmihalyi’s concept of Flow—that heightened state of being fully involved and energized by and with one’s work.

Brandy, also a strong proponent of collaboration, talked about how she felt that working together was quite helpful: “We definitely had better ideas and products for our entry in the McGregor project because we collaborated together.” Brandy spoke of the brainstorming process that she and her group went through, focusing specifically on the metamorphosis of an original idea that occurred as the members continued to build upon it. She also pointed out, as did a number of other participants, that the very nature of the McGregor project virtually required collaboration due to the huge scope of the work required to address all aspects of the assignment and the competition requirements.

Darlee also found it was invaluable to work collaboratively, with many people giving feedback to one another and building on each other’s ideas. However she raised the issue of power dynamics, a relatively unexplored issue that emerges in Communities of Practice, and identified the need for creating structure in groups to avoid one person dominating the group, frustrating other members, and thereby stifling rather than enhancing creativity.

Kristen had a different take on the benefits and problems inherent in collaboration in the creative process, and also spoke to the issue of power dynamics. She shares her concerns here:

I think sometimes working together to be creative is very hard because you don’t necessarily come up with something better. It might be something everyone likes, and so you gain consensus, but you have had to compromise to get there, and often the result isn’t as creative as it could have been. When you are in a group, there is a lot more pressure,
and sometimes you hold back with your ideas because others might think they are weird, or you don’t want to share them in case others don’t like the ideas, and you can’t really get one idea that works for everyone, so we sort of tone it down but that doesn’t end up with a very creative product.

In the above passage Kristen is clearly identifying the sociological concept of group-think, sometimes raised as a criticism of the products of Communities of Practice. Kristen went on to talk about the importance of support and trust that needs to be in place for effective collaboration, and how it takes time to develop this. As she put it, “In doing developmental relationships with people in the group, you can really get creative, delving into your own creativity and expanding your ideas.” Although she also added, “sometimes it isn’t hard to be creative on your own and sometimes it’s hard to be creative as a group.” In all it seems to depend upon the particular group and support of the members within that group, and their willingness to deal with the issue of who has power in the group and how that power is used. This sentiment was echoed by Lindsay who felt that a productive group supports its members and once the group members are comfortable and confident, you “get tons and tons of really good ideas” and further, the advantage of collaboration is access to a variety of skills among members which helps to develop ideas and bring them to fruition.

The online questionnaire took themes from the students’ discussions and explored the opinions of the larger group of participants. Four statements were employed to determine (a) the importance of collaboration in the creative process, (b) whether participants enjoyed collaborating, or (c) if it stifled their creativity, and (d) if trust is important within the creative community.

The questionnaire item containing the statement “Group work is an important part of the creative process” in Figure 8 found the bulk of the responses in the category “Neutral” (41.5% or 27 participants), although there was a substantial representation in the category “Agree” (32.3% or 21) with a further 9.2% or 6
participants in the category “Strongly Agree.”

**Figure 8.** Responses to the statement “Group work is an important part of the creative process.”

Figure 9 shows the responses to the questionnaire item containing the statement “I enjoy working in groups, collaborating with others on creative projects”. The bulk of the responses again fell into the category “Neutral” (40.0% or 26 participants), an interesting finding compared with interview responses. However we see a strong representation in the category “Agree” (26.2% or 17) along with a further 9.2% or 6 participants who “Strongly Agreed.”

**Figure 9.** Responses to the statement “I enjoy collaborating on creative projects.”

Figure 10 shows the participant responses to the questionnaire item containing the statement “Working in groups stifles my creativity”. The responses again were predominantly neutral (41.3% or 26 participants) followed closely by 36.5% or 23 participants who fell into the category “Disagree.”
One of the issues that several students raised is that of the importance of feeling safe in a group. The next questionnaire item containing the statement, “I need to feel a sense of trust before I can be truly creative in a group” in Figure 11, shows that this is an important issue for effective group work. The bulk of participants fell into the category of “Agree” (40.0% or 26 participants) along with a strong representation in the category “Strongly Agree” (30.8% or 20).

The main theme that emerged about the importance of collaboration was that most faculty members saw it as the key type of interaction required for work in the professional world of fashion design. There were particular outcomes of collaborative activity that faculty valued as well, such as the development of more original ideas, being able to take on substantially more aspects of the creative process, learning skills such as compromising, communication, and learning how to give and receive feedback. Faculty also pointed out problems inherent in group work, such as the extra time required in developing and finalizing ideas.
The students also recognized that collaborative work skills would be required in the business world, and felt that it was beneficial to learn effective communications skills, as was developing an ability to explain and persuasively demonstrate their ideas. Students spoke to other benefits of collaborating such as the development of more sophisticated and creative ideas, opportunities for feedback, learning new skills, and opportunities to practice weak ones. They also commented on the benefit of being able to take on larger multi-dimensional projects and in so doing, learn more about their field. They also offered several caveats for effective group work such as the importance of forming effective and supportive groups where people were comfortable sharing ideas. The sense of trust in the group so engendered would provide an environment where members felt confident in taking on various roles, providing feedback to each other, and helping each other to further hone their creative skills.

The questionnaire assessed the larger group’s perceptions of several concepts. In the first item, the participants were neutral in rating the value of group work in the creative response, although there were also a significant number of responses in the “Agree” category. This neutral response also emerged in response to the statement, “I enjoy collaborating on creative projects.” Clearly this answer reflects similar tensions emerging from the interview responses. When asked if collaborative work stifled their creativity, the questionnaire participants were almost evenly divided between disagreeing or remaining neutral.

The last statement built on the responses of a number of students who felt that a positive group environment, one where people trust and support each other, are comfortable sharing ideas and opinions, and effectively provided feedback was critical to successful group creative processes. Over 70% of the participants agreed that this sense of trust was critical for group creativity to occur. This suggests that a sense of trust is important to students when collaborating in groups and has clear implications for the way faculty form groups in their classes and informs our understanding of the conditions necessary for effective collaborative work among students.
The following table compares the responses about group work that emerged from the questionnaire. From this table we can see that the participants in the online questionnaire appeared to be neutral in their views of the benefits of collaboration while at the same time they do not appear to believe collaboration negatively affects their creative work. However a strong response in the Agree column indicates the importance of a positive and supportive environment in creative work.

Table 10
Comparison of Group Work Responses

<table>
<thead>
<tr>
<th>Item</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group work is an important part of the creative process</td>
<td>9.2%</td>
<td>32.3%</td>
<td>41.5%</td>
<td>16.9%</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td>(6)</td>
<td>(21)</td>
<td>(27)</td>
<td>(11)</td>
<td>(0)</td>
</tr>
<tr>
<td>I enjoy working in groups collaborating with others on creative projects</td>
<td>9.2%</td>
<td>26.2%</td>
<td>40.0%</td>
<td>20.0%</td>
<td>4.6%</td>
</tr>
<tr>
<td></td>
<td>(6)</td>
<td>(17)</td>
<td>(26)</td>
<td>(13)</td>
<td>(3)</td>
</tr>
<tr>
<td>Working in groups stifles my creativity</td>
<td>1.6%</td>
<td>19.0%</td>
<td>41.3%</td>
<td>36.5%</td>
<td>1.6%</td>
</tr>
<tr>
<td></td>
<td>(1)</td>
<td>(12)</td>
<td>(26)</td>
<td>(23)</td>
<td>(1)</td>
</tr>
<tr>
<td>I need to feel a sense of trust before I can be truly creative in a group</td>
<td>30.8%</td>
<td>40.0%</td>
<td>16.9%</td>
<td>10.8%</td>
<td>1.5%</td>
</tr>
<tr>
<td></td>
<td>(20)</td>
<td>(26)</td>
<td>(11)</td>
<td>(7)</td>
<td>(1)</td>
</tr>
</tbody>
</table>

Is Creativity an Individual or a Collaborative Process?

While faculty and students seemed to be strong supporters of collaboration as an important part of the creative process, this question attempted to ask a similar question in a slightly different way, and thus to assess the validity of responses. Further I hoped to tease out some of the elements in the creative process, attempting to separate the ideation, the actual creative part of the process, from the manual steps.
Faculty responses.

Teddy, in his role as professor of the course and faculty coordinator for the McGregor project, observed that for this large project, most groups did break up the work into different areas and assign it to various members with the appropriate skills—a divide and conquer approach, but in their defense, he reminded me that it is a huge project! Clearly, the amount of work involved in the project, in combination with the short period of time students had to complete this work, would be critical factors in the approach taken by the students. Those preparing for the McGregor competition would be closely affected by (a) the large proportion of marks at stake (50% of the course value), and (b) the chance of winning substantial monies.

This division of labour or divide and conquer approach to collaborative work, identified by Levy & Murnane (2004) is a common student approach to group work, a point raised by three of the faculty members. James made clear his negative sense of the value of collaboration in the creative process and his belief that collaboration is more appropriate as a business model rather than for creative art. Three faculty members spoke of commonly seeing this division of labour approach and believed that the truly successful collaborations were those in which most members were involved in all aspects of the project. James shared the following, which both demonstrates and encourages this divide and conquer approach:

In a number of courses I teach I see that collaboration tends to water down the final work. For example I have students work in two’s or three’s or more, collaborating on a two page spread in a magazine. I always used to say that it would be better to assign one designer, one photographer, and one stylist and so on, in effect, letting people do what they do best. Usually they want to make it a more friendly thing and do all aspects together, including sitting in front of the computer designing the layout and almost invariably it is the most vocal student with the best inter-dynamic skills or the most overpowering personality who ends up forcing their design on the rest, and it is not usually the best design.
Finally Phil raised an interesting point, and one that has some strong representation in the literature on the individual versus social nature of creativity. Fischer et al. (2005), while agreeing with Campbell (1969) and Shneiderman, (2002) that individual creativity has limits because the human mind itself is limited, reminds us that “individual knowledge, imagination, inspiration and innovation are the bases for social creativity” p. 485. Phil made the observation that even when students do work on their own they are, in effect, collaborating with the history of design. Although, arguably, this is not true collaboration in a temporal sense, but rather connecting with the collective work in the domain. In this view, looking at magazines, the Internet, and reading and participating in fashion blogs, are still forms of collaboration. He made an interesting, albeit unintentional connection with Csikszentmihalyi’s (1969) observation that creativity does not happen inside a person’s head, but in the interaction between a person’s thoughts and a social-cultural context.

Phil’s comment, “they might not be conscious of the collaboration but it’s still there” echoes what might be a common belief amongst people generally, that we tend to see ourselves as individually creative and our work entirely as the fruit of our own labours when in reality, we build on what others have done. Tharp (2003) feels strongly that “borrowing or appropriating is an essential part of creativity. Where do you get your ideas? The short answer is: everywhere. It’s like asking where you find the air you breathe: Ideas are all around you” (p. 95). Finally, who explains this better than the musician Dizzie Gillespie who once said of Louis Armstrong’s giant influence on jazz, “No him, no me” (as cited in Tharp, 2003). Realistically we build upon each others’ work whether we view this as connectivity, collaborating at a distance and at different times, or working together in real time and real place.

**Student responses.**

The student participants were fairly evenly divided in their perception of creativity as an individual or collaborative process. Donna and Sandi felt strongly that it could be both. Collaboration offered them the opportunity to benefit from other people’s creativity when working on a large project with many elements, further, in
this situation they were also able to divide up the work and share the load. However they also pointed out that group work can be a frustrating thing as group members may get typecast in one role and are subsequently asked to take on that role in other projects. This creates a situation where these typecast members of the collaborative community fail to learn new skills due to lack of time. Karen also saw creativity as a little bit of both, individual and group, “I think it is people, individuals bringing their ideas to the group, sharing them with the other members who add to them and molding them into one main idea.” She went on to say that people need to be open and committed to other members of the group and be willing to pull their own weight as well as being comfortable sharing their own ideas.

Julia also thought creativity could be both individual and collaborative. She felt that while collaborating can be great for creativity and groups can come up with things that a single individual might never think of, there are issues in collaborating, such as too much talking, not enough work getting done, and having to ensure people take on a fair share of the work. Tess also felt that it could be both, and went on to say that, “you can be creative with someone else, which is a different kind of creativity and when there is good energy we can accomplish some really good ideas … ultimately, people are social animals” she said, and, finally, she offered a rather pragmatic observation that emerged in other interviews, “collaborating offers the benefit of having more people to share the work.”

The rest of the participants felt that creativity was strongly collaborative however they did offer the same caveats. Bonnie was quite positive, “I think when people collaborate there is an explosion of creativity,” although she went on to point out that this usually happens in a relaxed, open, and honest environment. In her experience any sort of hostility in the group stifles creativity. Darlee was also positive about collaborating:

I found it really exciting to work collaboratively because of the inspiration and spark you can feed off each other’s ideas. One person draws something and that makes you think of something else and then you add to it and eventually something really unusual and unexpected
emerges. I feel sometimes that’s when I get my best creative energy, working with someone else who can inspire me and I can inspire them!

Kristen believed that she was more creative in a collaborative environment—she also referred to “that spark or spur to developing new ideas.” Brandy also believed that creativity was definitely a collaborative process, agreeing with her colleagues that the mix of different individuals adding to ideas in the end generates much better ones than one individual might be able to develop alone, “the more minds the better” was the way she put it. In her collaboration on the McGregor project, she thought that her group generated much better ideas than they might have on their own, and that developing their brand and logo for the competition was an extremely creative process. She did add, echoing a number of others with the same concern, that you need to be comfortable in your group or you will “censor everything and may be afraid to throw out [share] the wacky ideas that others often think are wonderful.” Andra frames it all from a pragmatic perspective:

I think creativity definitely is a collaborative thing and working together helps prepare you for the future. Any large scale project is definitely never going to be only your creative vision, no matter what field you are in, so I think definitely creativity is collaborative. In fact, even when working on your own, you are still getting ideas from others—we don’t live in vacuums.

Four statements were developed from the preceding themes and subsequently included in the online questionnaire. The larger group who took part in these questionnaires were asked to rate their responses to the following statements, (a) Creativity is an individual vs. collaborative process, (b) Working alone increases my level of creativity, (c) The final product benefits from collaboration, and (d) Working in groups stifles my creativity.

The responses to the questionnaire item “Creativity is an individual vs. collaborative process,” indicates a fairly even distribution between the categories disagree, neutral, and agree/strongly agree. Figure 12 shows the spread of the
responses here as strongly parallel to the perceptions of the qualitative interview participants, and I would suggest that the neutral weighting is indicative of those individuals who felt creativity was both individual and collaborative, perhaps depending upon the various steps in the process.

![Creativity is an individual vs. collaborative process](chart)

*Figure 12. Responses to the statement “Creativity is an individual versus collaborative process.”*

The answers to the statement in the next questionnaire item were somewhat stronger. In Figure 13 we see that the responses to “Working alone increases my level of creativity” fell into the category “Neutral” (36.9% or 24 participants). However, combining the categories agree and strongly agree returns an overall percentage of 50%. While not statistically significant, I think that this clearly supports the interview participant’s ambivalence about the value of collaborative creativity.

![Working alone increases my level of creativity](chart)

*Figure 13. Responses to the statement “Working alone increases my level of creativity.”*

In Figure 14, the next questionnaire item containing the statement “The final product benefits from collaboration,” clearly shows this ambivalence again. The responses showed a narrow spread between the category “Agree” (32.3% or 21
participants), and a slightly higher percentage of responses in the category “Neutral” 35.4% or 23 participants.

![The final product benefits from collaboration](image)

*Figure 14. Responses to the statement “The final product benefits from collaboration.”*

Finally, the questionnaire item in Figure 15, “Working in groups stifles my creativity” demonstrated that most participants did not find collaborative work stifling in terms of their collaborative work. Over 40% of the participants responded in the “Neutral” category (41.4% or 26 responses), however this was closely followed by responses in the category “Disagree” (36.5% or 23). Approximately 20% or 13 participants did, in fact, find group work stifled their creative work.

![Working in groups stifles my creativity](image)

*Figure 15. Responses to the statement “working in groups stifles my creativity.”*

I asked the student participants to tell me how much collaborative work is expected of them, thinking that might be a critical factor in their views of collaboration. Most of the responses indicated that there had not been a lot of group work in the curriculum until their third year, with the participants speculating that
this was done intentionally to ensure that each learned the basic skills required prior to being actively involved in collaborative activities.

Again, they believed that this focus in the final years of their studies on collaboration was intentionally done to help them learn collaborative skills in preparation for the reality of the fashion design business world. As Kristen pointed out, “It’s good to know how to cope with situations and people with various skills and ability and that team work skills and the ability to be outgoing and able to work cohesively in a group are important skills to add to their employability.” Andra agreed, seeing the prevalence of group work in the third semester in a positive light, reflecting expectations of the fashion industry where workers need to creatively compromise. While she also thought that group work could be frustrating, the ability to mesh with people is still an important skill to develop. Darlee viewed her third year as one group project after another:

There are so many group projects to the point that some of my friends are laughing because every time they call, I have to say I can’t go out, I working on a group project. In fact I have four on the go right now. Pretty much each class has a group project! In one course, the whole class of about 30 people spend the entire year working together towards the goal of putting on a show and while we are all working together in a large community, we also have smaller groups. It is exciting and I chose to do that course to get the opportunity to work more closely with some of the other people and get to know my fellow students as I felt a little bit isolated in the first two years because of working alone so much.

The preceding discussion about creativity as an individual or collaborative process yielded a number of interesting responses. To begin with, the faculty member who oversaw the McGregor project observed that groups on this project divided up the work, and assigned tasks to various members with the appropriate skills. However, this strategy is also common in larger projects with more specific timelines. In fact, most faculty members spoke of this divide and conquer approach taken by students, which they typically felt was a less effective strategy because the
truly successful collaborations were those where all members were involved in all aspects of the project. James was a faculty member who did not favour collaboration, seeing it rather as appropriate for a business model and not as a good approach for supporting students’ creative work. He suggested that collaboration actually reduced the quality of the final work. Phil supplied the keen observation that even when students work alone, they are in effect collaborating with the history of design, echoing Csikszentmihalyi’s (1969) notion that creativity occurs in the interaction of a person’s ideas and a social-cultural context. As Phil put it, “they might not be conscious of the collaboration but it’s still there.”

The students were fairly evenly divided on this issue and a number of them thought creativity could be both individual and collaborative. This was evident in discussions but was made particularly clear in the questionnaire results where participants were asked if they saw creativity as an individual or collaborative process. The majority fell into the category “Neutral”, while the next strongest response was fairly evenly divided between the categories “Agree” and “Disagree”, although there was some evidence of a positive response when over 10% of the participants categorized their responses as “Strongly agree.” Most student responses to the question, “working alone increases my level of creativity” returned a mainly neutral response, closely followed by a high level of agreement, and half that again strongly agreed. Clearly this neutral response indicates some differences in opinion among the participants, perhaps due to their lack of experience in collaboration and resulting from their unformed and uninformed opinions.

The similar statement “working in groups stifles my creativity”, asked in a different format to test for reliability, confirmed the results with a mainly neutral response, very closely followed by a high portion of respondents disagreeing. And finally, the statement, “the final product benefits from collaboration” intended to determine if others felt that the final product was ‘watered down’ as James felt. The responses were led by the “Neutral” category, and closely followed by an even distribution between the categories of “Agree” (slightly higher) and “Disagree.” This appears to prove out the discussion distribution where students appeared to be evenly
divided on creativity as an individual or collaborative activity and may well indicate that it all depends on a number of factors, such as supportive group members and a sense of trust within the group.

While some students felt that collaboration could be both individual and collaborative they were quick to point out the benefits of collaboration such as being able to benefit from other people’s creativity, and being able to share the workload on large projects such as the McGregor competition. The disadvantages they expressed included being typecast into specific roles, a point that was similarly noted by the faculty member who oversaw the project. The students believed that when this happens they missed out on new learning, quite the opposite of the benefits touted from working collaboratively and certainly not aligned with the concept of collaborative practice as a fundamental learning component of the Communities of Practice model. A number of other students also spoke to the benefits as well as the negatives of working in groups.

Another group of students felt quite strongly that creativity really is a collaborative activity and their positive approach to collaboration came through in their discussions. Bonnie talked about “explosions of creativity”, Darlee thought collaborating was, “when I get my best creative energy,” Kristen felt that collaborating yielded more creativity, Brandy spoke to the benefit of “generating much better ideas”, and finally, Andra simply said: “I think creativity definitely is a collaborative thing.”

The following table compares responses from the questionnaire on student perception of collaboration in terms of creative work. In all cases the strongest response to each of these statements falls into the Neutral category which would indicate that collaboration can have both a positive and negative impact on creative endeavour work and that these participants were ambivalent about whether or not collaboration actually had a negative effect on their personal creative work.
Table 11

Comparison of Views of Collaboration Responses

<table>
<thead>
<tr>
<th>Item</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I see creativity as an individual vs. collaborative process</td>
<td>12.3% (8)</td>
<td>23.1% (15)</td>
<td>36.9% (24)</td>
<td>26.2% (17)</td>
<td>1.5% (1)</td>
</tr>
<tr>
<td>Working alone increases my level of creativity</td>
<td>15.4% (20)</td>
<td>33.8% (22)</td>
<td>36.9% (24)</td>
<td>12.3% (8)</td>
<td>1.5% (1)</td>
</tr>
<tr>
<td>I think the final product is more creative when I work with others</td>
<td>0.0% (0)</td>
<td>32.3% (21)</td>
<td>35.4% (23)</td>
<td>29.2% (19)</td>
<td>3.1% (2)</td>
</tr>
<tr>
<td>Working in groups stifles my creativity</td>
<td>1.6% (1)</td>
<td>19.0% (12)</td>
<td>41.3% (26)</td>
<td>36.5% (23)</td>
<td>1.6% (1)</td>
</tr>
</tbody>
</table>

Student Approach to Group Work

The purpose of this question was to make explicit faculty’s observations about the way in which students approached group work. This issue had emerged in the previous theme—identifying perceptions of creativity as an individual or collaborative process—where some of the faculty touched on the divide and conquer approach to group projects. I felt it might be worthwhile to specifically address this issue because it features in the literature about models of collaboration. Levy and Murnane (2004) identify this model of collaboration as individuals engaging in specialized tasks within a given framework whereas social creativity is a matter of emergent interactions and the development of collaborative meaning among the community’s members. They suggest that the division of labour model that divides tasks among a group of people results in a final product that is equal to the sum of individual efforts, whereas the social creativity model produces an outcome that is greater than the sum of the individual efforts. I thought that this was a significant difference and hoped to find out how this group of participants actually approached their collaborative work.
The faculty participants were asked whether they had observed students taking this divide and conquer approach identified by Levy and Murnane (2004). Did students merely divide up the work and share it among the group members or did they genuinely collaborate on most stages of the process, applying the social creativity model?

**Faculty responses.**

I asked each faculty member how students approached collaborative work in their various courses, and again most spoke to the need for replicating the business world model. Mike pointed out the necessity of developing community, and James, the one faculty member who was quite vocal about questioning the value of collaboration, told me that he felt that students get too much group work and that he was not a fan of collaborative work. In fact he thought that the more people you involve in a project, the less creative it gets. He raised the concept of group-think, a sociological concept which speaks to the way final decisions can get watered down. However he did mention that the topics he teaches such as web design are not necessarily successful collaborative ventures. James also had this to say:

The most creative ideas are ideas of pure brilliance and simplicity from one individual. That doesn’t mean collaboration doesn’t result in highly creative things, it does, and in my research I collaborate with other people all the time. Usually in these cases one person is driving the project and collaborating people have different zones of responsibility and creativity.

Bridgette has attempted to employ group work more often in her classrooms recently and has discovered some positive outcomes. Consequently, she plans to continue to have students work together and also to incorporate further collaborative opportunities in her curriculum. However, both she and Phil warned that as instructors, they need to be fully aware of the pedagogical impact of having students collaborate, especially in terms of grades. Both raised the point that there is always the possibility of groups having a member who does not share equally in the workload
which can frustrate the entire group, or conversely, an overpowering member who dominates all aspects of the collaborative project thereby suppressing other member’s opportunity to voice their issues and interests. Both scenarios can dampen creativity. Letting students work on their own occasionally allows them more freedom and flexibility. In an effort to ameliorate personality differences in groups, most faculty members allowed students to choose their own groups although one took the opposite stance, assigning students to groups to reflect a business world model.

Feedback

One of the main benefits of working in a Community of Practice is receiving feedback from the members of the community, particularly from the more skilled members (Fischer et al., 2005; Ye et al., 2004). My assumption was that the faculty members would be these more skilled members because they were responsible for this aspect of project management. The results from this study seem to suggest a broader notion of “skilled” members.

Faculty responses.

Faculty believed strongly that their feedback was important to students; however they also viewed peer feedback between students as a valuable learning tool as well. One of the major issues that emerge in peer feedback is honesty and constructive feedback. Samuel was an especially positive proponent of peer feedback, and as he pointed out in a school environment, “it might be the last time students had an opportunity to be in a non-judgmental, productively critical environment.” He believed that peer feedback and critique should be incorporated into the curriculum as much as possible. In his opinion, students need to get used to someone critiquing their work. James offered some suggestions for effective peer critique as well as a new perspective on its benefits. He suggested that not only do students learn from the group feedback, they also gain the skill of, as he put it, “developing a critical eye” on creativity. He puts this into perspective thus:

Sometimes they [critiques] are useful and sometimes not, however a small critique, run well, can be tremendously beneficial if it is led
properly. I have a running joke with my students that during a critique they can’t say “I like …” because it is a matter of opinion and you are not using the tools you have been learning to decipher work critically and so they have to say something such as “I believe that this is successful because …” and then give me reasons for it … using the appropriate words and vocabulary helps them to develop their critical eye towards speaking intelligently about a new design.

Other issues emerged from discussions about group feedback and while most faculty members felt strongly about the benefits of peer feedback and group critiques, they also raised the issue of privacy—sometimes groups or individuals do not wish to share their work in progress because of marks or competitions. Members of the faculty identified the need for privacy as a significant issue during the McGregor competition where groups were in competition with one another. The faculty member who oversaw this project recognized this as a valid concern and dealt with it by working with each group privately, discussing their progress, helping with technical problems or issues, and generally keep a finger on the pulse of group process. Teddy felt quite strongly about this privacy issue, pointing out that not only are quite substantial marks at stake, (50% of the course mark), but also at stake was the competition prize money provided for the winning designs by the McGregor company.

The issue of instructor feedback was perceived as an important part of faculty work and generally they believed that most students valued and acted upon their feedback, especially those students who really wanted to learn. However James thought that some students felt that they knew everything, and treated faculty feedback as merely a matter of opinion—no more valid than their own. He added that in his experience, “that sort of arrogance was a foil for insecurity and that generally he has found the most creative people are almost always open to new ideas and humble to an extent about their own.”
Student responses.

The importance of peer feedback as well as instructor feedback in the creative process was also a strong theme that emerged from students’ responses. Both Donna and Sandi thought feedback was important and that it benefited their creative projects. They spent time getting feedback from both professors and their fellow students, but Donna shared the fact that generally she valued and acted on the feedback she received from her peers more often than suggestions from professors, whereas Sandi thought the ideas and suggestions from professors were worth more because, “they definitely knew their stuff, especially when it came to computer programs, and how to do certain things, and they could show you how to execute your ideas better, and you are able to advance your project.” Sandi also shared a more pragmatic strategy in the case where she disagreed with the suggestions of her professors, she would incorporate their suggestion anyway, as she put it, “I’ve had the experience where I’ve thought oh, I really don’t like their ideas, but I’m going to do it anyway, just because I will probably get a better mark for it and more often than not, they are right about the design anyway.” She went on to say that, “If it’s for a portfolio piece or something I feel really passionate about, I can always remove their suggestions later.”

Karen recognized the value of feedback, and said, “It’s really important to get feedback and in most of our design classes we present our work every week, and when we work in groups, it’s even better because you not only get your professor’s take on your work but other people’s opinions as well.” In some classes she felt that the one-on-one interaction with the professors was great. In fact in some classes the professor would come by and talk to every student showing them different ideas and approaches, and offering suggestions to develop and improve upon their ideas. “I really thought that was great,” she said. She especially valued the professor’s feedback, and was not overly concerned about the subjectivity of it. She went on to say:

I have that kind of mindset that they [professors] are knowledgeable about their field and know a lot more than I do. I agree with their
critiques 90 percent of the time and rarely do I think its crap. I’ve only been in school for three years, how much could I know compared to someone who is a professor and teaching the class! I really value their opinion.

Tess also valued working collaboratively and receiving feedback: “I like it, rather than work at home, when I am here in the labs with others I can bounce ideas off people and ask questions.” She added that asking for feedback is definitely something she had been consciously trying to incorporate more often into her work. “A bunch of us often get together on Skype to share ideas and get feedback on our projects.” However in all, she solicited feedback from her professors more often than from peers, and in fact found that some of the faculty provided amazing feedback and would do so either in person or by email.

Julia also valued feedback from both professors and peers: “I think feedback is extremely important” and she told me that during her experiences at OCAD (The Ontario College of Art and Design), the approach was quite different, with a lot of emphasis on a class critique where everyone shared their work and professors discussed each piece and invited critiques from the class. “This is something I really miss because I found that to be most helpful, not only receiving feedback from the professor but also the class, and a further benefit was the opportunity to see everyone else’s work and how they handled an assignment.” Julia spoke at some length about the benefit of good critiques:

That sort of situation made me strive to do so much better because I knew that my work was going to be seen by everyone. While we do some class critiques here, they generally are optional and everyone just says nice things instead of giving actual suggestions. At art school [OCAD] people didn’t hold back in the critiques, they would say things like you really did a sloppy job and it might be harsh but it isn’t about you, but rather your work; it’s not personal. It is in the interest of doing better work, and generally helps you improve.
Andra, another supporter of faculty feedback thought it was definitely important because many projects, especially the McGregor project, were open to interpretation, and getting feedback, especially in the earlier stages, was critical in helping to ensure you were on track. She also added that the professors have worked in the industry so they definitely know what is up to standard—in fact that was part of why she was in the program, paying for professionally creative teachers that could help her grow, and she especially liked the small classes where the teachers got to know her and where the feedback was more personalized. Pat, another participant who strongly valued feedback, believed that it just made the project stronger. She added this opinion:

Feedback’s the biggest thing, and one of the big benefits of working in a group, you end up creating something stronger that you would alone. Even when working on my own I still try to get feedback from both professors and my roommates … usually none of us will hand in a project unless the professor has looked at it and given us feedback. That’s where most of the learning occurs, getting feedback as you go along with a project.

Bonnie, Kristen, and Brandy were not as enthusiastic about the value of feedback in creative work. Bonnie thought that feedback was more important when she was in her earlier years and less confident, but as she gained confidence with her concepts and ideas, she thought feedback was less important, although she did admit that it helped at times with executing projects. Kristen felt much like Julia, questioning the value of class critiques that were nice, without being critical and offering solid suggestions, while Brandy believed that peer feedback held little value:

I tend to be quite independent and the only feedback I need is to make sure I am doing what is required. I don’t need affirmation from the group, rather some feedback from professors is more important because they have the skills and training, and the technical abilities that can help make my ideas better.
These two levels of feedback that emerged from the interviews, peer and faculty feedback, were employed in the questionnaire. I asked the larger group of participants to respond to the following statements, “Receiving feedback from peers is important in my creative work”, and “Receiving feedback from teachers is important in my creative work.”

The questionnaire item found in Figure 16, “Receiving feedback from my peers helps me to be more creative” produced quite a strong response in the category “Agree” (61.5% or 40 participants) with a further 21.5% or 14 participants in the category “Strongly Agree.”

![Chart](chart.png)

*Figure 16. Responses to the statement, “Receiving feedback from peers is important in my creative work.”*

On the other hand the questionnaire item in Figure 17, “Receiving feedback from teachers is important to my creative work” returned a somewhat weaker response; 46.2% or 30 participants fell into the category “Agree” although substantial number of participants (35.4% or 23) fell into the category “Strongly Agree.”
Feedback as an important tool in the creative process was a strong theme that emerged from this research. What I found interesting is that the student participants in this study found both faculty and peer feedback as critical in their work. As clearly demonstrated in the figures above, the faculty feedback was strongly valued; although so was feedback from peers. This strong response is clearly indicative of the fact that students not only value their professor’s opinions, they appeared to strongly welcome feedback and critique from their peers as well.

The faculty members also recognized the value of peer feedback as a tool to support student creativity. Samuel was especially positive about this and I had the opportunity to observe him leading a couple of class critiques where students appeared to be comfortable with this activity by demonstrating their willingness to participate and provide meaningful, constructive suggestions to their peers. James also had some positive views of peer critiques and felt that they helped students develop what he called a critical eye on creativity. I found this insight quite informative; not only were the students learning how others viewed their work, they were also learning how to critically assess and discuss other’s work.

One of the main disadvantages of peer feedback was identified as privacy about marks. Additionally, in this study, prize money was also at stake. In recognition of this concern, the faculty member responsible for the class ensured that he worked with each group in private. Apparently he had experienced past situations where students tried to listen in on the emerging work of their colleagues and he
consequently now takes extra care to avoid this and eliminate the possibility of any copying or plagiarism that might occur as a result of eavesdropping.

Several student responses reflected the value of feedback from their professors and from their peers. Donna talked about how she would generally accept suggestions from her peers instead of faculty. However some students such as Sandi and Karen valued the faculty feedback because their professors were knowledgeable about their fields and were able to help advance projects. Other students commented that even when they did not like the professor’s suggestions, they would adopt them in order to get a better mark.

Karen highly valued feedback on her creative work, and liked the way most design courses provided the students with an opportunity to present their work each week. She also commented that working in groups provided an even better opportunity for feedback from her colleagues. Tess recognized the value of feedback and was purposefully making a concerted effort to solicit feedback on a more regular basis. Julia, a transfer student from OCAD, felt that the group critiques could be used more in creative work in the school of fashion and communications. She believed that good critiques really helped her to improve. Andra indicated the importance of getting feedback to make sure she was on the right track, especially when working on projects that are open to interpretation such as the McGregor project. Andra went on to say that, “Feedback’s the biggest thing and one of the major benefits of collaboration.” Most, but not all, of her colleagues would concur.

Bonnie, Kristen, and Brandy lacked the same level of enthusiasm for feedback, and some of the comments they provided suggested first, that feedback is more important in earlier years before one gains confidence in design abilities, and second, that some class critiques were uncritical and lacked solid suggestions. Brandy felt peer feedback was not at all important. An obviously independent student, she commented that she did not require affirmation from her group or community.

Table 12 compares the questionnaire participants’ view of feedback from peers versus faculty. From these responses we see that while both peer and faculty feedback was valued by these participants, peer feedback was slightly more valued.
Table 12

Comparison of Views on Feedback

<table>
<thead>
<tr>
<th>Item</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Receiving feedback from peers is important in my creative work</td>
<td>21.5% (14)</td>
<td>61.5% (40)</td>
<td>12.3% (8)</td>
<td>4.6% (3)</td>
<td>0.0% (0)</td>
</tr>
<tr>
<td>Receiving feedback from teachers is important in my creative work</td>
<td>35.4% (23)</td>
<td>46.2% (30)</td>
<td>12.3% (8)</td>
<td>4.6% (3)</td>
<td>1.5% (1)</td>
</tr>
</tbody>
</table>

Overall Benefits of Collaboration

In this final question, I asked the participants to share an overview of their perceived benefits of collaboration. This was purposely employed to identify any outstanding collaboration issues that may not have emerged previously. Some new things did emerge, such as the concept of critical thinking, the social benefits of collaborating, which involved developing relationships, and, finally, the benefit of simply having fun. I asked both faculty and student participants if they were able to identify any further benefits that might be found in employing collaborative strategies in creative work.

Faculty responses.

The faculty mainly employed collaboration in their assignments to mirror the experience of working in the fashion industry, providing students with the opportunity of gaining experience in team-work, learning about effective communication as well as developing technical skills. Preparing for the world of work was a common theme. When I asked Teddy to come up with a list of what he believed were the benefits of working collaboratively, he had this to say:

When students collaborate, I think they learn how to work as a team, how to communicate with others and they can learn a lot from the other
students, each of whom is strong in many areas and can pass this knowledge on to the weaker ones. They also learn how to convince others that their ideas have merit, and at other times how to compromise—this process is not easy, but it is important to learn because of the reality of the business world of fashion. You aren’t always satisfying yourself, but generally others in this world. They also learn team work, work ethics, time management, and that others can and often do have quite different perspectives. I also have them conduct peer reviews, as peer review is becoming much more common in the fashion industry.

Teddy’s response covered a multitude of benefits to be garnered through collaborative work, many of which were practically situated in preparing students for work in the creative industry of fashion design and communications. Samuel had a similar list of benefits although some new perspectives emerged:

I would suggest that collaboration fosters their ability to be critical and their ability to work with a team, understanding how ideas can evolve, and to understand the relationship between that evolution and the final product … and learning to allow ideas to evolve. On a practical side, it teaches them something about a work environment, and the practical side of collaboration, and that the final product is not necessarily something that either one of the people involved may have actually conceived.

Mike also felt that collaborative experiences help students prepare for the working world, providing opportunities to develop skill in collaboration with people with different personalities, developing work ethics, and crystallizing their own creative styles. It also prepares them for the experience of working with others who do not pull their own weight and develop an awareness that recognition is not always apportioned fairly and of the possibility that, based on their skills set, they may be
typecast into a narrow role and fail to learn about or gain skills in areas where they may be weak.

James felt that the main benefit of collaboration was in gaining perspective. What he meant by this is:

Getting students together offers them the benefit of different perspectives and getting students from different backgrounds together can offer some amazing potential because it offers access to people from different media and expertise and thus your vision or idea can encompass all of those areas without one individual needing to have all that expertise themselves. So there are huge benefits in terms of access to other fields of interest and input from hugely varying perspectives which is fascinating because you can split off in a lot of other directions and all of a sudden you find yourself saying wow, I never thought of that, and all of a sudden you are somewhere else completely!

From his comments above, James has identified one of the key strengths of the Communities of Interest model, namely that the diversity of members across domains provides opportunities for social creativity and new insights. Bridgette offered quite a comprehensive list of benefits to be achieved through collaboration. She went on to share her list:

Replicating the real world of fashion design is key, where students learn a number of important skills such as understanding how to effectively communicate with other team members, learn how to compromise, how to set goals and meet deadlines with a team, and understand that there are strengths and weaknesses within groups, and to develop different ways of communicating ideas. Further, working in groups helps students to learn which sorts of people they work best with, provide opportunities to take on leadership and worker roles, and learn how to divide work so that the members with the stronger skills are completing the tasks that require those skills.
Bridgette concluded by pointing out that one of the big benefits of collaborating is the opportunity to share ideas and further develop creative projects and to reduce the overall student workload.

**Student responses.**

I also asked the student participants to share their version of the benefits of collaborating on creative projects. A number of these were suggested, such as a pragmatic approach to reducing the workload, sparking new ideas, and learning new skills. Also mentioned were the benefits of inspiration and motivation, getting to know others and developing relationships, developing collaborative skills, and simply having fun.

From the above it would appear that a majority of the participants valued collaboration for providing opportunities to share the work and thus reduce the overall workload. The McGregor project in particular was quite intimidating in its scope and working together in groups served to make this more manageable. Sparking new ideas was another often touted benefit although the participants used different ways of phrasing this, including: building upon each other’s creativity, developing better ideas, sparking inspiration, harnessing energy, motivating each other, and overcoming what they called “brain block.”

Learning new skills from each other was also an important theme. Donna valued learning new skills from her colleagues, especially those with more highly developed skills in areas in which she felt weak. Tess’s response was similar, she pointed out the benefit of having different technological skills and how these really added to what the group was able to achieve. Darlee also identified the value of learning through seeing other’s work, as well as their approaches to work.

Inspiring and motivating each other was another strong theme. Many of the participants referred to the large scope of the McGregor project and how intimidating it appeared at the outset. Andra felt that one of the main benefits of collaborating was the inspiration that came about when members in her group got stuck on a certain portion of the project, or were unsure how to express an idea. Motivating
each other was high on her list of the benefits of collaborating, as she mentioned, “if you’re all working towards one final goal, I find people are less likely to procrastinate when they are collaborating, and group members help to keep each other on track, especially when you get stuck.” Brandy called it “surpassing brain block or writers block” and found the members of her group were successful in helping each other past these obstacles.

Although less frequently mentioned, benefits such as developing relationships and having fun also arose. Donna and Darlee both welcomed opportunities to work with new groups, and Darlee particularly valued having a supportive community to work with. Julia thought getting to know other people and forming relationships with her peers was enjoyable, and, finally, Bonnie thought working together was a lot of fun.

I developed two statements from the collective responses of the students above and incorporated them into the following questionnaire items: “I learn and develop creatively when collaborating with others” and “The main benefit of collaborating is getting more work done.”

The first item found in Figure 18, asking participants to respond to the statement, “I learn and develop as a creative person when working in collaborative groups”, found 33 participants (50.8%) in the category “Agree.”

![Figure 18. Responses to the statement “I learn and develop creatively when collaborating with others.”](image)

The next questionnaire item in Figure 19, containing the statement “The main benefit to collaborating is getting more work done” shows a strong response (40.6% or
26) from participants in the category “Agree” with a further 20.5 or 13 participants in the category “Strongly Agree.”

![Bar Chart](image)

**Figure 19.** Responses to the statement “The main benefit to collaborating is getting more work done.”

This last question about collaborative benefits for creative work was asked of both faculty and students. Most faculty members employed collaboration in their classrooms to parallel the requirements of the fashion design and communications work environments, thus providing students with opportunities to gain experience in teamwork and skills in areas such as communications, technology, listening, work ethics, time management, personal responsibility, persuasiveness, and respecting different perspectives.

A few caveats emerged from faculty comments. These included needing to be aware of situations where recognition was not always apportioned fairly, and the need to be careful of students typecasting each other into the same roles across different assignments and so limiting the experiences and learning they encountered.

Student responses on the other hand, while pragmatic in some ways, also focused on the creative benefits of collaboration. They spoke not only about reducing the workload, but also of learning new skills, developing relationships, and having fun. Inspiring and motivating each other was another strong theme, especially when working on large projects, such as the McGregor competition. The notion that collaboration encouraged the development of new ideas emerged quite strongly and will be dealt with in a separate section.
Two statements based on the data from the student interviews were incorporated into the online questionnaire. The first item asked participants to respond to the statement “I learn and develop creatively when collaborating with others”. A strong response of just over 50% agreed with this statement and this was interesting in light of the many responses in other statements where the category of neutral dominated. When students were presented with the statement, “The main benefit to collaborating is getting more work done”, 40% of the responses fell into the “Agree” category. What is significant about the remaining responses is the fairly even distribution between the categories of “Strongly Agree”, “Neutral” and “Disagree” all close to 20%.

Table 13 provides a comparison of the student’s perceived benefits of collaboration in terms of its value and it appears from the responses here that collaboration is strongly valued for its learning opportunities and simply in getting more work done by sharing the load among group members.

Table 13

*Comparison of Responses on the Benefits of Collaboration*

<table>
<thead>
<tr>
<th>Item</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I learn and develop creatively when collaborating with others</td>
<td>6.2% (4)</td>
<td>50.8% (33)</td>
<td>27.7% (18)</td>
<td>15.4% (10)</td>
<td>0.0% (0)</td>
</tr>
<tr>
<td>The main benefit to working together in groups is getting more work done by dividing it up</td>
<td>20.3% (13)</td>
<td>40.6% (26)</td>
<td>17.2% (11)</td>
<td>17.2% (11)</td>
<td>4.7% (3)</td>
</tr>
</tbody>
</table>

**Developing New Ideas**

When I asked students to share what they felt were the overall benefits of collaboration developing new ideas was a common response, which I will elaborate
separately here due its prevalence. Donna and Sandi both thought that one of the main benefits of collaborating on creative projects was the sparks of ideas that fly back and forth, brainstorming with others and, in the end, coming up with a much better product. They believed that creativity feeds off of creativity. Karen said: “When you are working with others the ideas can get even better—other people can come up with things you might never think of and in the end you end up with a much better product.” Bonnie raised the point of the value of group members’ different perspectives and valued the ideas developed from different perspectives, which she thought really helped to generate great ideas that are quite creative.

Tess had one of the most positive responses, saying that the benefits of working collaboratively in the development of creative ideas were “hugely beneficial.” Her perspective on collaboration was a bit broader than most of her colleagues. While she thought group work was beneficial, she also saw many other activities as being collaborative such as using the Internet, which supported both the simple acquisition of information, but also provided tools such as email, chat rooms, blogs, Facebook, YouTube, and Twitter, all those tools of social networking that allow likeminded individuals to communicate and share. Tess talks about these virtual tools here:

You can get out there [virtually] and learn about what others are doing and share your own work and you can do it on campus, or you can do it from home, there is this huge world at your fingertips, and you can connect with all those people with the technology… there is this blog, Cool Hunter, he’s this online blogger for fashion, and he’s just brilliant and the best part of it is that it’s a community where I can share ideas and pictures of things I have developed, and within a couple of hours I can see a lot of comments, and feedback. The guy running the blog has actually created this culture and he makes videos on the feedback and it’s this self-looping thing that is fantastic!

Andra, Brandy, and Kristen all valued collaboration as a vehicle for developing better creative ideas. Brandy thought it was particularly helpful when she would get
stuck on something, and someone else was able to add to her idea and often trigger another idea. Andra agreed that collaborative projects ended up with better products because of the different opinions, angles or perspectives that people brought to the group, which helped to give the end product appeal outside your own demographic and thus appeal more to the general public.

The responses of participants who took part in the online questionnaire paralleled those of the qualitative interviews. Two statements were developed from the qualitative responses in order to test the generalizability of these strongly positive responses with a larger group: “Collaborating is a great way to spark new ideas, and “Creative inspiration comes from external sources.”

Figure 20 summarizes the responses to the first question, “Collaborating is a great way to spark new ideas”, and strongly support the positive perspectives of the interview participants. The bulk of the responses fell into the category “Agree” (49.2% or 32 participants). When the responses that agree and strongly agree are added together, fully 90% of the participants felt quite strongly about this and it was in fact, the highest rated response of the entire questionnaire.

![Collaborating is a great way to spark new ideas](image)

*Figure 20. Responses to the statement “Collaborating is a great way to spark new ideas.”*

The second questionnaire item in Figure 21 explored much the same concept, but added a new dimension to determine where the collaborative activities came from. The statement “My creative inspiration usually comes from external sources such as the Internet, magazines, and brainstorming with others” found that responses fell mainly into the category “Agree” (52.4% or 33) with further 15.9% or 10
participants in the category “Strongly Agree.”

Figure 21. Responses to the statement “Creative inspiration comes from external sources.”

Table 14 shows the questionnaire participants view of collaboration in terms of developing ideas, and shows a strong representation of participants who view it as valuable in sparking new ideas with others, and that they value external sources for developing ideas, not only in brainstorming activities with others but also using magazines and the Internet as well.

Table 14

<table>
<thead>
<tr>
<th>Item</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collaborating with others and brainstorming is a great way to spark new ideas</td>
<td>40.0% (26)</td>
<td>49.2% (32)</td>
<td>9.2% (6)</td>
<td>1.5% (1)</td>
<td>0.0% (0)</td>
</tr>
<tr>
<td>My creative inspiration usually comes from external sources such as the Internet, magazines, and brainstorming with others</td>
<td>15.9% (10)</td>
<td>52.4% (33)</td>
<td>15.9% (10)</td>
<td>12.7% (8)</td>
<td>3.2% (2)</td>
</tr>
</tbody>
</table>
Discussion

The idea of working in Communities of Practice, where participants learn by engaging in activities of the community and working with peers and insiders provided the theoretical framework for this body of research and guided much of the approach to gathering and analyzing the data in this section. It would appear that the results here also support the Fischer et al. (2005) framework for creativity—they believe that there is an and rather than a versus relationship between individual and social creativity. Faculty raised the issue of the divide and conquer approach to collaborative work that would indicate a solitary or individual approach, however Fischer et al. (2005) speak to the importance of supporting a process in which individual and social creativity are both necessary and mutually reinforce each other. Phil, one of the faculty members, made the observation that even when students work alone, they are in effect collaborating with the history of design, echoing Csikszentmihalyi’s (1969) belief that creativity occurs in the interaction of a person’s ideas and a social-cultural context. As Phil put it, “students might not be conscious of the collaboration but it’s still there.”

Fischer et al. (2005) suggest that individual and social creativity can be integrated with the use of effective collaboration models and they speak to the issues that emerged from students responses about the importance of developing good community structures, where people feel safe and supported, and trust their fellow collaborators, enhancing the creative process by providing the right environment and interactions. Perhaps given these supportive environments, students can move past the traditional models of collaboration, dividing up the work and engaging in specialized tasks with little or no opportunities of learning new skills, or developing weak ones, and leaving creativity as an emergent benefit of collaboration.

A number of the students commented on this engagement in specialized tasks as an issue that emerged from their collaborative work on the McGregor project. One negative factor is that once a group member is perceived as successful at some group role or task, he or she tends to get typecast in that role. This was noted by both the faculty coordinator for the project as well as other faculty and students. Students
further commented that when this happens each of them miss out on new learning, quite the opposite of those benefits typically touted from collaborative work. Lave and Wenger’s (1991) concept of Legitimate Peripheral Participation suggests the benefit of collaborative work lies in providing opportunities for learners to engage in authentic activities as part of an apprenticeship process in which newcomers to the community start out on the periphery and move toward the centre of the community as they gain skill and knowledge in practice. However, in the case where students get typecast in particular roles or become responsible for repetitive tasks, they have fewer opportunities to gain experience in handling new roles and learning new skills.

One of the major objectives of the Communities of Interest model, on the other hand, is to ensure that there is shared understanding within the group and to make sure all voices are heard and focus on knowledge development as synthesis and mutual learning through the integration of multiple knowledge systems. Perhaps drawing from the strengths of each model of collaboration would be of value. Faculty can assist by recognizing their role in helping students to develop new skills, and to support them, and to explore avenues to change the way students are asked to collaborate in an effort to provide these experiences that more closely resemble legitimate peripheral participation.

Power issues were a common thread throughout much of the data in this chapter, (a) the power differential between faculty and students, and (b) the power issues emerging from group dynamics. The first area, power differential between student and faculty arose in a number of responses to questions about feedback and how it was perceived by faculty and valued by the students. Faculty felt quite strongly that feedback from them was important to the students. However while the students indicated that they valued this feedback, they also felt peer feedback was important. In fact, one student, Donna, commented that she generally would work from peer feedback more often than that from faculty. Sandi valued feedback only from those faculty members who had credibility in her eyes, in other words, good solid industry experience, and also noted that when she might disagree with feedback from her professors she would incorporate their suggestions anyway to receive better
marks and then if it was an important piece that she planned to use in her portfolio, she would remove these suggestions later.

Some students, such as Bonnie, Kristen, and Brandy were less enthusiastic about the value of feedback on their creative work, mainly due to their perceived experience and confidence in their abilities. The responses to the two statements that were employed in the questionnaire, asking students to rate the value of receiving feedback from peers versus feedback from teachers would substantiate the slight difference I found in students perception of the value of peer (60%) versus faculty (45%) feedback.

The second area of interest was that of group dynamics which surfaced when students spoke of issues such as the need for a group leader or facilitator who supports every voice being heard, who can help people to take on various groups roles and avoid being typecast into one, helping the group to gain consensus rather than merely compromise, and trying to avoid or eliminate hostility in groups.

From the outset of the exploration of collaboration in creative work, students began to raise the issues of the time it takes to brainstorm in a group and to finalize ideas, the need for people to take on various roles, and the need for an effective group facilitator. Darlee in particular spoke of the importance of some structure for effective groups, without which one person could take over, dominate the group, frustrate the members, and ultimately stifle rather than enhance creativity. Kristen echoed some of these concerns, specifically speaking to the issue of compromise in gaining consensus, with the end result of a design or product that is less creative than it could have been.

Kristen raised the issue of the fear group members often experience in sharing their ideas, feeling that others might think them banal, or worse, downright weird. Kristen also spoke to the need for structures and environments of trust to truly facilitate creativity and the issue of the amount of time it can take in forming such groups. As she put it, “sometimes it isn’t hard to be creative on your own and sometimes it’s hard to be creative as a group,” it is dependent upon the community and the support of the members within it. Lindsay felt that a productive community
supports its members and once you are comfortable and confident within your community you can harness the skills and ideas among the members and get a lot of really good work accomplished.

The questionnaire asked students to respond to the statements that emerged here, and the response to the statement “Group work is an important part of the creative process” reflects a similar ambivalence to the interview responses about the value of collaborating and the responses were mainly neutral (over 40%), however 40% agreed or strongly agreed. When student were asked if they enjoyed collaborating on creative projects they appeared to be fairly evenly divided on this issue as well. Finally, the students strongly supported the statement that a sense of trust was important to be creative in a group. Clearly these were strongly held convictions on the part of the participants in this study.

One faculty member actively encourages a division of labour (Levy & Murnane, 2004) in the group work he employs despite the fact that students found fault with this strategy. He also believed that collaboration waters down the final product, and commented that in his experience it is always the most vocal student or the one with the most overpowering personality who tends to force a particular design on the group, and clearly students would resent being forced into groups. Student participants Darlee and Sandi spoke of the frustration of being typecast in one role in one project after another and how they missed out on new learning because of this.

Karen and Julia believed that group members needed to be open and committed to the community, and willing to pull their own weight, and Bonnie pointed out good creative work usually only happens in relaxed, open and honest environments and the presence of hostility in the community just shuts down and stifles creative work. Students were mainly neutral about whether the final product benefited from collaboration and in light of this the also neutral response to the statement working in groups stifles my creativity was not surprising.
Implications for Curriculum, Teaching, and Learning

Perhaps the most important implication for curriculum design is in the development of collaborative opportunities to support further learning experiences for students and avoid them being slotted into specialized tasks in which they have skills but which precludes them from learning new ones. Care must be taken to develop a learning environment of trust and safety, where students are comfortable in sharing ideas and confident in being valued within the learning community.

Building into curriculum opportunities for frequent feedback, both from faculty and from peers is also indicated and perhaps providing students with opportunity to choose between individual and collaborative work might better support students with individual versus collaborative styles.

Chapter Summary

This chapter delved into the perceptions of faculty and student on the value of collaboration in the creative process. Some of the main themes described were those of feedback, replicating the world of fashion design, getting more work done, and sparking ideas and brainstorming.

The following chapter will cover the final focus of this research project, that of technology; exploring both how it can support collaboration, and its effect on the creative process.
Introduction

The purpose of this part of the study was to explore the effectiveness of technology in supporting collaboration and to discover whether the use of computer technology tools was perceived to change the nature of the creative process, and if so, how and why. In essence, this research sought to explore the gap identified by Edmonds et al. (2005) and to address Johnson and Carruthers (2006) call for further research to determine if computers and computer medicated technology are of value in enhancing the creative process, and if so, how this could be applied to curriculum design. Given the rapidly expanding numbers of computer users, it is surprising that the role of computers in creativity remains a largely unexplored area (Shneiderman, 2002; Candy & Hori, 2003).

Research to investigate ways in which creative tasks can be supported by computers conducted by Sedivy and Johnson (2000) and Lubart (2005) indicate a lack of availability of technology tools in the earlier stages of the design process. Vass, Carroll, and Shaffer (2002) stress that computer technology should not restrict creativity, rather it should partner in the process.

If the technology is to play any part at all in extending the boundaries of human thought and actions, and to be an effective partner in the creative process, it is critical to employ technology support tools in a way that fosters creativity. The challenge is that technology tools have traditionally focused on productivity, facilitating and speeding up manual work, and facilitating a linear, task-oriented approach. If computer software technologists are to support creative endeavour, they need to be understanding and empathetic collaborators with the designers. In fact one often-overlooked aspect of tools for creativity is the need for users to communicate with the computer technology tools “in the language of the problem, not in the language of an operating system, programming language, or network protocol” (Vass et al., 2002, p. 31). They go on to say that technology should not
restrict the creative process, or even act as a mere assistant, rather it should be a full partner in the creative process. It is that aspect of technology that this research hoped to explore—did participants see computer technology as a mere tool to be employed in only some areas of the creative process or was it seen as a full partner, effectively facilitating each step in this process? The following discussion sheds light on these questions.

**Effectiveness of Technology in Support of Collaboration**

This question looked at faculty and student perceptions of the effectiveness of technology in supporting collaboration. I anticipated that some of the responses might provide specific examples of the various technological tools that students employed as they collaborated on the McGregor project and how they continued to connect with faculty as they worked on this project.

**Faculty responses.**

The faculty response to this question was overwhelmingly positive with responses mainly falling into two areas, the value of technology in saving time, and using technology to build a sense of community. Teddy believed that by using various technological supports, groups were able to connect more often, and more effectively. Many of the groups who continued to rely on some face-to-face meetings reported that the number of times they needed to meet was reduced through the use of computer technology and connectivity software.

Further, during the weeks leading up to the McGregor competition itself, several students returned home during study week, others were out of the country either on vacation or working and one student was doing an internship in Milan, Italy. Using computer technology, these students were able to maintain contact with their groups and continue to work as effective, full partners in group processes. Teddy mentioned that the winners of this year’s McGregor competition met only once to start off the project. After that they communicated entirely online. A great savings in time occurred because, as he put it, “you can skip the social niceties of initial face to
face meetings and just get down to work.” The winning group told Teddy that they saw technology as really helpful in collaborating on the project.

Samuel, a strong supporter of technological collaboration, talked about the “tyranny of furniture.” He went on to say that, “it certainly changes the classroom dynamic when we don’t have everyone sitting in rows, like a lecture hall, all facing the front. With laptops, they can push tables together, or go off into a corner and work together,” the ability to collaborate is portable and can take place anywhere, anytime. However Samuel thought that in the broader sense, the benefit of technology is in building a sense of community, which is more likely to happen if students can work in a comfortable, personal space, rather than in noisy computer labs. Samuel also noted that the architecture of classrooms and computer labs in particular, was all wrong for collaboration.

Mike also spoke of the efficiency of using technology, referring to the niceties, or social conventions, such as chit chat and how much of it can be avoided or eliminated when students collaborate with computer technology because “they cut to the chase” and really get down to work. James commented on the reduction in workload when collaborating through technology, although he felt strongly that relationships needed to be developed in person, before effective virtual communications could take place. Brown and Duguid’s (2001) research similarly supports the notion that technology is effective in maintaining groups that have developed face to face.

Bridgette, a fashion designer with many years experience with famous designers such as Alfred Sung, spoke as an expert on the fashion industry. She commented that it was one of the first industries to strongly embrace technology, especially for collaborative purposes. She went on to say that:

In the fashion industry, it is critical to be able to use technology for collaboration. We use it to send sketches, and get feedback. You can send a sketch to someone in Paris in minutes and get your feedback from them right away. They even have software programs that are meant for the fashion industry where people can collaborate and see the portions
of work they need to see, and others portions of the work can be blocked out, so the use of technology in the fashion industry is critical in collaboration.

Phil, another faculty member with years of professional practice in the field of fashion design, felt that the use of technology for collaboration was absolutely important, both for students working with him, and in his professional practice as a means to stay connected to clients. “It’s fantastic because you are constantly sending files back and forth, and this makes it so effective.” He went on to share an example of just how effective technology can be in allowing collaboration and how this can lead to a much better end product. He used as an example a Flair competition that the School of Fashion holds every year. The awards ceremony for this event is held at the Bay, and the invitation is designed by students.

This year, they were sending me files to comment on and this went back and forth, and when we got close to being done I was sending them out to all the constituent groups like the Bay, Flair Magazine, and so on. So there was a huge amount of using technology to implement that process effectively in a way that we never could have done, say 10 to 20 years ago. I mean, forget it, it would have taken months to do what we did in a few short weeks and the finished product was stunning.

Student responses.

The students were also strongly positive about the effectiveness of computer technology in support of collaboration. Of the 13 student participants, only one participant was lukewarm in her response. Although Darlee was positive about a number of the benefits such as making communication a lot easier, and sending files back and forth, she added, “you can collaborate more with technology than without it, keeping in touch wherever you are,” however she did raise the issue of fragmentation, pointing out that even though you save time when you divide up the work it can end up looking like it came from five different people, if there is no cohesiveness to the final project. She also spoke to the efficiency technology offers
as one can get to work without the social interaction, which in face to face collaboration can end up taking up time.

Donna and Sandi found technology most helpful in their collaborative work, especially during the weeks leading up the McGregor competition. They told me that one of their group members was in Hawaii during the design work and through the use of emails, text messages, and Facebook they were able to continue to collaborate seamlessly with her.

Bonnie’s response spoke to the spontaneous use of technology that people engage in these days, often without really thinking about it. She pointed out that it has become an accepted and almost invisible part of the way people work and interact. While her group did not use technology in every part of the design process, others did and indeed some groups never met at all face-to-face during the project, connecting instead through email and Facebook, and completing all of the project requirements in a timely way: “So the Internet is great not only for research but collaboration too! Although face to face collaboration is nice, a lot of time gets wasted, whereas when communicating online we get to the point.” This was interesting, especially after her earlier assertion that her group did not use technology for every phase of the project. Bonnie went on to say “we did use email, sending files back and forth, and researched on the Internet, we also used computer software to collaborate on drawings, and used Google to find pictures and shapes, and Facebook to talk.” While she did not define that group activity as collaborating through the use of technology, they were, in fact doing just that.

Bonnie’s responses and lack of awareness of the role of the technology, is representative of Philip’s (2007) claim that many students today use technology as a cognitive prosthetic. In this case it would appear that Bonnie was so accustomed to using communications technology all the time, she was unaware, until she was prompted, and only then consciously realized how the use of technology had changed the way she and her group interacted.

Julia thought that technology was “amazing”, in terms of collaborative possibilities particularly for supporting the sharing of ideas and giving and receiving
feedback. In her experience, because each group member was working on different aspects of the project, they were able to work independently yet still share ideas with other group members when needed. For example she was responsible for creating the packaging of their product and was able to send visual samples of this off to other group members who needed to see these samples so they could add the brand to the actual product—“just in time technology” was her term for this capacity. Brandy and her group used email a lot, but used USB keys or jump drives for large files. These USB keys were helpful for file transfers because of file size limitations on many email systems. She laughingly talked about the fact that even though all the members of her group lived in the same building they often resorted to collaborating through various communications technologies such as email, texting, or Facebook.

Although not clearly verbalized, it would appear that this group found that collaboration through technology saved much time, partly through avoiding more time-consuming social interaction, as other participants have noted, but also by maintaining a continuous ability to communicate and collaborate with group members. As well, many of these students appeared to use technology in all aspects of the design process, thus further facilitating transfer of ideas, files, and pictures. It appears that communication through technology is becoming second nature to these students, and that for particular activities they might even prefer this mode of connecting with their peers over face-to-face meetings.

Even though Kristen felt she lacked technological sophistication, in her estimation her group used the Internet for about 75% of their project and relied on personal interaction for 25%. They completed almost every aspect of the project using computer technology, including designs and technical sketches, and research and advertising. She explains:

We made up a PDF package, and even created a commercial that we videotaped and we had sound bites embedded into our marking plan, we recorded consumers talking to us and also embedded those interviews into our project so that you could click and listen to them. Without
technology we wouldn’t be doing any of this or be able to develop such a comprehensive project.

Finally, Jenny’s group relied heavily on computer technology to collaborate, using text messages, and emails, and using the “reply to all” feature of email to keep everyone informed and on track. They used Facebook with the private or public message feature and found that quite helpful in following up with people, but also turned to email to send files or feedback.

The following questionnaire item shows the participants views of technology and collaboration and was framed as the statement “I feel that computer technology is helpful in collaboration”. From Figure 22 we see the bulk of the responses feel into the category “Agree” (44.6%) and a further 38.5% of participants in the category “Strongly Agree.”

![Bar chart showing responses to the statement “Computer technology is helpful in collaboration.”](image)

*Figure 22. Responses to the statement “Computer technology is helpful in collaboration.”*

In all, it would appear that both faculty and students viewed the use of technology as vital in supporting collaboration. Faculty talked about how effective it was in building a sense of community among students and how it was instrumental in saving time—allowing group members to collaborate more often and effectively, wherever they wanted to, and to keep members connected who were physically distant from the school and their peers, either on vacation or work assignments. I was particularly interested in the theme of technology providing time saving through allowing participants to avoid social niceties when collaborating through technology as this notion does not appear in the research literature. Other advantages included
being able to connect in better environments than noisy computer labs and becoming prepared for the heavy reliance on technology in the fashion industry.

Comments from students about facilitating research, sharing files, and speeding up feedback also were commonly identified benefits. The participants who responded to the statement, “Computer technology is helpful in collaboration” certainly supported this notion, with approximately 80% of the participants agreeing. In reviewing the ways in which technology was employed, most participants spoke of disparate uses of computer technology perhaps suggesting that even though they used it seamlessly in many ways, they still did not view technology as a full partner in the process. The next question asked the participants to think about this directly.

**Is Technology a Full Partner or Mere Tool in the Creative Process?**

This question goes to the heart of this research study, attempting to identify faculty and student perceptions about the extent of the role technology takes in the creative process. I defined technology as partner when it was employed in facilitating all steps in the process in a seamless and workable manner rather than merely assisting at particular stages while other parts of the process were completed manually without the use of any computer technology. For example, technology used as a tool might be employed to support weak skills or to provide manual representations. Similarly technology as a tool could speed up sharing files and facilitate feedback, or facilitate making visually appealing presentations. I wanted to determine the extent to which various computer technology tools were employed throughout the creative process. For example, did some groups work with mechanical, non-digital tools such as pen, pencil, or water colours, and then scan this work into their computers to share or did they start the actual ideation process and design entirely through the use of computer technology? I questioned both faculty and students to find out how they perceived and used technology.

**Faculty responses.**

Samuel was somewhat ambivalent in his response to this question. He believed that it was important for students to learn the basics or the mechanics of the creative
process such as sketching and he was concerned with the fact that the students carried their computers everywhere and were losing their ability to do the manual work, as he put it:

I think using the computer limits the immediacy of their explorations—they almost lose the ability to have a discussion with someone and to make notes and sketch an idea out. The interface with the computer does not work at the speed of thought. We need to make those connections by hand. So I see the computer as just a tool, like any other.

He did add though, that computer technology could be thought of as an environment in which creativity occurs. He ended by reiterating the importance of being able to express ideas manually, for example, when meeting with a client, designers need to be able to make a sketch to illustrate expectations, and to use the computer in that situation would take longer. After further discussion, and based on his industry experience, he changed his mind and decided that a computer would in fact be a more professional strategy for such work with a client, as a quick sketch done on a computer could be shown to the client immediately or emailed later on. He also offered the following:

You could begin to think of the computer as a computer based environment, networked, not just in terms of a social network, but being a creative network where work can be created and transmitted, in effect, a place where creativity can happen, in fact you can and often do encounter the idea of a virtual study quite frequently. It certainly is evolving and the technology is evolving to be able to support it, where people can collaborate at a distance on the same project. However the designers need to develop [computer technology] tools that work seamlessly with the creative users. These [computer technology] tools need to be faster, more readily accessible, and have the ability to think like the actual artist.
This last part of his comment that tools need to be more seamless is one that also appears in the literature about technological tools for creativity. He used the early days of HTML programming as an example, where you needed to know the HTML codes to do certain simple functions. To illustrate, in creating a heading in bold, you need to place the letter b in brackets <b> prior to and after the material you wished to be bolded, as well as using the appropriate command to stop bolding. By contrast, using software such as Dreamweaver, a WYSIWYG (what you see is what you get) editor allows you simply to click on the bold icon, working much like any word processing software package. In this example, the technology has moved quite far from users having to learn another language in order to employ it to now simply using point and click technology to complete a task.

Notwithstanding these benefits, creative people would like to see technology become ever more seamless, with tools that model the task process of design artists rather than programmers. This assertion is found in a number of studies on the use of technology in creativity, and also emerged from this research. Using technology tools for creative design would likely be most effective if they enabled the designer to think about what he or she is designing and move directly into that process without having to think about how to employ the tool.

Bridgette’s response fell into both camps; she saw computer technology as a repository for templates and examples, all helpful tools in the creative process and in her opinion the technology was both a repository for templates and a full partner. She went on to say:

Whether you use templates for students to fill in, or provide them with sites to look up trend forecasting information, this is all going to help in the creative process so to answer the question about whether technology can be a full partner in the creative process, my response is yes, it provides ideas, models, templates but it also is a full partner because it allows you that collaboration with others. For example, students can put designs on a whiteboard and send it to me and I can
add comments, draw a line a bit differently and we can truly interact with their design ideas virtually.

Bridgette clearly sees technology as a full partner in the creative process; however other’s perceptions depended on how they actually employ technology. In her example above, if students are using whiteboards to create the design and she is able to work directly with that student and with that design in real time without requiring both of them to be in physical proximity then the technology is approaching full partnership in the creative process. In this situation it can help students bypass the use of manual approaches to design that require working together physically, whereas the use of internet technology supports working at a distance.

**Student responses.**

The students clearly valued and indeed relied on the Internet as a repository of ideas, models, and templates. Donna and Sandi believed that most of the class was more technically advanced than they were at drawing or painting using manual tools. For the McGregor project, they had to use computers, at least for developing the presentation as well as the electronic files required by the judges. The remaining components did not necessarily require the use of technology. Instead this was at the student’s discretion. Donna and Sandi said the starting point for their group’s design was drawing on paper, however it moved to the computer and Internet quite soon after that. Karen on the other hand said she was not all that good at hand illustrations and her sketch book mainly contained a lot of written ideas. For design sketches, however, she would start right off on the computer. A number of her professors were also encouraging students to skip that first step of drawing by hand as they were coming to view it as redundant. Karen said that the faculty encouraged students to gain experience in the use of computer design software because in the fashion industry, scraps of paper with hand drawings are generally considered unprofessional.

Tess said that while her group met together physically, they would, even then, be sitting, each with their laptops, sending each other electronic messages. When I asked her how she approached designing, she said that for some projects she really
wanted to manually sketch the designs out first, but typically, when she had an idea, “I just go on the computer and start playing around in Photoshop or Illustrator because it’s a lot easier. I don’t know how a person in the 60’s and 70’s drafted on paper; I don’t know how they got anything done.” In terms of making changes, which Tess believes is what the creative process is really all about, she said, “I can bang out 20 logos in a matter of minutes, just by cutting and pasting and playing around—so that is really good for the creative process” however she finished by saying she still enjoyed doing some things by hand and believes that it is still important to have the manual skills of sketching and drawing, even with the available computer software.

Julia liked to start out drawing by hand, with pen and paper, and although she did not necessarily use the drawings, she did so to maintain her skills in drawing. For the early stages of the McGregor project she did some preliminary research at Sears, using pen and paper to sketch display layouts, how clothes are placed on mannequins, what fixtures were used, and what the products looked like. These sketches were more for research and solidifying ideas later elaborated using the computer. Andra and her group’s approach was similar in that they relied heavily on computer technology, especially email and Facebook communications, to keep each member of the group on task, and to share work, despite how close they all lived to each other. In the design process Andra said:

The computer was a large part. Although my group liked to start with an inspiration board, something like a layout, these pictures were scanned in although the majority were found online in Google images, or through fashion websites were we got little clippings or just images that went with our theme and that’s kind of how our idea grew, mostly all with the use of technology.

Then as they moved through the design process, just about everything else was done on the computer including referencing, virtual library searches as well as actually executing the designs. Kristen and her group also used the Internet to get ideas and viewed it as a huge repository of ideas and samples for creative work.
Although there were a few exceptions, the large proportion of responses of both faculty and students suggest that these participants viewed technology as a tool rather than a full partner in the process. Perhaps one or two groups approached a full partnership with the various computer supports, and with further training in the computer use of design software they may, in their final years of the program, reach this level of computer usage. The responses of the qualitative interview participants suggest that computer technology was for the most part a tool in the process and it would appear from the response to the following statements that the larger group who took part in the quantitative questionnaire agreed.

The questionnaire item containing the statement, “I see computer technology as a full partner in the creative process,” demonstrates that this larger group of online questionnaire participants felt somewhat stronger about computer technology in the creative process. From Figure 23 we see the bulk of the responses fell into the category “Agree” (40.0% or 26 participants), however combined with the 21.5% or 14 participants to fell into the category “Strongly Agree,” fully 60% agreed or strongly agreed with this statement.

![Figure 23](chart.png)

Figure 23. Responses to the statement “Computer technology is a full partner in the creative process.”

The next questionnaire item, asked participants to respond to the statement, “We need better technology tools to support creativity” found in Figure 24 emerged from the faculty and student interviews and the responses here fell mainly into the category “Neutral” (40.0% or 26 participants), but were more positive with 32.3% or
21 participants categorized as “Agree” and a further 15.4% or 10 participants who fell into the “Strongly Agree” category.

![Bar chart for Better technology tools are needed to support creativity](image1)

Figure 24. Responses to the statement “Better technology tools are needed to support creativity.”

In light of the desire of many faculty and student participants for improvement in the development of computer tools for design, the following questionnaire item explored to what extent the technology affected their creative work. In Figure 25, the participants responded to the statement “Computer technology restricts my creativity”. We see here the bulk of the responses fell into the category “Disagree” (46.2% or 30). Clearly the participants here felt strongly that computer technology was a positive force in their creative work.

![Bar chart for Computer technology restricts my creativity](image2)

Figure 25. Responses to the statement “Computer technology restricts my creativity.”

The final questionnaire item found in Figure 26, attempted to ascertain whether or not participants felt that technology was a positive force in creative work. This statement was purposely worded to compare with the previous one as a test of reliability. The responses to the statement, “Computers and technology add to my
creativity” would appear to support this. The online questionnaire participants returned a strongly positive response in the category “Agree” (56.9% or 37 participants) with a further 20.0% or 13 participants categorized as “Strongly Agree”.

![Figure 26. Responses to the statement “Computers and technology tools add to my creativity.”](image)

These results from the online questionnaire items appear to indicate that the bulk of these participants in this study came closer to viewing computer technology as full partner in the creative process. Not only did they value computer technology as a repository of models and templates, but they also believed technology to be an effective research vehicle, through virtual library searches, as well as supporting collaboration and the actual design process. In contrast, those participants who took part in the personal interviews appeared to view computer technology as a tool rather than as a full partner in the creative process. While the larger group who took part in the online questionnaires was strongly positive about computer technology as a full partner in the creative process, they also believed that some improvement in technology tools would be of value.

**Other Uses of Technology**

I added this question in order to provide the participants with an opportunity to delve further into the ways students actually used technology in their collaborative work throughout the McGregor project.
Faculty responses.

Most faculty members shared their thoughts and observations about how students used technology in their creative work; however I spent somewhat more time exploring this with the faculty participant who oversaw the McGregor competition. Teddy broke down his response based on the three main areas involved in the work, (a) conceptualization, (b) production work, and (c) the final presentation to the McGregor judges. All the students used computer technology and software for their presentations to the McGregor judges, as they needed to make their presentations look professional. They used PowerPoint presentation software and some students also embedded videos and sound clips into their presentations.

Teddy added that for the production process, including technical sketches with all the dimensions such as details of stitching and production, many students preferred to use computer technology, but for the initial conceptualization, the ideation, he found many students still worked by hand. In the development process, he noted that students found it much faster to do rough sketches by hand since they needed to create a lot of them. Rough sketches would not necessarily be finalized and therefore need not look professional. He did find some students beginning to use a digitized pen for these early stages, but that was still uncommon. For the most part, students develop the ideas manually and once they have narrowed down their ideas, they move onto the computer to generate more professional looking sketches. He believed that the students who preferred to work on the computer from the start were the ones who wanted to cut corners, they want to avoid having to develop the 50 or so rough sketches normally required to start the creative process. He called it mental screening, and explained it thus:

They have 50 sketches in their head and they screen that and they come up with what they think is best. They don’t want to waste their time and do all the development sketches and then work on narrowing it down to one or two. The problem is that sometimes if you don’t put it down on paper, many of the ideas get lost. How many sketches can you store in your head? It’s limited so unless they have good skills working on the
computer they lose a lot of good ideas in the process involved in developing them and do not have all these sketches to refer back to.

Generally he felt that students in their third year of the program had not yet developed a high level of skill with computer drawing, and often the final sketch they present is the first one they have developed. In doing so Teddy felt that they are missing the playfulness of creative work, the process of refining and developing ideas. He also offered his opinion that the most popular computer packages, such as Photoshop and Illustrator, have limitations. Another, newer package, Photopaint, apparently has a number of interesting tools such as chalk, crayon, marking pen, and water colour assimilations. These are useful additions for fashion designers, and ones that Illustrator does not have.

Teddy went on to talk about the results of some recent research he had conducted in which he assessed student preferences for traditional versus technologically supported drawing media. He created a survey and did a pretest and posttest with one of his classes. At the outset of the course, he found over 50 percent preferred traditional drawing media such as water-colours. They had not yet learned the software, but their perception was that if they knew how to they would probably use it to create these preliminary technical sketches. At the end of the course he found the percentage of students who preferred to use the computer for technical sketches had risen to over 90%. However, he also found that when it came to fashion illustrations, half of the students still preferred to do those by hand because it was more reflective of their personal style. As well, the computer software still had some limitations, such as being unable to create the water-colour effect and consequently he thought computer software was more appropriate for these preliminary technical sketches.

Teddy also thought that students needed to learn the basics of drawing; even though they believe they would like to learn to use the computer and computer software earlier in their program (they learn the basics by hand up until the third year). Teddy used the example of a painter who would need to learn the foundational skills of his or her craft such as using lines, colour, shading, proportion, balance, and
perspective, before developing their own style and approach. Without the basic knowledge of the art, he questioned their ability to successfully begin work on a computer. Based on his experience, he sees students who lack proficiency in drawing begin to rely on the computer. In terms of future use, he went on to speculate that things might improve if artists could design their technological tools; currently they were at the mercy of the existing tools for design, which sometimes limit users and force them to work in ways not always congruent with their creative needs or skills. Once tools are created, they define the way we work. For example chalk and white boards in classrooms can only be used for writing or drawing. Employing computer technology allows for saving the work, easily changing, adding to, or deleting components as necessary.

Samuel felt that students were using technology much more in the third year of their program because that is when they are formally introduced to computer software for design. He found that students who have their own computers really seem to like using computer technology in their work, and went on to talk about the inconsistency of the available computers. Due to the mix of Mac and Windows technologies in different classrooms, students encounter inconsistencies in the keyboards between the two platforms. The keyboards are sufficiently different that students never become entirely comfortable with both. He suggested that committing to a single platform would provide better experiences for the students, and Mac, he believed was the best choice because it has been designed for these kinds of applications, and most magazine and design firms already employ a Mac platform. He further suggested that it would benefit students further if they all had the same laptop and software. He believed this had not happened at the college because of financial reasons, “I would like to see each of these kids with a Mac laptop—why not spend money building connectivity into the physical architecture of this place, rather than maintaining public computers that are filthy and don’t work well.”

James began by saying that the computer is the de facto tool for design, and therefore students need to learn the computer software they will use working in the fashion industry. James went on to say that he found some of the new interactive
technologies particularly interesting, “not so much Facebook” he pointed out, rather something that provides a more interactive experience and where students can get and give feedback, which in turn moves them forward in terms of their creative process work. He added these comments:

There is a huge potential for the Internet as an art medium and as interactive media which we are only starting to explore such as electronic poetry and art. No one here though is looking at the virtual environments although I have been encouraged to develop a course to teach design within some kind of virtual environment, like Second Life, that sort of thing, and that’s quite interesting because you are dealing with whole experiences and environments together and that makes using technology much more interesting. There are a lot of quite interesting possibilities.

James commented that he had not seen a big change in the use of computer technology, mainly because when he started to use computers they were already pretty well entrenched in the design field. He had, however, observed some faculty starting to use technology to teach the mechanics of fashion design. He was also of the opinion that students need the basic manual skills first, “if you can’t communicate an idea, the computer doesn’t do it any better, it is just a different tool.” He, along with his colleague, Teddy, sees drawing as important a communication tool as writing. He felt that the tools that currently exist for design or any kind of creative work were limiting and went on to offer ways to offset the problems of inadequate technological tools:

The job of any artist or designer is to learn the tools and their limitations and work within them, or use another tool. The mediocre artists are the ones that get trapped by their tools, they learn one tool and that ends up as a limitation in their work. The good ones use a whole lot of different tools. We teach three different kinds of software and each has a different purpose and various advantages and
disadvantages. The good students learn how to use all three to benefit their work.

James also had some strong opinions about the tools available to designers, “I think the tools are amazing,” he said. “When I learned graphic design, we used coloured paper and now, what I can do, Holy crap, there’s no limits.” He did go on to say that in terms of any sort of design, the software applications are not easily mastered: they are intuitive to a degree but require a lot of experience to master. Once you have mastered the software, there are few limits to what you can do. A wholly positive approach to the use of technology tools emerged from his response here:

If I can think of it, I can figure out a way to do it with technology. While some of the tools are clearly designed by a developer or an engineer, not an artist or designer, the negatives are such minor little picky things, and with each generation in the development of the software these issues have been taken care of. I use Adobe Creative Suite, the whole package and these tools are just amazing; to complain about the software would be silly.

Bridgette thought that the way students used technology depended upon their level of comfort and capability with computers and software. She had students begin work using technology, especially creating textile prints, however for their fashion illustrations she also found some used the computer to compensate for a lack of drawing skills. Alternatively, students liked to use a model or template, and then add their own individual flair to it. Bridgette went on to say that other students who are skilled at drawing begin the creative process sketching by hand and then scan it into the computer, so she sees both approaches in her student’s work. Phil thought students used the computer in almost all aspects of their work, from drawing, to sharing files via email, to research online, as well as for accessing the school library and using the Internet for samples and ideas. “It’s second nature for most of them to rely on computers and they make extensive use of what is available to them online,”
according to Phil, and one of the benefits he finds, especially in computer lab classes is that they are becoming very proficient at multi-tasking. This includes simultaneously working on designs, while listening to his lecture, and connecting with their friends on Facebook, and surfing the Internet.

I asked some of the longer-term faculty members whether they had seen a change in student’s use of technology over the years. Mike reported that he always tries to assess the student’s level of experience with a new software tool before introducing it and sees an increasing level of experience with them. “I am not sure if it is the high school curriculum,” he went on to say, “but I would speculate that what is driving it all is the use of applications like Facebook and MySpace, which gets students used to technology, and they have fun with it while at the same time learning computer skills.” He added that most homes now have computers, but agreed with other faculty that providing these students with their own laptop would allow them all to be “working from a level playing field.”

Bridgette said that the whole fashion industry truly appreciates the benefits of technology because it speeds up the entire design process and gets products out faster. She used an example of a buyer with a number of fabric swatches scanned in to their computer and explained how they could easily take a design and with the click of a key, change the fabric so that the customer could instantly see different style changes with various fabrics. This is just one example of computer efficiency for design. She also said that over the last 15 years, industry representatives increasingly visit the school to inform faculty which software programs they expect graduates to be familiar with. Bridgette went on to talk about the past and present uses of technology in the classroom:

In fact if you look back just 15 years ago, overhead projectors were about the extent of our faculty’s use of technology; they now use Blackboard, PowerPoint, various technologically supported learning objects, and software packages designed for the fashion and communication industries, and we now have substantially more computer labs available in the school.
I asked Bridgette for a specific example of the technologically supported learning objects referred to here, and she provided me with a web service for trend forecasting information that she shares with her students. The WGSN site (http://www.wgsn.com/) provides information on styling, colour, and fabric trends for their 36,000 customers across the apparel, style, design, and retail industries. This service provides accurate trend forecasting, CAD (computer aided design), insightful trend analysis, design and fashion guidance, and global fashion expertise.

The faculty participants were also asked to speculate on whether they thought students would like to use technology more or less often than they currently did. Mike reported that they were always using technology in his classes and developing their initial concepts was the thing they often did manually. Mike used as an example his approach to teaching web design. He spends a few weeks teaching them the actual HTML coding, but mainly only so that they are familiar with the basics of coding and then he quickly moves on to using Dreamweaver (commonly called a WYSIWYG, a what you see is what you get software package for designing web pages), that does not require knowledge of the actual computer language for web design.

James felt that students liked to dodge learning some of the basic manual skills and would prefer spending more time using computers and computer software in their design work. He speculated that eventually the school might end with all four years computerized, with students gaining some skills but losing others, most noticeably the manual skills involved in drawing and sketching. Bridgette had also noticed an increase in computer technology use and in some cases found students coming into the classes knowing more about computer and technology than the faculty did. She has often heard students saying in their third and fourth years in the program that they wish they had learned some of the computer software packages in first year. Phil agreed with the students and thought that they should be using technology much earlier in the course work. He feels it disadvantages students later on as there is a lack of comfort level with computer technology and especially the design related computer software.
These discussions would indicate that there are some differences in opinion among faculty about the use of computer technology in teaching fashion design; however I think it would be safe to infer that they generally view technology as a tool, using it for certain aspects of fashion design. In fact some of the faculty continues to support the need for students to learn the basic, manual skills before moving on to employing computer technology in their design work. The faculty members do acknowledge the versatility of many of the software applications, and all agree on the benefits of speeding up the design process and enabling quick sharing of ideas and files, however they clearly have not entirely embraced technology as a full partner in the design process from start to finish.

**Student responses.**

The students were asked to share the ways in which they used technology during the creative project for the McGregor project. Donna and Sandi both thought that computer technology worked well with their creative needs however they found it particularly effective in the last stage of the process, “especially if you are very hands on.” Sandi commented that, “I am not good at drawing so I like to start off right away with the computer and go from there—there are a lot of cool tools out there to help.” Bonnie felt using computers was especially helpful in doing research, and getting inspired by different images and ideas and that overall, from her perspective, the computer and software were an intrinsic part of the design process.

Tess and her group used the computer throughout the entire process of the project, from gathering information and ideas, to developing the design, and in creating the presentation. Darlee and her group also used the computer and the Internet and design software throughout the entire process. Darlee noted that, “in the research stage we used it extensively and it is amazing how fast you can find information, and this was critical to developing our ideas and our philosophy for our product.” She also shared the fact that her group did quite a large survey and that having it online allowed them to get responses from a much wider group of people, using online software called freeonlinesurveys.com. She went on to say:
We developed a survey of about 40 questions and spammed the heck out of all our friends ... and we got a really good response rate, about 150 responses and so many people took part because it was online and fast to do.

Darlee also noted that her group used computer technology for the actual drawings that were created using the Adobe and Illustrator computer software packages. She felt that in terms of creative work, the computer is an amazing tool. She reported the extensive use of computer technology in the third and fourth years of the program “going digital” she called it, in preparation for practical work in the fashion industry, and felt faculty were encouraging them to mirror the digital approach in their work on the McGregor project. “Even though we might still have incorporated some old manual approaches in the design process we translated them into digital imagines facilitating communication between group members” according to Darlee, who went on to say that, “most people skip the pencil and paper stage now and find it easier to just start on the computer and then keeping working on it through to completion.” Darlee’s point was that it was easier to share a finished idea with her group that was developed on and through computer technology than a pencil sketch, particularly so when group members were working in different locations.

Brandy and her group also used the computer extensively, “all our design was done graphically, nothing was really done by hand and everyone used Illustrator and Photoshop, even to develop our initial sketches.” “I am not a strong artist,” she commented, “so it is easier for me to use technology to support my weak areas.” She went on to tell me that for the McGregor project everything was completed using computer technology from the initial research stage, to developing their product and designing it, through to the PowerPoint presentation to deliver it to the judges. Kristen said her group could not imagine doing the work for the McGregor project without the Internet and computer software. Particularly important to her group was accessing the Internet as part of their inspiration, exploring a number of fashion blogs, as well as virtual style sites.
I developed four statements from these interviews and incorporated them into the online questionnaire. The first questionnaire item tried to determine whether or not many students began the actual creative process online. It seemed that some of the participants started their creative exploration using manual tools, while other started off with computer assisted design software. The statement in Figure 27, “I usually begin the creative process online”, found that the bulk of participants fell into the category “Disagree or Strongly Disagree” (in total 43.0% or 28). Just over 30% were Neutral, and slightly over 36% either Agreed or Strongly Agreed. In all, this questionnaire item clearly shows that the bulk of the participants did not begin their creative process online.

![Figure 27](chart.png)

*Figure 27. Responses to the statement, “I usually begin the creative process online.”*

The next questionnaire item asked students whether they used computers and computer technology in all phases of the design process. In Figure 28, the responses to the statement “I use computers and computer technology in all phases of the design process” projected the strongest response in the category “Disagree” (23 participants or 36.9%), although almost 45% Agreed or strongly agreed. From this item we can infer that while a substantial number of participants used technology throughout their design work, an almost equal number did not, producing similar results to the preceding question.
The third questionnaire item in Figure 29, containing the statement, “Computer and technology tools are appropriate for only some of the creative process” found the bulk of responses in the “Agree” category (58.5% or 38 participants) with a further 21.5% Strongly Agreeing. This position of the participants in this response clearly aligns with the two preceding ones.

The following questionnaire item attempted to identify whether or not participants preferred to use manual tools during their creative work. In Figure 30 we see that while the majority of responses fell into the category “Neutral” (29.2% or 19), the next strongest category, “Agree” indicates that more preferred to use manual means than not (26.2% or 17). However this item clearly shows the ambivalence that the participants felt about technology and its use in creative work.
Most of the students who participated in the interviews appeared to have a strongly positive approach to using technology in all phases of the creative process in preparing for the McGregor competition while the results of the larger group who participated in the online questionnaires appeared to be less positive about their view of technology as useful in all phases of the creative process, in fact almost 40% of the questionnaire respondents disagreed that computer and computer technology were useful in all phases of the design process, and further almost 60% felt that computer and technology tools were appropriate for only some of the creative process.

Thus it would appear that only some students were embracing the use of technology and employing it in all phases of their creative design, approaching use of computer technology as a full partner in the creative process. On the other hand a substantial percentage of students had not reached this state of technological expertise and dependence. There may be several reasons for this disparity. First of all, many faculty members had yet to fully embrace technology and perceived it as a useful tool for only some parts of the process, continuing to require students to learn and use manual skills in their design work. Thus they are modelling the “tool” view of computer technology for their students. Further, computer software had not been introduced in any sort of meaningful way thus far in the students program therefore logically the technologically adept learners would most likely be the ones to embrace the technology ahead of their less skilled colleagues.
Generally, faculty found students were increasingly using computers and computer technology in their fashion design work, and believed they should recognize this trend and begin thinking of ways to incorporate and support the use of technology. One suggestion, offered by several faculty participants, was to provide each student with the same laptop and computer software, thus liberating them from being tied down in computer labs and allowing them to work anywhere, anytime. There still was some consensus over the need for students to learn manual skills but several faculty participants felt that less attention could be applied to the mechanics of manual design. This may well be part of a gradual change process on the part of the faculty; some of whom were developing a more positive attitude towards using technology, and were beginning to change the way they employed it in their course work. While some faculty appeared to be wholly positive about employing computer technology into the design curriculum, others were not. This dichotomy of perception may well be a factor of experience, age, and technological skill level. In light of this the following question posed aimed to determine the perceived level of skill with computers and software.

Table 15 compares the questionnaire responses that focus on how technology is used in the creative process. While fully 60% of the questionnaire participants viewed technology as a full partner in the creative process, a number of them still believed that computer technology needs further functionality improvements however they still felt that computer technology added to their creative work but only for some aspects of creative work.

From these responses we can infer that this group of participants was generally positive about the benefits of using technology in their creative work while at the same time believing improvements in the software would be helpful for them.
Table 15

Comparison of Responses in Questions Relating to Technology uses in Creative Work

<table>
<thead>
<tr>
<th>Item</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I see computer technology as a full partner in the creative process</td>
<td>21.5% (14)</td>
<td>40.0% (26)</td>
<td>27.7% (18)</td>
<td>10.8% (7)</td>
<td>0.0% (0)</td>
</tr>
<tr>
<td>Better technology tools are needed to support creativity</td>
<td>15.4% (10)</td>
<td>32.3% (21)</td>
<td>40.0% (26)</td>
<td>9.2% (6)</td>
<td>3.1% (2)</td>
</tr>
<tr>
<td>Using computer technology restricts my creativity</td>
<td>3.1% (2)</td>
<td>6.2% (4)</td>
<td>26.2% (17)</td>
<td>46.2% (30)</td>
<td>18.5% (12)</td>
</tr>
<tr>
<td>Computers and technology tools add to my creativity</td>
<td>20.0% (13)</td>
<td>56.9% (37)</td>
<td>15.4% (10)</td>
<td>6.2% (4)</td>
<td>1.5% (1)</td>
</tr>
<tr>
<td>I usually begin the creative process online</td>
<td>10.8% (7)</td>
<td>15.4% (10)</td>
<td>30.8% (20)</td>
<td>29.2% (19)</td>
<td>13.8% (9)</td>
</tr>
<tr>
<td>I use computers and computer technology in all phases of the design process</td>
<td>15.4% (10)</td>
<td>29.2% (19)</td>
<td>16.9% (11)</td>
<td>36.9% (24)</td>
<td>1.5% (1)</td>
</tr>
<tr>
<td>Computers and technology tools are appropriate for only some of the creative process</td>
<td>21.5% (14)</td>
<td>58.5% (38)</td>
<td>10.8% (7)</td>
<td>9.2% (6)</td>
<td>0.0% (0)</td>
</tr>
<tr>
<td>I prefer mechanical tools (pencil, water colours, paper) when I am being creative</td>
<td>20.0% (13)</td>
<td>26.2% (17)</td>
<td>29.2% (19)</td>
<td>20.0% (13)</td>
<td>4.6% (3)</td>
</tr>
</tbody>
</table>

Comfort Level with Computers and Computer Software

As part of the section on technology and its efficacy in support of collaboration and creativity, I believed that an exploration of the participants perceived levels of ability would be informative. For example I thought that if the participants viewed themselves as lacking in technological skills, this would likely affect their perceived value of technological supports for collaboration and creativity and would most likely
also affect their use of these technology tools. The intent of this question was not only to assess the faculty and student comfort levels with technology, but also to compare the differences between these groups.

**Faculty responses.**

Teddy thought that comfort levels with computer software would depend upon the software package itself, for example in Photoshop or Illustrator he saw himself as much more advanced than his students. He had been using the software for a long time and had discovered many of the tips and tricks that students had yet to master. As to other teaching tools such as learning objects, he was comfortable downloading the items he needed to incorporate into his instructional repertoire. Overall, he thought that a comfort level with computer technology was developed on a need to use basis, but mainly he viewed technology as a tool.

Mike reported being quite comfortable using all the technological tools required in his work from fashion design to web design and using the various software tools that supported each domain. Although he was always interested in learning more he did keep in perspective the fact that the tools were there to help get things done. He added that there were many new and interesting software packages available but that the faculty members need to be mindful of the pedagogical value of these packages. He believes that “if they add to the learning, fine, if not, why bother.” Mike appeared to be moving closer to adopting technology as a full partner in the creative process but clearly had not yet fully achieved that mindset.

Bridgette also reported a high comfort level with the various technology tools, particularly computer-aided design (CAD) which she had been teaching for a number of years. She also expressed a strong comfort level working with any of the other computer programs that she taught. She also used Blackboard quite extensively, employing the whiteboard tool to critique and or demonstrate techniques, emailing files back and forth for feedback purposes, posting assignment information and due dates, uploading lecture notes, and providing pictures and models or templates for her students use. Of the faculty who participated in these interviews it appeared
that Bridgette was closest to fully adopting technology as a partner in the creative process.

**Student responses.**

The majority of student participants reported a strong level of comfort in their use of most design software packages and other computer tools such as the Internet and email, and this was backed up by the responses to the online questionnaire although all participants felt they would all benefit from continuing to improve their level of expertise with these computer software tools. The following responses explore this qualification.

Donna and Sandi both reported a high level of comfort with most computer software packages, and believed they were helpful in improving designs, allowing for professional document development, and in the creation of professional presentations. Sandi in particular was quite familiar with computers and had been working with Adobe and Illustrator for a number of years and was further honing her skills in using these packages during her undergraduate work. Karen talked of her ambivalence about learning a new program, frustrated with the learning curve while at the same time excited with the possibilities it held, and overall enjoyed working with and learning new design software. Karen was especially excited about upcoming classes in using Dreamweaver and Flash, and commented that, “after learning Adobe everything else is easy. When I have learned how to learn computer software I also began to think more logically like a computer and that helps me to master new software more easily.”

Bonnie reported that two years earlier, she rarely touched a computer and now she said, “I fly through the Internet and software programs; I’m very comfortable now since I got my Mac, I’ve been obsessed with the computer and technology and my outlook has totally changed, probably because of so many projects using computers.” Tess reported the benefits she experienced. “My dad has a computer company so I’ve always had a computer at home and I’m very comfortable
with all aspects of computer software and find it easy to learn, and pick up new [software] packages quickly.”

Darlee believed her background in traditional fine arts, using manual tools such as pen and paper, left her with a sharp learning curve in developing skill in using new computer software. Spending four years in high school drawing and painting resulted in a high level of comfort using these manual tools which she found easier to use than the computer, “it’s a little trickier to get it right on the computer.” She went on to say:

It was like being bilingual, feeling comfortable with both but still leaning towards a higher level of expertise manually than with [computer] technology while at the same I see that old skills and old media are being deserted in the fashion industry and realistically wonder why we should spend time on using old mechanistic tools to prepare for a world than no longer needs nor values these skills.

Julia experienced frustration when she was unable to figure things out, but had moved past the point of being afraid of computers, believing that having her own Mac laptop and the opportunity for lots of hands on time with it helped her to develop a comfort level quite quickly. Andra also saw herself as a skillful computer software user prior to the fashion program at this university but also believed that she was forced to learn at such an accelerated rate in her program of study that her skills were constantly developing. Brandy was of a similar mind, “I am quite comfortable using computers and technology although I still have a lot to learn and I am comfortable with that, and I like the fact that I keep on learning new skills as I go along.” She also pointed out that once she had developed a comfort level in learning and using computer technology, adding a new software package to her technological skills repertoire held little fear for her. She commented thus, “I don’t shy away from it at all now and in fact I am really excited about learning to use Dreamweaver, Flash, and other cool stuff like podcasting.”
The following two statements emerged from these student responses exploring comfort levels with computers and software and were employed in the online questionnaire in which the larger group participated. The first questionnaire item with the statement, “I am comfortable with most computer technology and software” in Figure 31, clearly shows most respondents viewed themselves as quite skilled in their use of technology: the bulk of the responses fell into the category “Agree” (54.7% or 35 participants) and a further 23.4% or 15 participants who fell into the category “Strongly Agree”. Combined the participants have reported an overwhelmingly positive view of their computer technology skills.

![Figure 31. Responses to the statement, “I am comfortable with most computer technology and software.”](image)

However, when participants were asked to respond to the next questionnaire item in Figure 32, containing the statement, “I need to develop better computer related skills to use technology more effectively” they returned a strong response again in the category “Agree” (53.8% or 35 participants) with a further 18.5% or 12 participants who appear in the “Strongly Agree Category.” This is a substantial number of participants reporting a need for further learning.
Responses to the statement “I need to develop better computer related skills to use technology more effectively.”

A comparison of these last two questionnaire items reflects an awareness of the rapidly changing nature of technology and the need to be flexible and accommodate to that pace of change. While I anticipated that most respondents would report a competent level of technological ability, their belief in the need to further develop better technological skills was rather curious although encouraging. This could be a result of these students’ recent introduction to computer software, and while they might be generally comfortable with computers, and technology, they were still able to recognize the need to move beyond comfort to a level of mastery. Also this may be due to a general awareness of the need for keeping pace with the constantly changing nature of the Internet, along with new developments in design software, new tools that are available, and the burgeoning use of new social software such as Twitter, Second Life, and other such developments.

Table 16 demonstrates that although most questionnaire participants reported that they were comfortable with using computer technology they still believed that they needed to continue to develop these skills to further enhance their use of technology in creative work.
Table 16

Comparison of Responses to Questions about Comfort Levels in Using Technology

<table>
<thead>
<tr>
<th>Item</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I am comfortable with most computer technology and software</td>
<td>23.4% (15)</td>
<td>54.7% (35)</td>
<td>15.6% (10)</td>
<td>6.3% (4)</td>
<td>0.0% (0)</td>
</tr>
<tr>
<td>I need to develop better computer related skills to use technology more effectively</td>
<td>18.5% (12)</td>
<td>53.8% (35)</td>
<td>9.2% (6)</td>
<td>18.5% (12)</td>
<td>0.0% (0)</td>
</tr>
</tbody>
</table>

Benefits of Using Technology

This final area of discussion asked the participants to sum up all the benefits of using technology in the creative process and I asked this to ensure that the participants had ample opportunity to fully explore and discuss all the benefits of using computers and computer technology.

Faculty responses.

Faculty participants strongly believed that the main benefit of using technology, much like the benefit of developing collaborative skills, was in preparing students to work in a collaborative and computer technology savvy fashion industry, in fact each faculty member spoke of the importance of ensuring the students emerged from the program ready to work in the fashion business, with solid skills in the computer technology employed by this industry.

The practical part of learning to use computer technology and the various software applications for design and communications is in, “preparing the student to be able to work in a creative field as a designer, or for production, anything like that with all the technological skills they will need to be effective” according to Samuel, who went on to say:

Preparing them for the world of work is paramount. Building on that, as instructors we want them to also think about how to be more creative
with these tools, to understand their value, and to think beyond the obvious and realize that they can do more than just write essays, or send emails, but that they can actually create something new and as instructors we need to recognize their perception that the computer is becoming a part of their brain.

Mike found it difficult to point out specific examples of the benefits of employing computer technology because, according to him, “the use of technology is so ingrained, it’s definitely part and parcel of the whole design process” although he noted that technology keeps changing, and, “because the tools influence and affect the way we as designers do things, it changes the process and changes the outcome, not necessarily better or worse, just different.” He also spoke of the way technology improves production, in terms of time and speed. James also noted the way in which technology is an integral part of the fashion world. He shared the following:

Without being able to use technology they [students] couldn’t exist in the world, I mean it’s a hugely technical world, they use Facebook, MySpace, email, and the Internet—students come into the program with a huge awareness of and expectation that they will be able to graduate knowing the technology that the industry requires. By and large we give it to them. In my profession I think technology has given us the opportunity to be as creative as we want to be. However on the downside some students find a blank screen more daunting that a blank canvas. The computer tools are more complicated and less intuitive, so you can’t pick up the pencil and start playing. There are some tools that work similarly but they need to know how to hook them up and every new tool has a layer of complexity. So the computer tools are certainly more complicated and have built in limitations but being less intuitive is a problem. Therefore part of my job as a teacher is to try to break down that barrier of technology and help them develop those skills that they will need.
Bridgette also viewed preparing students for work in the fashion industry as the main benefit of employing technology in the curriculum and if her colleagues were not successful in accomplishing this they were placing their students at a disadvantage when they entered the business world model where technology is employed in the design process and in collaborating with others in design teams. Phil also placed ease of collaboration at the top of his list of the benefits of technology, viewing it more as a production tool, at least most of the time, although useful on every level from research to the finished product.

**Student responses.**

While several students included preparation for the world of work in their list of benefits, they tended to focus more of the specifics of what technology actually did for them in terms of the creative process. They focused more on the benefits such as the ease, speed, and reliability of technology, the increased ability to access knowledge, and the ability to work anywhere while remaining connected with their colleagues.

Donna and Sandi valued technology as a production tool, which allowed them to accomplish their work faster and easier, and valued being able to work and connect anywhere, and anytime. As students they felt strongly that having a laptop program with everyone on the same computer and loaded with the same software would be a huge benefit. Bonnie raised the point of the reliability and convenience of technology and how helpful it was for her in finding inspiration to begin creative projects.

Tess also valued the timesaving factor but also raised the issue of saving paper. While this was the first mention of environmental awareness in the actual interviews with the participants, I found it was a common thread in the products and presentations that students did for the McGregor competition. The products developed by several of the groups had clear indications of environmental awareness ranging from the actual material the designs were made of, through to the displays, packaging, as well as in the manufacture and distribution process. Tess also valued
the ability to access information anytime, and anywhere. She pointed out that the
different technology tools make the creative process easier: her group found various
technologies instrumental in creating the final presentations and they were able to
incorporate their research, designs, and any other aspects they wanted to include and
put it all together in one location. To facilitate this, her group created a message
board for the McGregor project where they could talk about the project, and share
websites with helpful material. Tess said that, “it was useful in development of the
inspiration board and unit timeline and so that was helpful.”

Julia believed the main benefit of technology was access to knowledge: “If I
want to know about something, I can go online and find out anything.” The second
benefit she spoke of was speed, “the design process can be faster, getting
information, talking to other people, exchanging ideas and files and getting feedback
were all important as well.” Andra also appreciated the speed of access to up-to-date
information, and went on to say “the university library is one of the ten worst
libraries in the country” and therefore she would rather find current articles online.
Andra also valued opportunities to share work in progress with group members, as
well as timely access to feedback from peers or professors.

Brandy identified the ease of production and distribution, and the
professionalization of ideas into effective presentations as huge benefits of employing
technology in the design process and specifically in preparation for the McGregor
competition. Technology, according to this student, is particularly important if the
designer is a weak visual artist and lacks manual drawing and painting skills. She said
that, “the technology helps designers to draw and express things they wouldn’t
otherwise be able to do” as well as facilitating group members in communicating
ideas, designs, and feedback easily to others. Kristen particularly valued technology
as a vehicle for communication and collaboration, saving and storing things, sourcing
ideas through the Internet, and creating drawings. She found computer technology
invaluable in every aspect of the design process. Pat also referred to the benefit of
technology as a production tool, and in assisting to create professional looking work
and presentations.
Donna believed that creativity increased as she applied more applications to a project, as she put it, “I get an idea, and then that suggests another and it sort of snowballs as I play around with different programs.” However she still viewed computer technology as a means to an end—useful mainly to finish things up. I invited her to speculate on whether her perception of this was a function of herself as an artist, or due to her lack of experience with the software package. She shared the following:

I think it’s me personally as an artist. Even as a photographer, if I am going to take a picture, I’m not just going to take any crappy photo with the thought that I can Photoshop it and make it look like whatever I want. I would much rather take it in its purest form and be as close to my inspiration as possible and then put it into Photoshop and see if there are some small things I can do to improve it.

Julia believed the Internet and computers were instrumental in putting together the McGregor project and said it was hugely beneficial for her group who mainly relied on the Internet while she preferred to design and explore on her own. To put this into perspective, Julia went on to share the following:

I walked around to different department stores to see how they had done things such as packaging and display and finding pricing and then I used email to send that information back and forth with the group which was helpful and then of course putting it all together and creating the PowerPoint presentation for the McGregor judging—you really relied on the computer and software to do a professional looking presentation.

Andra stated that employing computer technology in her creative work was vital, “there is a wealth of visual and written information you can access from home, so employing computer technology is basically where I start, create, and finish every project.” Kristen opted to use a rating scale of 1 to 10 to demonstrate how she valued the use of computer technology, and placed it right near the top, going on to say, “I couldn’t do anything without technology—I wouldn’t know how to find information,
where to go to locate trends and so on. I mean it is hard enough to find things on the Internet let alone in the real world.” Her only complaint was that the tools were sometimes a little quirky and there were so many of them however she often succeeded in finding one to do just exactly what she wanted it to do.

The final two questionnaire items containing the statements that emerged from these discussions were employed in the online questionnaire asking the participants to rate their overall perception of the use of technology in the creative process.

The first questionnaire item in Figure 33, asking participants to respond to the statement, “Computer and technology are valuable tools in the creative process” found most responses fell into the category “Agree” (53.8% or 35 participants) with a further 34% in the category “Strongly Agree.” Clearly this quite positive view of computer technology in the creative process would indicate that this group valued technology as a tool, supporting their creative work.

![Bar chart](image)

*Figure 33. Responses to the statement, “Computers and technology are valuable tools in the creative process.”*

This next questionnaire item, in Figure 34, contains the statement, “The use of computer tools changes the creative process”. The larger group who took part in the questionnaire felt strongly that this was indeed the case. The bulk of the responses clearly fell into the “Agree” category (56.9% or 37 respondents) with a further 21.5%
in the “Strongly Agree” category. This was another quite positive response.

![Graph](image1.png)

*Figure 34.* Responses to the statement “The use of computer tools changes the creative process.

The next questionnaire item, in Figure 35, contains the statement, “The use of computer tools changes the final outcome of the creative process.” An overwhelming number of responses appear the “Agree” category (53.8% or 35 participants,) with a further 29.2% participants Strongly Agreeing.

![Graph](image2.png)

*Figure 35.* Responses to the statement “The use of computer tools changes the final outcome of the creative process.

Clearly most participants agreed that the use of computer technology changed the creative process and that it also changes the final outcome of the creative process. It should be possible to assume that this was viewed positively in light of the strongly positive response to the statement that computers and technology are valued in the creative process, speeding up the process, making designs and presentations much more professional, providing access to a plethora of information and inspiration, supporting weak manual design skills, and allowing group members to collaborate when it would be impossible otherwise due to geographic or time limitations.
The faculty believed the value of employing technology centered on industry preparedness. Students, on the other hand, felt that the benefits of computer technology were accrued in the creative process. They also spoke of the speed and ease of production, the benefit of working collaboratively, anywhere and anytime, and the ease of access to up to date knowledge, and finally, how the design software tools help to support their creative work, especially masking weaker mechanistic skills.

Table 17 provides the questionnaire participants view of technology in terms of how it changes the creative process and the final product. Clearly they see computer technology as a valuable tool in the creative process while also believing that it not only changes the process but the final outcome as well.

Table 17

Comparison of Responses to Questions About the Affects of Technology on the Creative Process and Product

<table>
<thead>
<tr>
<th>Item</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computers and technology are valuable tools in the creative process</td>
<td>33.8% (22)</td>
<td>53.8% (35)</td>
<td>10.8% (7)</td>
<td>1.5% (1)</td>
<td>0.0% (0)</td>
</tr>
<tr>
<td>The use of computer tools changes the creative process</td>
<td>21.5% (14)</td>
<td>56.9% (37)</td>
<td>15.4% (10)</td>
<td>6.2% (4)</td>
<td>0.0% (0)</td>
</tr>
<tr>
<td>The use of computer tools changes the final outcome of the creative process</td>
<td>29.2% (19)</td>
<td>53.8% (35)</td>
<td>10.8% (7)</td>
<td>6.2% (4)</td>
<td>0.0% (0)</td>
</tr>
</tbody>
</table>

Discussion

This last main area of the research project explored the participant’s views on the value of computers and computer technology in the creative process and
attempted to determine if technology effectively supported collaboration, and whether it changed the nature of the creative process. It has in large part, aimed to address the gap in the body of research relative to technology and creativity identified by Edmonds et al. (2005) and to address Johnson and Carruthers (2006) call for further research to determine if computers and computer mediated technology were of value in enhancing the creative process, and if so how.

Does employing a computer and computer technology tools change the creative process? The student participants in this study felt strongly that this was so. In fact one of the highest levels of support for a statement employed in the online questionnaire was returned here; approximately 80% of the participants agreed or strongly agreed that using computer tools changed the creative process. Exploring the responses to the semi-structured interviews with faculty and students aims to tease out the ways in which technology changed this process.

One of the major challenges in creativity work that technology appears to support is in facilitating collaborative projects. Students often spoke of how they were able to work with their colleagues on the McGregor competition in geographically diverse locations, and at times that benefited their schedule. It supported connectivity between group members, allowing them to work apart, while enabling them to share their work with others in the group, to get and give ideas, and to provide and receive feedback, often much more frequently than had they worked in physical proximity with each other. They were able to connect more often and get more done through the various modes of communication that they employed, such as email, Facebook, and other connectivity software. In all, students clearly valued the ways in which computer technology was particularly effective in saving time.

This issue of time saving benefits also arose when the participants spoke of conducting research for their projects. Accessing the university library virtually and using the Internet to locate ideas, samples, models, and templates saved much time at the outset of the creative process and facilitated sharing of information with group members and this was an oft cited benefit that many students identified.
Saving time and developing more professional work was another point raised by students as a benefit of employing computers and computer technology in the creative process. While some students indicated that they preferred to conduct parts of the creative process through the use of manual tools such as pen and paper, for example—they were evenly divided on this. It would appear that those with proficiency in using the design software generally employed it in all phases of their design work, clearly demonstrating the importance of helping students achieve computer technology skills to enable them to employ this technology seamlessly in all aspects of their creative work. This division may be an outcome of their recent introduction to computer design software and the fact that, at the time of this research study, they had not had an opportunity to truly master these technological skills. While the bulk of the respondents reported being comfortable with computer technology and software, they overwhelmingly agreed that they needed to further develop better computer related skills to use the technology more effectively.

The National-Research Council (2003) believes that information technology has developed some level of sophistication and cost effectiveness that enables creative people to go beyond enhancing productivity and move towards opening up new creative possibilities. It would appear that this body of research would, in part, support this. Faculty participants spoke of the computer technology tools for creative design becoming much more intuitive and easy to use, although they believed that mastering the use of these tools takes time and practice. One of the issues that some faculty members raised was that of eliminating computer labs and providing all students with the same laptop and software; perhaps this university is reaching that tipping point of recognizing the benefits to be achieved in doing so. According to the faculty and student participants in this study, this would certainly go a long way to ensure a level playing field for all students.

Collaboration

Johnson and Carruthers (2006) identified the importance of developing ways to facilitate the creative process and improve the resulting artefacts through the use of technology tools and they suggest that we need to develop a theoretical account of
collaborative creativity and the role of technological tools in support of this. Much research, and indeed the results from this study supported this view of collaboration, defined by Levy and Murnane (2005), as the divide and conquer model, where the work gets broken up amongst the community members. While this tends to have something of a negative connotation, it often is the reality in large projects with a number of constituents collaborating together. Facing that reality, we need to look at the technology available to support collaboration. Student participants talked about how technology allowed them to share ideas and models amongst themselves, and how sharing their portion of the work on a timely basis facilitated the continuing development of product. It also allowed students to constantly share ideas and approaches, to get feedback from their peers, and to disseminate finished products within their groups. Many researchers have focused on these benefits of collaboration in creativity, and the ways in which technology can facilitate this such as Edmonds et al., (2005), Fischer (2006), and Harnell-Young (2006) among others.

Design partner

Research to investigate ways in which creative tasks themselves can be supported by computer technology, conducted by Sedivy and Johnson (2000) and Lubart (2005) indicate a lack of support for technology tools in the earlier stages of the design process and Vass et al. (2002) stress that computer technology not restrict creativity but rather partner in the process, and Candy and Edmonds (2000) feel technology should extend the boundaries of human thought and discover how technology can foster creativity. This study explored these three areas.

When the student participants in this study were asked if computer technology restricted their creativity, the majority of them disagreed and felt strongly that computers and technology tools actually added to their creativity. In asking students how the creative process flowed, I attempted to find out whether they employed computer technology in the early parts of the design process and the results from this study suggest that the students relied rather heavily on computer technology to begin the ideation process, looking to the Internet for inspiration in the form of images, templates, and so forth. They also accessed libraries, blogs, and listservs looking for
research materials in the early stages of the creative process. These findings appear to belie those of Sedivy and Johnson and Lubart’s in terms of lack of use of technology tools in the inception stages of creative design. This may well be due to recent and ongoing improvements in the computer technology tools for creative design, or in the technologically receptive mind sets of these young student designers who participated in this study.

Further, many of these students preferred to employ computer technology in the actual design process, although some still preferred the use of manual tools such as pen and paper at this stage. This most likely is due to some students’ lack of skill in the use of the computer and technology tools at the outset of their program of study and appeared to be further exacerbated by the recent introduction of these computer software tools into the curriculum. Those lacking these skills may well be the participants who reported a perceived lack of intuitiveness of design software while other students who were much more technologically savvy quickly learned and grasped the use of these computer software tools and demonstrated an ability and interest it employing them throughout the design process. Future studies might wish to explore this in more detail to determine if this was, indeed, the case.

In all, though, the student participants generally found computer technology extended the boundaries of what they would be capable of in a number of ways, facilitating collaboration, providing a much larger body of access to ideas and templates, and in facilitating the development of professional presentations.

**Implications for Curriculum, Teaching, and Learning**

There are several implications for curriculum design and instructional strategies. First of all, students must be given the appropriate tools for the creative process, and be provided with sufficient training to master them, enabling them to use these tools seamlessly and effectively.

In terms of having students collaborate on creative projects, a clear implication from this research is that technology, while helpful in maintaining community, is less successful at establishing it. Opportunities for learners to connect
in physical proximity should be established at the outset of collaborative projects and assignments.

Chapter Summary

This chapter has explored the ways in which technology was employed in collaboration and in the creative process, the final and perhaps most important areas of this research project. Starting with a brief overview of the issues identified in the body of research on technology and creativity, the chapter moved on to look at the main themes that emerged from the interviews and the questionnaire items on technology and its perceived value in the collaborative creative process.

The chapter then incorporates a brief discussion of these themes and how they connect with the body of existing research on technology in the creative process. The following chapter will attempt to weave the three main overarching themes of this body of research together—creativity, collaboration, and technology, into a comprehensive discussion of the implications of these findings for curriculum design, teaching, and learning.
Chapter Seven
Discussion and Implications for Practice

Introduction

I conducted this study to contribute to the body of research on human-computer interaction in support of creativity. Few studies have explored the ways in which community might support creativity, and fewer still have explored the impact of technology in collaboration and on the creative process.

Edmonds et al. (2005), upon completing a comprehensive series of studies on creativity enhancing technologies pointed out the need to understand the opportunities and limitations of computer technology for creativity, and posed a key question that the research currently does not answer—does the use of computer technology make a difference to the creative process, its outcomes, or both. The true value of computers in enhancing creativity remains unclear. I hope that this work can shed some light on the efficacy of computer technology in support of creativity.

Overview

In the preceding chapters, the participants’ responses have been provided with analysis throughout. In this chapter I explore some of the underlying themes that emerged from each of the three chapters on the overarching areas of this study, creativity, collaboration, and technology, and what they imply for this research, and, further, explore the implications of these themes for practice in terms of teaching, learning, and curriculum design. Next I present the limitations of the thesis, and end the chapter with directions for future research.

Creativity

Some of the main topics explored within the concept of creativity as discussed in chapter four are the creative process, assessment of creativity, the need for certain skills in the creative process, and the role of curriculum in support of creative work. One of the themes of interest that emerged in discussions about the creative
process was that of inspiration, and how this was facilitated through collaboration, and through the use of computer technology—employing tools such as email, Facebook, and Twitter, and the Internet using Google, blogs, and such to locate ideas—the inspiration that sets off the process. The larger group of respondents who took part in the online questionnaire responded strongly to the statement, “Creative inspiration comes from external sources,” in fact over 70% of the respondents agreed with this statement. Further, many of the participants indicated that the Internet was their main source of this spark or inspiration and overall students found that the use of computer technology tools were a key component at the outset of their creative journeys.

Other themes from discussions on the creative process were those of brainstorming, problem solving, and critical thinking; participants viewed these activities as collaborative in nature, and while some of it was conducted in physical proximity to their group members, much of it, and in some groups all collaboration was conducted through computer technology using collaborative software such as virtual whiteboards, Facebook, and email.

Creative sketching and the need for manual design skills emerged from the discussions and a number of participants diverged in their approach to sketching; some chose to do this individually and manually, others fully collaborated in the process, both face-to-face and virtually. Some participants felt that the computer software for fashion design better supported their ideation sketches, by making up for weak drawing skills, helping to develop professional drawings, and allowing for speedy sharing of their designs among group members.

Gathering samples, templates, and models of design was another step that appeared to be an important aspect in the creative process and while most participants tended to work through this step individually, they almost always choose to use the Internet and then share their findings with other group members at which point they collaboratively decided which of these templates or models would be employed in developing their final products.
Creative design skills.

I found that all of the student participants employed technology at various points throughout the creative process, and many opted to use computers and computer technology in all aspects of this process. Of particular interest were the discussions about the use of technology and manual skills in the creative process. The faculty, on one hand, seemed strongly to support the need for students to develop manual skills in support of their craft before employing technology to replace them. This became quite evident through students' comments that they were not introduced to any computer design technology until their third year, and several seemed to resent having to spend their early years in the program learning the basics of design skill. The faculty at this institution believed, as does Tharp (2003), that, “you’re only kidding yourself if you put creativity before craft” (p. 163). She believes that mastering the underlying skills of the creative domain allows the student to build their creativity on the solid foundation of the requisite skills. According to Tharp, skill gives you the wherewithal to execute the ideas that occur to you—it allows you to close the gap between what you can see or think and what you can produce, the more skilful you are within your domain, the more sophisticated and accomplished your ideas can be. Tharp goes on to say:

The wonderful and scary thing about solving creative problems is that there isn’t one right answer. There are a thousand possible answers, but the valuable and practical thing to do is fix the things you know how to fix. That’s why a failure of skill is unforgivable: If you don’t have a broad base of skills, you are limiting the number of problems you can solve when trouble hits. (p. 222)

It would appear that the faculty perception of the importance of developing manual skills prior to incorporating computer software into their repertoire was clearly not echoed by the students. In fact some students valued the computer design software in helping to support or even mask poor manual design skills. These students were much more likely to embrace the use of computer technology to replicate the work of manual design. Students also believed that computer technology was invaluable in speeding up the design process, facilitating the sharing of products and
ideas among group members, and in helping to develop more professional images and presentations. From these discussions it appears that those students who truly valued computer technology as a skill-enhancing tool would be those who most closely approached viewing technology as a full partner in the creative process.

Several questions came to mind based on this dichotomy of manual skills versus computer technology that emerged from the study results. Why did faculty value and insist on students learning manual design skills rather than the computer software tools to replace these skills, particularly as the latter would be required knowledge in the fashion design world? As well, who has decided that manual skills should be valued over skill using computer software? Further, are there clear pedagogical reasons for learning and mastering the manual before the computer in terms of creative design skills? The students quite clearly believed the computer technology tools and software would be of benefit in their design work and time spent here would better support their future career. This is an area where further research on learning with the appropriate design tools is required.

Certain faculty members were beginning to recognize the value of computer technology and questioning the emphasis on learning manual skills. While the School of Fashion at this institution continues to wait until third year before introducing students to computer design software, some faculty believe that this should occur sooner in the program, and from these discussions it would appear some changes might take place shortly, placing technology tools for design at the heart of this curriculum.

This issue has clear implications for curriculum design. Faculty need to be mindful of their approach to the tools they choose to employ, whether manual or computer, seeking sound pedagogical reasons for their choices, rather than deferring to tradition. The tools that students use in their work should be ones that allow for seamless and effective execution of that work, and clearly align with the skills they will require in their eventual employment within the fashion industry.
Freedom of expression.

Another interesting and somewhat dichotomous theme that emerged from the data linking creativity and curriculum design was that of freedom of expression. Students’ spoke of valuing freedom to explore and express themselves in personally authentic ways and that appears to be congruent with much of the literature on creativity. However some students viewed this freedom as overwhelming and preferred some sort of structure framing and guiding the creative process. From the kinds of responses students gave to this area of discussion it would suggest that total freedom could be quite daunting and that curriculum employing structures or guidelines that would inform and guide student work would be appreciated. In fact Sawyer (2007) deals with this paradox, recommending establishing a goal that provides a focus—just enough so that the group can tell when they are close to a workable solution—but one that is open-ended enough for problem finding and critical thinking to emerge (p. 45). Clearly this issue has serious implications for the way assignments are framed and presented to students.

The use of marking rubrics offers a possible solution. Rubrics can serve to clearly inform students of evaluation strategies, as well as indicating the weighting of the various aspects of the assignment. Dealing with the subjective nature of evaluation, and especially the difficulty of assessing creative work, was another common theme emerging from this study. For the most part, the faculty believed assessing creative work was quite subjective, and one faculty member pointed out that some of the difficult issues are generational. To deal with this subjectivity one faculty member has tried developing rubrics to be more objective, however this has led to further issues such as the length of time it took to work with the rubrics and often, in the end, the marks did not seem fair. Other faculty spoke of avoiding assessing the creative product, and instead apportioned marks that focused on how well the student had achieved the assignment objectives using subcategories of assessment such as quality of work, saleability of the concept—in effect assessing the mechanics of the process work, rather than the perceived creativity of the final work.
Sharing rubrics with the students might be a good evaluative strategy and provide those guidelines or structure that some of the students felt were critical to their success. Included in the rubric could be areas for assessment of critical thinking and effective problem-solving skills—both issues were raised by faculty members in assessment of creative work. There is the danger, as pointed out by some faculty, that the use of rubrics and clearly defined assessment elements may take the creative energy out of assignments. This area would be well worth further research in terms of supporting the student’s need for more concrete guidelines as well as helping faculty to take a more objective stance to assessment of creative design work.

**Pragmatic nature of creativity.**

Another theme of interest was the pragmatic or practical nature of creative work within the domain of fashion design. When we think about creativity many of us think of it in terms of new and unique things, conceptualizing creativity as the big C, or revolutionary breakthrough approach to creativity (Csikszentmihalyi, 1996; Gardner, 1993) rather than the small c or evolutionary approach that focuses on refining and applying existing paradigms and which clearly defines the fashion world’s approach. Many faculty members spoke of this need for the creative design to be practical and marketable and it aligns with the fashion industry’s need to develop creative but marketable products that the public will purchase.

The fashion industry is, after all, based on the business of designing, manufacturing, and selling. This was most helpful in understanding why the participants often referred to the fact that nothing in fashion is ever entirely new and which in turn helped me to understand the importance of finding inspiration and templates of existing designs to inform and support this refining process to which many participants referred, and to understand how critical access to computer technology was in supporting this discovery process. I saw this as congruent with the situationalist school of thought on creativity, identified by Shneiderman (2000), who emphasize the social and intellectual context as key to the creative process, and who see creativity as situated within a Community of Practice, requiring tools supporting access to previous work in the domain, such as models, and templates. Clearly
technology would be most helpful in providing access to previous work in the domain, and many students in this study identified the Internet as the starting point in the creative process.

**Collaboration**

Chapter five presented the results from this study about collaboration and how it supports creativity and the issues that emerged from these discussions. Also included in this chapter were the responses to the questionnaire which supported the position that creativity can, for the most part, be nurtured through collaboration. It also supports the claim in much of the current work done in this area that all creative work is, in some way, collaborative in nature. Apparently the Community of Practice model is strongly embraced by the fashion design and communications communities, precisely because they see collaborative practice as a fundamental learning component of collaborative work and the support that collaborative process gives to creative endeavour.

The faculty participants valued collaboration in preparing students for employment in the world of fashion design. The students who took part in this study recognized this; however they also saw further benefits such as providing inspiration, feedback, and in developing their creative skills. They also felt that working collaboratively helped them to take on larger projects.

One particularly interesting comment raised by a faculty member was that students are technically collaborating with the history of fashion design, even when working alone through their use of magazines, the Internet, and fashion blogs, among other sources. Csikszentmihalyi (1969) similarly commented that creativity does not happen inside a person’s head but in the interaction between a person’s thoughts and a socio-cultural context. As Phil, one of the faculty participants put it, “students might not be conscious of the collaboration, but it’s still there.” Much of the current research on collaboration and creativity is beginning to recognize the true nature of creativity as collaborative at heart. Artists, musicians, and even business organizations at the cutting edge of creative work are starting to recognize this.
This view is entirely consistent with the concept of situativity—that all learning is inherently social and co-participatory, and this notion of learning is the philosophic grounding of Wenger’s (1991) Communities of Practice Framework.

In his book, *Group Genius*, Sawyer (2007), a researcher in the field of creativity and collaboration, responds to the question many of us ask about the difference between individual and group creativity—is not the individual mind the ultimate source of creativity and does not each creative spark emerge from one person? Sawyer tells us that researchers have discovered that the mind itself is filled with a “kind of internal collaboration, and that even the insights that emerge when you’re completely alone can be traced back to previous collaborations” (p. xii). This was particularly evident in the fashion design domain, where most new creative work actually takes some aspects of existing design work and changes, adapts, or builds upon it, something that most of the student participants readily pointed out.

It may be prudent at this juncture to compare the concept of collaboration, which infers connection in real time, and that of the collective, which does not. This may be a small distinction but important when we talk about and view creative work as being collaborative. The term collaboration is generally assumed to indicate people engaging with each other in real time, solving a problem or creating a design together, while the idea of the collective refers to the use of ideas and work that has gone on before, that helps to inform design work. I believe that when researchers such as Csikszentmihalyi and Gardner, or Lave and Wenger refer to the collaborative nature of design, they include this concept of the collective. In fact in Lave and Wenger’s perspective the collective is often embodied in the reified objects such as documents and rules developed by the community over time. Shneiderman’s concept of collaboration rather refers to the real time work done together and both these concepts closely aligned with the work the participants in this study have done.

Notwithstanding the above discussion, the student participants in this study were evenly divided on the concept of creativity as an individual versus collaborative process, they found working alone tended to increase their level of creativity, and were evenly divided on whether or not the final product benefited from collaboration.
Some student participants pointed to the community itself as a key determinant of effective collaboration. However they did feel that working in groups did not stifle their creative processes. Over 40% of participants remained neutral in response to this statement on the questionnaire and over 35% of participants disagreed that group work stifled their creativity.

One of the main benefits of collaboration, according to a number of the student participants, was the ability to take on large projects, and achieve much more than they possibly could alone, employing the divide and conquer approach to work common among students. When asked if the main benefit of collaboration was getting more work done, over 40% of the questionnaire participants agreed, although an even stronger response on the questionnaire (over 50%) indicated that participants learned and developed creatively when collaborating with others. Students reportedly valued: (a) opportunities to try out and develop new skills, (b) motivating one another, (c) sparking ideas and developing new ones, (d) creating and maintaining relationships, and (e) having fun. In fact a quite positive response emerged from the following statements, “Collaborating is a great way to spark new ideas” and, “Creative inspiration comes from external sources.” This wholly positive view of collaboration is supported by Sawyer (2007), who shares the following:

We’re drawn to the image of the lone genius whose mystical moment of insight changes the world. But the lone genius is just that, a myth; instead, it’s group genius that generates breakthrough innovation. When we collaborate, creativity unfolds across people; the sparks fly faster, and the whole is greater than the sum of its parts. Collaboration drives creativity because innovation always emerges from a series of sparks—never a single flash of insight. (p. 7)

The participants in this study, both student and faculty, often spoke of this benefit of sparking ideas, and how the sharing of these ideas appears to help creativity unfold among group collaborators. Csikszentmihalyi, (as cited in Sawyer 2007), would likely agree. His concept of flow, a state of heightened consciousness, is often touted as the most essential ingredient in creativity, and he found that the most common occasion in which people experienced flow was in conversation with others.
The faculty employed collaboration in the curriculum to acculturate students into their eventual work environment, identifying the importance of gaining skills to ensure success in the teamwork environments often found in the fashion industry. The students, on the other hand, viewed collaboration as beneficial in the creative work in providing opportunities for feedback, learning and gaining skills, developing new ideas, building social relationships, and simply in having fun. Perhaps this last area is an important one to remember in approaches to teaching and learning and as equally important as having students developing technical and social skills. Playfulness engenders an openness, which, like brainstorming, may allow new ideas to emerge. Much research on creativity talks about its playful nature; this might be a critical part of creative work that should be addressed in curriculum design.

The final issue that emerged from a further analysis of these themes is that of power issues inherent in Communities of Practice. The issues of power emerged in two ways from the data that of power over, involving the faculty positional power relative to program control and evaluation, and the group dynamics that take place between students. The latter area of group dynamics appeared to be quite complex. Both power over and power between themes will be discussed further in the implications section.

The above provides a brief review of the data that emerged from this research project on collaboration. Clearly there was a lot of support for the value of working in community and most students felt that once they had a positive community developed where members felt supported and valued, the group was much more creative than a designer working alone.

The following tables, table 18 and table 19 provide an overview of the questionnaire items that dealt with collaborative issues based on the highest percentage of responses in comparison to all categories.
Table 18

*Number and Percentage of Questionnaire Items in the Category Agree Compared to All Categories*

<table>
<thead>
<tr>
<th>Item</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>My creative inspiration usually comes from external sources such as the Internet</td>
<td>15.9% (10)</td>
<td>52.4% (33)</td>
<td>15.9% (10)</td>
<td>12.7% (8)</td>
<td>3.2% (2)</td>
</tr>
<tr>
<td>Receiving feedback from my peers helps me to be more creative</td>
<td>21.5% (14)</td>
<td>61.5% (40)</td>
<td>12.3% (8)</td>
<td>4.6% (3)</td>
<td>0.0% (0)</td>
</tr>
<tr>
<td>Receiving feedback from my teachers is important to my creative work</td>
<td>35.4% (23)</td>
<td>46.2% (30)</td>
<td>12.3% (8)</td>
<td>4.6% (3)</td>
<td>1.5% (1)</td>
</tr>
<tr>
<td>Collaborating with others and brainstorming is a great way to spark new ideas</td>
<td>40.0% (26)</td>
<td>49.2% (32)</td>
<td>9.2% (6)</td>
<td>1.5% (1)</td>
<td>0.0% (0)</td>
</tr>
<tr>
<td>I learn and develop as a creative person when working in collaborative groups</td>
<td>6.2% (4)</td>
<td>50.8% (33)</td>
<td>27.7% (18)</td>
<td>15.4% (10)</td>
<td>0.0% (0)</td>
</tr>
<tr>
<td>I need to feel a sense of trust before I can be truly creative in a group</td>
<td>30.8% (20)</td>
<td>40.0% (26)</td>
<td>16.9% (11)</td>
<td>10.8% (7)</td>
<td>1.5% (1)</td>
</tr>
<tr>
<td>The main benefit to working together in groups is getting more work done by dividing it up</td>
<td>20.3% (13)</td>
<td>40.6% (26)</td>
<td>17.2% (11)</td>
<td>17.2% (11)</td>
<td>4.7% (3)</td>
</tr>
</tbody>
</table>
Table 19

Number and Percentage of Questionnaire Items in the Category Neutral in Comparison to all Categories

<table>
<thead>
<tr>
<th>Item</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group work is an important part of the creative process</td>
<td>9.2% (6)</td>
<td>32.3% (21)</td>
<td>41.5% (27)</td>
<td>16.9% (11)</td>
<td>0/0% (0)</td>
</tr>
<tr>
<td>I see creativity as an individual rather than a collaborative process</td>
<td>12.4% (8)</td>
<td>23.1% (15)</td>
<td>36.9% (24)</td>
<td>26.2% (17)</td>
<td>1.5% (1)</td>
</tr>
<tr>
<td>I enjoy working in groups collaborating with others on creative projects</td>
<td>9.2% (6)</td>
<td>26.2% (17)</td>
<td>40.0% (26)</td>
<td>20.0% (13)</td>
<td>4.6% (3)</td>
</tr>
<tr>
<td>Working alone increases my level of creativity</td>
<td>15.4% (10)</td>
<td>33.8% (22)</td>
<td>36.9% (24)</td>
<td>12.3% (8)</td>
<td>1.5% (1)</td>
</tr>
<tr>
<td>I think the final product is more creative when I work with others</td>
<td>0.0% (0)</td>
<td>32.3% (21)</td>
<td>35.4% (23)</td>
<td>29.2% (19)</td>
<td>3.1% (2)</td>
</tr>
<tr>
<td>Working in groups stifles my creativity</td>
<td>1.6% (1)</td>
<td>19.0% (12)</td>
<td>41.3% (26)</td>
<td>36.5% (23)</td>
<td>1.6% (1)</td>
</tr>
</tbody>
</table>

Technology

The data that emerged during this research would indicate that the role of computers and computer technology in support of collaboration and creativity are multilayered. Not only can technology support collaborative work, quite often successfully as indicated by the results of this study, but it is also a key component in the actual creative design process itself. It supports creative collaboration and the creative work as well. One of the key questions asked in this study related to whether or not computer technology can be a full partner in the entire creative process. Several groups who took part in this study did employ computer technology tools throughout all parts of the creative process, achieving this full partnership approach.
with technology in the creative design process. These people felt that they were able to eventually develop a more creative and sophisticated product through their virtual collaboration and technologically supported design. However not all groups were able or wanted to partner seamlessly throughout their creative work with computer technology, although they appear to be close to achieving that end.

Employing technology such as the Internet, blogs, and social networking sites allowed the participants to research their intended markets, find examples of ideas, and brainstorm with their groups. Employing computer software in the design process with tools for sharing these designs electronically among the community was important for most groups and especially important for the groups whose members were on vacations or working outside of the country during some of the weeks of this study. Working collaboratively also allowed students to learn new skills from each other and computer technology certainly supported the give and take of peer feedback throughout the process. A positive response of well over 85% from the questionnaire indicated that the participants felt that computer technology was helpful in their collaboration.

The student participants were also positive about computer technology being a full partner in the creative process and they agreed that computer technology added to their creativity although they did feel that better technological tools needed to be developed to further enhance or support creativity. However this could be a reflection of their recent introduction to technological tools for creative work and their subsequent lower level of expertise with these tools.

Further points of interest were that not all participants used technology in all aspects of creative work. In response to the questionnaire statement, “I begin the creative process online”, the participants were closely tied at 30% each in the categories of “Neutral” and “Disagree.” Further, when asked whether computer and technology were appropriate for only some of the creative process, almost 60% of the questionnaire participants agreed, although there was a strong representation of questionnaire participants who used computer and computer technology in all phases of the design process. This was an interesting tension that emerged from this study;
while an overwhelmingly high percentage of the group indicated a strong comfort level with computer technology, they also returned a strong response indicating their awareness of their need to develop better computer related skills in order to use technology more effectively.

A particularly interesting concept that has not been addressed in the literature on the benefits of technology in collaboration emerged in a number of faculty and student observations. This concept is the time-savings that occurred through virtual collaboration and avoiding social interaction, the so called chit chat that is often a large part of any sort of face-to-face collaboration. One participant commented that while face-to-face collaboration has advantages, a lot of time gets wasted chatting and when her group worked online they got to the work faster. Other students commented on this issue in similar ways.

Overall students were wholly positive about employing technology in the creative process, pointing out the various benefits such as industry preparedness, ease, speed, access to knowledge, and technology as an effective production tool. Finally, the participants definitely viewed computers and technology as valuable tools in the creative process, and felt that the use of computer technology changed the creative process—over 80% agreed with this view.

Table 20 contextualizes the creativity related issues emerging from this study and identifies those collaborative and technological supports for each mentioned by participants.
<table>
<thead>
<tr>
<th>Creativity theme</th>
<th>Collaboration support</th>
<th>Technological support</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inspiration</td>
<td>Sparking ideas</td>
<td>Source of ideas</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Vehicle for collaboration during the ideation of process</td>
</tr>
<tr>
<td>Brainstorming</td>
<td>Fine tuning ideas</td>
<td>Source of ideas and ability to share them</td>
</tr>
<tr>
<td>Developing sketches</td>
<td>Collaborating on drawing</td>
<td>Collaborative software to design together as a team</td>
</tr>
<tr>
<td></td>
<td>Giving and receiving feedback</td>
<td>Vehicle for sharing and receiving feedback</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Design software to create professional sketches virtually for members at a distance</td>
</tr>
<tr>
<td>Samples and templates</td>
<td>Locating and using previous work</td>
<td>Repository of models &amp; templates and ease of access to and sharing of these templates</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Virtual access to libraries, Google images</td>
</tr>
<tr>
<td>Skills</td>
<td>Learning new skills</td>
<td>Computer technology for learning new skills</td>
</tr>
<tr>
<td></td>
<td>Practice weaker ones</td>
<td>Computer technology to support weak skills or avoid learning manual ones</td>
</tr>
<tr>
<td></td>
<td>Various members bring different skills to the collaboration</td>
<td>Computer technology to support sharing knowledge</td>
</tr>
<tr>
<td>Feedback</td>
<td>Peers from community can provide feedback</td>
<td>Peers from collaboration community can provide feedback on a timely basis</td>
</tr>
<tr>
<td></td>
<td>Faculty from community can provide feedback</td>
<td>Ease of sharing ideas to solicit feedback on a timely basis</td>
</tr>
</tbody>
</table>
How does technology enhance the creative process?

Table 20 demonstrates the various ways in which collaboration supports each of the main creativity themes, and, further demonstrates how technology is successfully able to support both collaboration and creativity. Following is a more in depth discussion of each of these themes.

**Inspiration.**

Shneiderman’s (2000) inspirationalist school of creative though recognizes that creative work begins with problem formulation and brainstorming and continual refinement. An important tool in this process is the use of mind mapping software and the use of graphical and visual tools. The creative process, in the case of these fashion design students, begins with a problem or need. The next step, that of sparking ideas, was perceived by students and most faculty as being well supported through collaboration, provided each group has been able to negotiate trusting and supporting relationships with the community, have structures in place to ensure all voices are heard, and have a team leader or facilitator in place to ensure these structures of support remain in place, and that work gets done on time.

Computer technology, according to the participants in this study, provided an invaluable source of ideas from the Internet, through the use of blogs, social networking sites, and online fashion magazines, however the study participants also felt strongly that the true value of technology in their work on the McGregor project lay in its enhancement of communication among group members throughout the ideation process.

**Brainstorming.**

Collaboration during the brainstorming process appeared to be a critical component of the creative process and was mentioned by virtually all of the student participants. Sharing ideas, fine tuning them, and, in a number of situations, being able to develop more sophisticated ones were all valued aspects of collaboration.

Again, computer technology provided a wealth of sources for ideas during this ideation or brainstorming stage as well as supporting collaboration with the
community during the process. Sawyer (2007) talks about the benefits of electronic brainstorming which he believes allow groups to avoid the tendency to focus only on a few categories or approaches. Electronic brainstorming is a more asynchronous process in which each member of the groups writes out or draws his or her ideas and then passes them to the next person. In this way, individual ideas can be fully developed before being viewed and commented upon by others in the group and Sawyer believes that this encourages and supports exploring many categories for solutions rather than just a few.

**Developing sketches.**

The participants spoke of collaboration as helpful to begin the design process with sketches that they could share, build on, and receive immediate feedback. Some participants employed collaborative design software which allowed them to actually collaborate on a design or some aspect of it in real time, while they were in geographically diverse locations.

Computer technology software for designing together as a team helped in this process both through the sharing of files asynchronously, and synchronously, in real time, with some or all group members present. This was quite important for all groups I spoke with—in some cases group members were vacationing or working out of the country, others were a few blocks away, but the main benefit was in allowing the community to connect whenever convenient.

**Samples and templates.**

Shneiderman’s (2000) situationalist school of thought, those who emphasize the social and intellectual context as key to the creative process, and who value tools that support access to previous work in the domain, and opportunities to share their work appeared in this study. Several participants raised the need for and use of samples and templates in the design process. They believed that locating and using previous work either as ideas or basic designs upon which to build their concepts was valuable in their work.

Computer technology was particularly valued by most participants in this study; they spoke of how useful various technologies were as a repository of models and
templates and how easily these were to access through Google images, online fashion magazines, fashion blogs, or virtual libraries.

**Skills.**

Shneiderman’s (2000) structuralist school of thought encompasses those emphasizing an orderly methodological approach to the creative process, and who focus on the issue of manual skills in the creative process. Some of the interesting tensions that appeared in this study related to the issue of skills in the creative process. For the most part, the faculty members emphasized the importance of students learning the manual skills such as the use of pen and paper or water-colours before employing computer software in place of these skills. A further difference of opinion among faculty surround the question of whether the curriculum should be changed to focus less on these manual skills in favour of teaching technology to replace them.

Students on the other hand welcomed learning and working with computer technology, specifically computer design software tools, to replace the need for manual design work. They spoke of technology’s ability to fine tune and professionalize their work and, in other cases, to compensate for weak manual skills.

Collaborative practice as the context for learning new skills is the fundamental learning component of Communities of Practice. Some members of any community will be more skilled than others and these individuals can be critical in helping to develop or further hone skills in new members, and in so doing help these less skilled members move from the periphery toward the centre of the community.

Through the use of computer technology, members of the community are able to share their knowledge and expertise seamlessly with one another, as well as employ technology to actually compensate for weaker skills. The participants in this study valued their collaborative groups, viewing them as instrumental in the development of their design skills; however there was recognition of the ongoing concern of potentially being slotted into the same role in each group project.
Feedback.

The situationalist school of creative thought, emphasizing the Community of Practice as the location for the emergence of the creative process through social process of approval, would certainly agree that feedback is a critical component. Both faculty and student participants felt feedback was critical in informing the creative process. What stood out from the results of this study was the student view that peer feedback was often valued more than feedback from their professors.

One of the benefits of collaboration is that group members are available to offer suggestions and ideas throughout the process and this emerged during this study as well. The ease of sharing ideas to solicit feedback, and the speed and convenience of getting and receiving such feedback on a timely basis was also identified as a valuable component of collaboration.

The following tables, table 21, table 22, and table 23 report the questionnaire items that focused on technology themes, and organizes these items into the categories of agree, neutral, and disagree.
Table 21

*Number and Percentage of Questionnaire Items in the Category Agree in Comparison to All Categories*

<table>
<thead>
<tr>
<th>Item</th>
<th>Strongly Agree (%)</th>
<th>Agree (%)</th>
<th>Neutral (%)</th>
<th>Disagree (%)</th>
<th>Strongly Disagree (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I feel that computer technology is helpful in collaborating</td>
<td>38.5 (25)</td>
<td>44.6 (29)</td>
<td>15.4 (10)</td>
<td>1.5 (1)</td>
<td>0.0 (0)</td>
</tr>
<tr>
<td>Computers and technology are valuable tools in the creative process</td>
<td>33.8 (22)</td>
<td>53.8 (35)</td>
<td>10.8 (7)</td>
<td>1.5 (1)</td>
<td>0.0 (0)</td>
</tr>
<tr>
<td>The use of computer tools changes the creative process</td>
<td>21.5 (14)</td>
<td>56.9 (37)</td>
<td>15.4 (10)</td>
<td>6.2 (10)</td>
<td>0.0 (0)</td>
</tr>
<tr>
<td>I am comfortable with most computer technology and software</td>
<td>23.4 (15)</td>
<td>54.7 (35)</td>
<td>15.6 (10)</td>
<td>6.3 (4)</td>
<td>0.0 (0)</td>
</tr>
<tr>
<td>Computers and technology tools add to my creativity</td>
<td>20.0 (13)</td>
<td>56.9 (37)</td>
<td>15.4 (10)</td>
<td>6.2 (4)</td>
<td>1.5 (1)</td>
</tr>
<tr>
<td>Computers and technology tools are appropriate for only some of the creative process</td>
<td>21.5 (14)</td>
<td>58.5 (38)</td>
<td>10.8 (7)</td>
<td>9.2 (6)</td>
<td>0.0 (0)</td>
</tr>
<tr>
<td>The use of computer tools changes the final outcome of the creative process</td>
<td>29.2 (19)</td>
<td>53.8 (35)</td>
<td>10.8 (7)</td>
<td>6.2 (4)</td>
<td>0.0 (0)</td>
</tr>
<tr>
<td>I see computer technology as a full partner in the creative process</td>
<td>21.5 (14)</td>
<td>40.0 (26)</td>
<td>27.7 (18)</td>
<td>10.8 (7)</td>
<td>0.0 (0)</td>
</tr>
<tr>
<td>I need to develop better computer related skills to use technology</td>
<td>18.5 (12)</td>
<td>53.8 (35)</td>
<td>9.2 (6)</td>
<td>18.5 (12)</td>
<td>0.0 (0)</td>
</tr>
</tbody>
</table>
### Table 22

**Number and Percentage of Questionnaire Items in the Category Neutral in Comparison to all Categories**

<table>
<thead>
<tr>
<th>Item</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I usually begin the creative process online</td>
<td>10.8% (7)</td>
<td>15.4% (10)</td>
<td>30.8% (20)</td>
<td>29.2% (19)</td>
<td>13.8% (9)</td>
</tr>
<tr>
<td>I prefer mechanical tools (pencil, water colours, paper) when I am being creative</td>
<td>20.0% (13)</td>
<td>26.2% (17)</td>
<td>29.2% (19)</td>
<td>20.0% (13)</td>
<td>4.6% (3)</td>
</tr>
<tr>
<td>We need better technology tools to support creativity</td>
<td>15.4% (10)</td>
<td>32.3% (21)</td>
<td>40.0% (26)</td>
<td>9.2% (6)</td>
<td>3.1% (2)</td>
</tr>
</tbody>
</table>

### Table 23

**Number and Percentage of Questionnaire Items in the Category Disagree in Comparison to all Categories**

<table>
<thead>
<tr>
<th>Item</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I use computers and computer technology in all phases of the design process</td>
<td>15.5% (10)</td>
<td>29.2% (19)</td>
<td>16.9% (11)</td>
<td>36.9% (24)</td>
<td>1.5% (1)</td>
</tr>
<tr>
<td>Using computer technology restricts my creativity</td>
<td>3.1% (2)</td>
<td>6.2% (4)</td>
<td>26.2% (17)</td>
<td>46.2% (30)</td>
<td>18.5% (12)</td>
</tr>
</tbody>
</table>
Answering the research question

This study set out to understand the opportunities and limitations of computer technology for creativity and to attempt to answer the question that current research has not yet answered—does the use of computer technology make a difference to the creative process, its outcomes, or both. The framework is the concept of collaboration and the Communities of Practice model which was instrumental in allowing recognition of creativity as a collaborative versus individual activity. Additionally, Shneiderman’s Genex framework was employed to illuminate the technology portion of the research, looking not only at how computer technology supports collaboration but also in exploring the ways in which computer technology has an impact upon the creative process itself.

The benefits of collaboration on the creative process are many and were clearly outlined by the participants in this study. The faculty held a more pragmatic view, that of preparing students for work in the fashion industry which strongly embraces collaboration. The student participants explored the benefits of collaboration and community in the creative process in a multidimensional manner. They spoke of their ability to take on large projects and achieve much more, but also talked about being able to learn from their colleagues and develop as creative persons with the support of their community. They spoke of developing new skills, motivating each other, sparking ideas, maintaining relationships, and having fun.

All of these benefits can be gained when the community is a positive one, where members are supported and their voices heard, able to take on different roles and learn new skills, and where their contributions are valued. It would appear that the participants in this study clearly valued collaborative work and generally found it positive.

What is the role of technology here? At the outset of this research I anticipated that the role of technology would be valuable in supporting community and this has been borne out by the data. Many researchers have focused on collaboration in creativity, and technology to facilitate this (Arias et al., 2000; Candy & Edmonds,
The faculty participants felt technology was quite effective in allowing students to connect more often, and more effectively, and especially helpful when group members were not able to meet face-to-face. Faculty also spoke of virtual collaboration helping students avoid the tyranny of furniture, allowing them to work quietly anywhere they wished, and enabling them to work in comfortable spaces rather than in noisy computer labs.

What was quite interesting however, and not evident in the literature, is that a number of participants, both faculty and students, spoke about the time saving feature of technology in terms of avoiding the social conventions, such as chit chat and getting down to work faster. Other benefits were reported, such as the ability to share ideas, designs, and files back and forth, locating templates, giving and sharing feedback, and keeping everyone informed and on track. Over 85% of the online questionnaire respondents agreed that computer technology was helpful in their collaborative efforts.

What is technology’s role in changing the creative process, its outcomes, or both? Vass et al. (2002) believe that for technology to be an effective creative tool, it needs to work seamlessly with the designer, and be a full partner in the design process, and should foster, rather than hinder, creativity. The data from this study suggest that not all participants viewed computer technology as a full partner; some participants thought of it as a useful tool for only some parts of the creative process. Participants reported benefits such as ease of locating ideas, communicating them to community members, helping to overcome weak manual skills and so forth however a number of those who took part in this study identified the need for better tools, tools that are easy and intuitive to use, and work with the designer in their own language. In fact 40% of the questionnaire respondents were positive about the role of technology in the creative process.

One of the most noticeable benefits that emerged from this study was the sharing of ideas. As Sawyer (2007) points out, technology supports and even
accelerates the innovation process because these sparks of ideas students spoke of, can happen in real time. Sawyer feels that increased bandwidth, communication, and social networks provide the potential for groups to be far more creative, and through the use of technology he believes that group genius is much more likely to occur.

From the sorts of responses students gave in the personal interviews, I believe that within the context of this group of participants and this study, that technology does change the process and the final product. Almost 60% of the questionnaire respondents agreed that the use of computer tools changed the creative process, and this was borne out as well in the personal interviews. Students believed the creative process was more collaborative with the use of technology, keeping community members connected when they were unable to connect face to face. The participants were also wholly positive about the ways that technology could successfully support weaker manual skills, and how computer design software facilitated the development of professional designs.

Figure 36 provides a model clarifying the interrelationship between the three overarching themes of exploration that emerged in this study and demonstrates that creativity can be driven by collaboration and technology, both individually and socially. It also shows a relationship between technology and creativity, how one drives the other. Technology can help build creativity and creativity can improve upon technology. Finally, it shows the relationship between technology and collaboration; all these connections were clearly made by the participants in this study.

![Figure 36. Graphic representation of the relationships between creativity, collaboration, and technology.](image-url)
Implications

In the following sections I discuss the theoretical and practical implications that have emerged from this research. Initially I focus on the theoretical implications of the results in relation to the theories of Communities of Practice and Communities of Interest. This section mainly explores the section of this study on collaboration. Following the theoretical implications, this chapter will go on to look at implications for practice, which incorporates implications for curriculum design, for teaching, and for learning.

Comparing and contrasting the differences between these two models of collaboration has been useful. Initially, the Communities of Interest model was helpful in contextualizing the data that emerged from heterogeneous groups made up of both design and communications focused students. However most groups were homogeneous, from one stream or the other and for the most part are better described through the constructs of the Communities of Practice model. Subsequent discussions explore the theoretical implications of the results in relation to the Genex framework which while a complementary framework for Communities of Practice, goes further in assisting with an understanding of the data from the technological perspective of this study. However other data emerged that serve to highlight the shortcomings of this theoretical construct. The differences between these models are further explored in this section. The section of this research that focused on technology will be explored using the Genex framework. Following the theoretical implications, this chapter will go on to look at implications for practice, which incorporates implications for curriculum design, for teaching, and for learning.

Theoretical Implications from the Community of Practice model.

The main theoretical assumptions underlying the development of the research instruments for understanding the collaborative aspect of this study and employed in the data analysis were taken from the Communities of Practice model as a means to understand constructing knowledge and learning through collaborative experiences.
Part of working in community is the concept of social creativity and how it can be fostered through increased social capital. Social capital, which Fischer et al. (2004) define as being “characterized by the interpersonal relationships an individual has with other members in a community,” provides a basis for analyzing sense of community, specifically the individual’s sense of connectedness. A large part of this study was focused on understanding how the participants related to, and worked with one another collaboratively, and how this was supported by computer technology. Further, current research is changing the way we view the concept of creativity as a much more complex and multifaceted concept, in which collaboration plays a strong role.

This research also looks at two conceptual dimensions of collaboration, homogeneous communities such as those described by a Communities of Practice model and heterogeneous communities of different domains such as those characterized by the model of Communities of Interest. At the outset of this work I felt that differentiating between these two collaborative models might be important in better contextualizing the results in terms of the various groups and the makeup of their members, coming as they did from different streams of study within this School of Design; fashion design and fashion communications. The barriers for collaborative work are discussed in some detail in chapter two and summarized in Table 1. The main issue that is highlighted by the Communities of Practice model is the challenge of innovation, which was a theme that emerged from this study. The issues highlighted by the Communities of Interest model on the other hand were in establishing a shared understanding and the challenge of finding common ground among members. A key strategy to overcome these challenges is the use of boundary objects. The concept of boundary objects is discussed in some detail in chapter two. To briefly summarize, their main use is in overcoming communication barriers across conceptual dimensions, in effect bridging the conceptual gap that occurs between community members from different domains of practice.

Boundary objects are externalizations of ideas that provide for shared understandings across spatial, temporal, conceptual, or technological gaps. In
creative design communities, boundary objects can be useful in establishing shared contexts for communication while providing referential anchoring—they can be pointed to and named and are useful in increasing shared understanding among a diverse community. A graphic explanation of boundary objects can be seen in Figure 1. The use of samples and templates ties directly to the benefits of boundary objects and were viewed as particularly important when students from two different streams of study formed groups.

To illustrate a sample of a particularly useful boundary object in the field of fashion design one of the faculty members related the experiences of two students from the fashion communications stream who decided to create a line of clothing for one of the larger fashion shows that are put on at the end of each year, and in which the designs are usually created by the fashion design students. Apparently the designs created by the communications stream students failed miserably because they did not understand the concept of draping and fabric flow. Had they employed a jenny (that adjustable, headless designer’s model) and used it to work with the fabric they chose they would have been able to see, very early on in the design process, that their choice of fabric for the design did not effectively communicate their design intention.

Communication students have basic knowledge of apparel design and pattern drafting. Design students progress through their program advancing their skills in design, draping, and pattern drafting. It would be difficult for a communication student to drape an evening wear collection because they have not acquired those skills. After graduation, one student from the design stream and one student from the communication stream teamed up to create an apparel collection that was successful. This design team emerged with a designer and a communication student who each took on different aspects of design and production. Each student took on responsibilities that used the strengths and skills that were developed in each of the programs.

The differences between Communities of Practice and Communities of Interest was also explored in detail earlier in Chapter Two’s discussion of the main theoretical framework for this study: Table 2 presents an overview of the creative
elements within these two models as well as the strengths and weaknesses of each model of collaboration.

To briefly revisit these differences, Communities of Practice are made up of individuals who work as a community within a certain domain, undertaking similar work. I would suggest that this model would be more useful to describe group experiences where the groups were formed by members from one of the two domains within this classroom, either the fashion design or the fashion communication students. When students from both domains converged in a group, the Communities of Interest model was a more useful one to employ in understanding the issues of collaboration, and in analyzing the data.

For example in the Communities of Practice model, members have opportunities to develop skills through interaction with their community. Sustained engagement and collaboration are based on shared histories and knowledge systems. These can provide supports for efficient communications by taking advantage of members shared backgrounds, benefiting from the existence of an accepted, well-established centre of expertise, and often the team or group is able to represent a collective mind while allowing each member to contribute information and skills to the team necessary to complete the project. Members are able to learn from sharing skills and experimenting and receiving feedback from one another. The strengths of a Communities of Practice lie in its shared ontology. However the very existence of this shared ontology can lead to watered down ideas. This challenge was mentioned by several participants. The participants believed that when group members were uncomfortable disagreeing with each other, or lacked confidence in contributing unusual suggestions then the final product was less creative than it would have been had they found themselves in a more open and trusting atmosphere.

The issue of developing skills arose quite frequently in discussions with the participants with several commenting on the benefits of learning from one another. This clearly illustrates the value of the Communities of Practice concepts of a shared background and established centre of expertise that provide access to highly skilled members. The significance of feedback was another recurring issue I found in the data
and which is another benefit of working in a Community of Practice. Communities of Interest on the other hand, while valuing and relying on the diverse skills of the community do not seek to transfer these skills but rather to take advantage of them.

The concept of virtual Communities of Practice as posited by Raelin (2008) explores the benefits of electronic communications that keep communities together. Descriptions of virtual Communities of Practice clearly focus on their function rather than physical proximity. However, they provide similar benefits, including the sharing of information, handling divergent thinking tasks, and reducing barriers such as inequality of participation. Such structure can remove the need for dealing with more superficial aspects of the task, such as the time-intensive social niceties participants mentioned in this study as something they were able to dispense with online.

Communities of Interest are made up of members from different communities and they form in order to resolve a particular problem. Members thus may have a wider variety of skills and abilities that cut across domains. The benefits of Communities of Interest lie in the diversity of their members, the support of social creativity, and the opportunity for new insights. However, there may be an underlying weakness to this structure, specifically the lack of mutual awareness (a particular strength of the COP model). This can cause stress as people may be coming from quite different perspectives. However, using boundary objects such as models and templates can reduce such possible friction. While a number of participants spoke of the benefit of using external sources for samples, ideas, and templates, and all these would be consistent with either model of collaboration, it was found to be particularly helpful in those groups who lacked a shared understanding of certain design or communications factors and who commented that having a sample or template to help explain things to one another was critical in connecting ideas among group members.

Table 24 attempts to organize the themes that emerged from the research on collaboration and creativity and connect them to and compare and contrast them between Communities of Practice and Communities of Interest. This table helps to demonstrate how both types of communities have strengths and weaknesses.
Table 24

Comparison of Collaboration Data, Communities of Practice, and Interest

<table>
<thead>
<tr>
<th>Communities of Practice</th>
<th>Collaboration research data</th>
<th>Communities of Interest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nature of problems: Different tasks in same domain</td>
<td>Practicing roles</td>
<td>Typecast in roles</td>
</tr>
<tr>
<td>Knowledge development: Refinement of own knowledge - new ideas from within the domain</td>
<td>learning and practicing skills</td>
<td>Synthesis and mutual learning through integration of multiple knowledge systems</td>
</tr>
<tr>
<td>Objectives: domain coverage</td>
<td>Group dynamics</td>
<td>developing relationships</td>
</tr>
<tr>
<td>Weakness: group think</td>
<td>watered down creative work</td>
<td>time taken to gain consensus and make decisions</td>
</tr>
<tr>
<td>Strengths: shared ontology/understanding</td>
<td>less time taken to make decisions</td>
<td>diversity and new insights, increased social creativity</td>
</tr>
<tr>
<td>People: apprentices and masters</td>
<td>learn and practice various roles</td>
<td>stakeholders from different domains</td>
</tr>
<tr>
<td>Learning: LPP</td>
<td>peer &amp; faculty feedback</td>
<td>Informed Participants</td>
</tr>
<tr>
<td></td>
<td>introduction to new skills and roles</td>
<td></td>
</tr>
</tbody>
</table>
A particularly interesting theme that emerged from this research is that of power issues inherent in Communities of Practice. I found that the issues of power emerged in two ways from the data, that of power over in the case of the faculty positional power relative to control and evaluation, and those group dynamics that take place between students. This latter area of group dynamics appeared to be quite complex with many different characteristics.

**Power over: Faculty.**

In Communities of Practice, new member learning takes the form of legitimate peripheral participation (Lave & Wenger, 1991), a type of apprenticeship process in which newcomers work from the periphery towards the centre of the community as they gain in skill through interacting with and being guided by more experienced members of that community. The community focuses on taking advantage of the skills and shared backgrounds of its members who work within the framework of an accepted and generally well-established centre of expertise.

What the theory fails to explore are the problems that emerge in Communities of Practice in terms of the issues that stem from power relations. Veenswijk and Chisalita (2007) criticize Communities of Practice theory for failing to take into account those issues of power, conflict, and ideology. They looked at the way in which Communities of Practice are driven by internal and external power relations and how this affects the core of knowledge deemed to be valuable in these communities. They also examined the concept of boundary objects or artefacts which are employed to symbolize shared beliefs and orientations and help acculturate new members into the community.

Hartnell-Young’s (2006) study of teacher’s roles in Communities of Practice supported by technology also raised concerns about leadership, power, and empowerment. She found that among the teachers who took part in this study, issues of power were alluded to in terms of leadership and control of resources, but rarely made explicit, and saw this as an indication of power issues being part of the tacit knowledge of school communities. Hartnell-Young also found that boundary objects were an important part of work and learning in individual Communities of Practice but
were critical in work conducted in different communities, and these boundary objects were identified as artefacts, documents, terms, and concepts. The following paragraphs explore two areas of power that were visible in the data from this study, that of faculty power over the community, and power issues among the actual students who participated in the collaborative work.

The student participants in this study were clearly aware of the positional power held by faculty in the larger community and recognized that this came from the actual positions the faculty held as well as emerging from their established expertise in the field of fashion design. When students spoke about feedback they looked at it from two perspectives, feedback from their professors and from their colleagues. Feedback from professors was valued by the student participants especially if they believed that the faculty member had some significant industry experience. Students valued the feedback from those faculty members they believed had authentic experience and expertise to support their suggestions and so they, more often than not, acted upon this feedback. In fact some students clearly recognized that faculty members had power over them in terms of evaluation and consequently would sometimes change certain aspects of their work as recommended by their professors, even when they disagreed with the recommendations, simply to get good marks. Afterwards, if it was a piece of work they valued and wished to maintain in their design portfolios, they simply changed the item back to what they personally thought was a better product.

In contrast to faculty feedback, students spoke openly about the value they attributed to peer feedback, sometimes in opposition of faculty’s views. From these data it would appear that students valued feedback from faculty more in terms of execution, i.e. the process, using the technology, and so forth but valued their colleagues’ feedback about the final product. The data from this study would indicate that students viewed the process feedback from faculty as valuable in terms of learning the skills and design process, but their colleagues’ feedback on the final product was valued more because they were of comparable age and understood current styles. Several students and one faculty member alluded to these
generational differences in their discussions. It was quite evident, when viewing the final collections during the presentations to the McGregor judges, that these students identified their target market as closely aligned with their own age groups. As I viewed the presentations this generational divide became apparent; most groups’ target age for marketing their product was well under the age of 35. Based on this, I clearly understood why their peers’ view of fashion would be perceived as more closely aligned with their own, and thus more highly valued.

Some students, particularly the ones who claimed to be more experienced and confident in their skills and design work, tended to value feedback less as they became more experienced members of the larger design community. The online questionnaire employed two statements about feedback, asking the participants to rate how they valued feedback from peers and from faculty. Sixty per cent strongly value peer feedback, however the participants also valued feedback from the faculty (45%).

Exploring the value of peer critique in creative design might be an area of valuable future research especially in light of the comments of several student participants and faculty who found that if students could be honest and open in critiques, that these activities might be a valuable learning experience. Relevant here is the current work a professor at the University of Toronto developing computer technology software to support peer critique for student writing. This may well have implications for all students, not only those involved in creative design and arts based curriculum.

**Group dynamics.**

Many issues in group dynamics emerged from the interviews with student and faculty participants as they explored the value of collaboration and community in the creative process. Some of these issues appear to be common to any sort of collaborative effort such as problems when one individual takes over the process, forcing their opinions on others, and creating a hostile environment. Conversely there can be individuals who do little, relying instead on the work of other group members. Students also pointed out the need to be willing to take on different roles, and the
need for a facilitator to organize, coordinate, and deal with group dynamics. Some of these themes will be discussed further.

**Roles in Communities of Practice.**

It is important within any sort of Community of Practice that members are willing to take on various roles within the community and this exploration and practice of various roles represents a valuable means of legitimate peripheral participation in the community. Schlager and Fusco (2003) believe that there are no designated and immutable roles or hierarchies in Communities of Practice and thus leadership, from a community perspective, takes on a different appearance. According to Wenger (1998) the leadership role in virtual teams is often shared among the members, and these internal leadership roles are critical to the development and nurturing of communities. These roles include *inspirational* leadership (experts and those with great ideas); *day-to-day* leadership (those individuals who organize activities), *classificatory* leadership (those who help members understand best practices); *interpersonal* leadership (members who connect to each other and the groups); *boundary* leadership (members of the community who help each other to connect with other communities and groups); and *cutting-edge* leadership (members who develop and bring to the group new and radical ideas). Wenger points out that these roles can be formal or informal, but clearly the members of the group need to recognize them and to acknowledge the community members who take on these roles. It is apparent from this study that whether formally, or informally, many of the roles identified here were taken on by the student participants, and not always with positive results.

Students did point out the benefits to be gained from collaborative efforts such as learning new skills from their colleagues and having opportunities to practice weaker ones, a benefit identified as one of the important dimensions of Communities of Practice. However, a number of these students experienced frustration when they found themselves repeatedly typecast into the same roles. It seemed that once they gained some sort of proficiency at some skill or in some role, they were frequently relegated to that role, often to the detriment of future learning and development.
This would appear to be consistent with the divide and conquer strategy of collaboration, identified by Levy and Murnane (2004) that while helpful for completing large projects and achieving good marks, can also restrict the learning of these typecast group members. If students in the collaborative communities do not have time to learn from one another and to practice various roles and transfer skills among the members, then the individual never has the opportunity to move beyond being an apprentice.

The people and knowledge dimensions of collaborative communities, in particular, Communities of Practice, clearly point to the refinement of knowledge that comes from the skills development of the individual who moves from the role of apprentice to that of the master within the domain. This is in sharp contrast with the model of Communities of Interest which focuses less on skill development and more on the synthesis and mutual learning that develops informed participants.

Another concern, raised by one of the student participants, was that the division of labour may bring about the benefit of saving time, but may also yield a fragmented final product lacking in cohesiveness. I think that this issue can emerge in both collaboration models. For example in Communities of Practice, the nature of problems are dealt with by members taking on different tasks within the same domain, perhaps resulting in this fragmentation, whereas in Communities of Interest, problems are seen as common tasks across multiple domains. This approach may well support the development of a more seamless and less fragmented product, as long as group members are able to overcome the lack of mutual awareness and understanding and harness the skills of all members to develop a cohesive and seamless product. In the long run, however, whether members are working within or across domains much more effort needs to be put in at the end of the project to smooth out this fragmented appearance.

Students also spoke about the need for valuing all group members, creating a trusting and safe environment where members are open to other’s ideas and comfortable and willing to share their own. I would suggest that each collaborative model would have strengths and weaknesses in this area. In Communities of Practice,
members share knowledge, skills and understanding and this would, potentially, go a long way towards overcoming issues of trust and understanding, and would be a major means for the development of codified knowledge. One might expect that lack of trust and understanding would occur more frequently within Communities of Interest, because members come from different backgrounds and domains; however the major objectives dimension of this model of collaboration focuses strongly on the importance of shared understanding and on making all voices heard within the community. Each model of collaboration would need to carefully encourage and support all members having a voice.

**Need for group or community facilitator.**

Several students spoke of the need for someone within the group to take on the role of group leader or facilitator. The participants felt that having someone in this role served to keep things organized, to make sure everyone’s voice was heard, and to ensure each group member was doing their share of the work. It also helped to avoid disagreements and the subsequent hostility that often emerges in collaborative activities and ultimately has a negative impact on creative processes. Sawyer’s (2007) research has found that using a facilitator is essential to good brainstorming and collaborative work and that groups led by a skilled one are generally more creative. One of the faculty participants felt that it is often the most vocal student with the best inter-dynamic skills or the most overpowering personality who forces their ideas on the group. Another faculty participant commented on how an overpowering individual can dominate a group and thus suppress the voices and interests of other group members, ultimately frustrating the whole group’s creativity.

A student participant noted that without some sort of structure one individual could take over, dominate the group, make decisions without consensus, and frustrate the members with the end result of stifling, rather than enhancing creativity. Several participants believed that structures need to be in place for successful collaboration and felt that issues such as trust and comfort were critical for effective collaboration. The questionnaire asked participants whether a sense of trust was important for them to be creative in a group and these participants felt quite strongly about this, in fact
over 70% agreed. Apparently the student participants in this study were not always able to form those strongly supportive communities. When asked if they enjoyed collaborating on creative projects it may be assumed that the neutral stance taken by the majority of participants would indicate that often these critical structures were not in place to ensure a positive experience.

**Gaining consensus within the community.**

Faculty participants felt that when groups worked well together, they invariably developed much more original and creative work. They did identify some problems that can emerge such as the length of time it can take for the group members to reach consensus, often an issue that emerges in Communities of Interest, due to the lack of common understanding when constituents from different domains come together to solve a problem. The issue of group-think, a common weakness of Communities of Practice, was identified by students who reported that sometimes to keep peace the group members would compromise resulting in poorly designed and executed products. Another participant weighed in on this topic as well, feeling that collaborating on creative projects can be quite difficult and sometimes the group comes up with something everyone likes, which points to consensus, but yet this consensus may often compromise the final product. The negative effects of group-think were raised by several participants, and as noted above, this concept has been identified as one of the potential weaknesses of collaboration in Communities of Practice.

One student who felt it was important to be able to work collaboratively raised the need for group members to develop skills in explaining or demonstrating their ideas to their community. As she noted the best idea, poorly explained will likely be ignored. This speaks to the importance of shared understanding within Communities of Interest, and likely she was referring to the use of boundary objects here as a means to develop this shared understanding. Finally, the student participants raised concerns such as the amount of time it takes to brainstorm and it may be that those participants who raised these points were members of heterogeneous groups formed with members from the two different streams of study. These participants had to
spend more time developing connections and understandings of each other’s fields, a common challenge in Communities of Interest.

It would appear that these two models of collaboration were helpful in both the development of the research instruments and in analyzing the data. Clearly each model has its strengths and weaknesses; Communities of Practice are based in shared ontology but have the potential disadvantage of group-think. Communities of Interest benefit from diversity and new insights but may suffer from the many problems arising from lack of mutual awareness and understanding. Communities of Practice on one hand help their members to develop into highly skilled practitioners; Communities of Interest offer opportunities to synthesize and develop mutual knowledge and understandings of various domains.

In recognition of the above issues, faculty need to be mindful in employing collaborative projects in curriculum design and to remember that students value opportunities for both individual and collaborative work. On the one hand, working alone would allow students to develop skills levels, and identify areas of weaknesses. It would support opportunities for self reflection, critical thinking, and problem solving and collaborating, on the other hand, it would support developing ideas further, thinking about things in new ways, and help to improve weak skills and learn new ones from their communities and, finally, gain skills in working collaboratively.

Care needs to be taken in group activities to ensure that students do not consistently get slotted into specialized tasks where they have highly developed skills but lose out on opportunities to practice and develop new ones. Further, helping students develop collaborative skills for working in teams would be an important aspect of curriculum design. Perhaps spending some class time discussing the various roles within groups, and stressing the importance of taking on these various roles might be worthwhile. A further recommendation would be to clarify the benefits and disadvantages of working in each model of collaboration, and providing guidance and suggestions to help students take advantage of the benefits while minimizing the disadvantages.
Theoretical implications of the Genex framework.

The following table organizes the strong themes that emerged from an analysis of the data using Shneiderman’s (2000) Genex Framework as a comparison guide. This framework was particularly helpful in contextualizing the data from the technology portion of this research, looking at ways in which computer technology not only supported collaboration, but also how it affected the creative process. The foundational beliefs that underlie Genex’s approach are (a) new knowledge is built upon previous knowledge, (b) effective computer tools can support creativity, (c) refinement is a social process, and (d) creative work is not complete until it is disseminated. It is important also to note that these phases are not linear and in fact creative work often requires returning to earlier phases. For example, using libraries and other resources might be necessary during the entire creative process, and discussions with peers and mentors often take place repeatedly during the process.

In Table 25, we see the eight activities that make up the Genex framework and which need to be incorporated into computer tools to support creative work. Clearly the data that emerged from this study relative to technology richly ties to the Genex Framework with themes that emerged from the research.

**Searching and browsing digital libraries.**

Digital libraries provide the user with support in searching which is a vital part of a larger creative process and the participants in this study talked about how they not only found virtual library access a time saving feature, they also found that they were able to access multiple libraries in search of support for their work.

**Consulting with peers and mentors.**

Consulting and collaborating with group mentors and their professor was one of the strongest themes that emerged from this study. The participants talked about the various computer tools they used to connect and share ideas such as email, listservs, newsgroups, blogs, and USB keys. They pointed out the benefits of saving time, helping people to stay connected with the group, the speed of giving and receiving feedback, sharing ideas, and providing opportunities for motivation and inspiration.
Table 25

Comparison of Technology Data and Genex Framework

<table>
<thead>
<tr>
<th>Genex Framework</th>
<th>Technology Research Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Searching and browsing</td>
<td>Access to libraries</td>
</tr>
<tr>
<td>• Digital libraries</td>
<td></td>
</tr>
<tr>
<td>Collaborating with peers and mentors</td>
<td>Saving time</td>
</tr>
<tr>
<td>• Email</td>
<td></td>
</tr>
<tr>
<td>• Listservs</td>
<td>Builds community and keeps members connected</td>
</tr>
<tr>
<td>• Blogs</td>
<td></td>
</tr>
<tr>
<td>• Chat</td>
<td></td>
</tr>
<tr>
<td>Visualizing data and process</td>
<td>Fast Feedback</td>
</tr>
<tr>
<td>• White boards</td>
<td></td>
</tr>
<tr>
<td>• File sharing</td>
<td></td>
</tr>
<tr>
<td>Reviewing histories</td>
<td>Ease of Collaboration</td>
</tr>
<tr>
<td>• Saving early work</td>
<td></td>
</tr>
<tr>
<td>Thinking by free association</td>
<td>Sharing Ideas</td>
</tr>
<tr>
<td>• Brainstorming</td>
<td></td>
</tr>
<tr>
<td>• Mind Maps</td>
<td>Access to templates and samples</td>
</tr>
<tr>
<td>• Concept Maps</td>
<td>Repository of ideas for later review and possible use</td>
</tr>
<tr>
<td>Exploring “what if” tools</td>
<td>Inspiration</td>
</tr>
<tr>
<td>• Simulations</td>
<td></td>
</tr>
<tr>
<td>• Models</td>
<td></td>
</tr>
<tr>
<td>Composing Artefacts</td>
<td>Opportunities to try out new approaches</td>
</tr>
<tr>
<td>• Collaborative writing</td>
<td></td>
</tr>
<tr>
<td>Sharing Results</td>
<td>Speeds up production</td>
</tr>
<tr>
<td>• Email</td>
<td></td>
</tr>
<tr>
<td>• Digital libraries</td>
<td>Professional looking designs and presentations</td>
</tr>
<tr>
<td>• Blogs</td>
<td></td>
</tr>
</tbody>
</table>
**Visualizing data and process.**

Visual representations are becoming quite useful in creativity work, and are well supported in virtual learning environments through the use of white boards where users can upload existing ideas and pictures, or draw freehand, either synchronously in real time with other designers or asynchronously, and accessed when convenient. These files can be shared and worked on or commented upon by all members of the practicing community. The participants talked about how they used these tools to collaborate and to connect with faculty to help solve problems or simply to get feedback.

**Thinking by free associations.**

When a creative new idea is born, it usually consists of associations linked together in a way that has not been thought of before. Software that supports brainstorming, mind maps, concept maps, and other drawing strategies can be quite useful in drawing out ideas and looking at new associations and relationships. As Shneiderman (2000) points out, “the gift of the computer is the capacity to quickly create and easily manipulate diagrams” (p. 127). This was another strong theme to emerge from the data.

**Exploring solutions: What-if tools.**

Many tools support what-if modelling and the participants in this study valued computer software design tools for providing opportunities to try out ideas and approaches. There are some quite interesting software packages for creative work and many are into successive generations and have become richly featured, supporting explanatory text, collaborative usage, and more. Their downfall comes from the lack of integration with other software, a critical aspect of creativity support. A common complaint, both from faculty and student participants, was the need for the software to work in the language of the designer in a seamless manner. The concept of computer technology tools and their ease of use was an important part of the research questions I formulated and the resulting data were quite helpful in contextualizing these results.
Composing artefacts and performances.

As with what-if tools, many software tools exist, for example word processors have developed into flexible tools that have become increasingly easy to use with many features that support the creative use of documents. There is, however, always room for improvement. Web-based, collaborative word processing software exists such as Google Docs, although few students took advantage of this specific software, and instead chose to work on different aspects of the final presentation document, and email their sections to one of the group who was responsible for putting it all together.

Reviewing and replaying session histories.

Reflection is a critical aspect of improvement, and necessary in the creative process. Producing histories of work can be difficult and requires involved software design to ensure that the results are not only comprehensible and useful, but easy to access and retrieve. The student participants did comment on the difficulty of retracing steps to find an original or earlier iteration of creative work, and that saving files, rather than overwriting them enabled them to do so.

Disseminating results.

Email, listservs, digital libraries, blogs and the Internet are all useful in disseminating results. Currently there are many systems in place where anyone looking for a product, whether it is a book or specific journals can register to participate in a discussion with a like-minded community. These online discussions groups can stimulate creative work and in fact this point was raised by one of the student participants who spoke of a fashion blog she visited often and how it was helpful in sharing her work and getting feedback.

Both the Communities of Practice and Genex frameworks were instrumental in informing the development of this study and in contextualizing the data that emerged from it. The latter, the Genex framework, (generator of excellence) built upon Csikszentmihalyi’s approach of supporting access to the domain and consultation with the Community of Practice however it delves into the ways in which computer technology can support collaboration through the use of Web-based services and
computer design software that supports creative endeavour. Thus while both frameworks connect, one is more likely to inform and assist in the analysis of the data focused on collaboration; the other more effective for the technological aspect of this study.

**Implications for Practice.**

Many of the conclusions I have drawn from this research align with the new set of skills identified by the University of Toronto’s Martin Prosperity Institute report by Martin and Florida (2009) “Ontario in the Creative Age,” which stresses the importance of students being prepared to take part in a culture of human creativity which is seen as the ultimate economic resource. The report emphasizes access to education and the importance of post secondary education in preparing students for knowledge and creative work and the need for them to have opportunities to acquire the core skills required for success in the creative age. They break these skills out into three main areas, (a) analytical skills, (b) social intelligence skills, and (c) physical skills. This need for these same skills also clearly emerged from this study, and are consistent with Martin and Florida’s report.

These skill areas take on a particular structure in the creative domain of fashion design. The analytical skills that were important in the creative process were the ability to think critically, to solve problems creatively, and to conduct research and locate workable ideas and samples to begin the creative process. Social intelligence skills were deemed critical in collaborating effectively with groups and teams. Learning how to communicate effectively with others, and to work together to develop better ideas and products was a critical component of collaboration. Finally, physical skills were also an important aspect of creative work, and this research project explored the critical need for skills (both manual and technological) within the domain of fashion to succeed in the field.

While it may be possible to identify the core skills necessary for the creative age; it is more of a challenge to determine effective ways to inculcate them in students. Concerns emerge at every level within educational institutions; introducing
creativity into the educational experience involves risk (Hargreaves 2007). Risk to students engenders fear, a major barrier to creativity. Students are often afraid of the unknown and of failure, and for some, engaging creatively might be a source of anxiety. Several student participants spoke about this risk in terms of too much freedom, lack of structure and fear of misunderstanding assignment requirements and, ultimately, receiving poor marks. Care needs to be taken when including unusual and creative strategies in the curriculum, especially when assessment is involved. Much research is clearly required here to develop a good understanding of effective ways to introduce creativity into the curriculum.

Risk from the teacher’s perspective may occur in relation to their lack of skills in incorporating pedagogically creative strategies and the need to have the courage to take on non-traditional teaching methods. Institutions risk their reputations if negative publicity occurs through the adoption of new creative instructional and or evaluative strategies.

As Hargreaves (2007) points out, there are many institutional restrictions that can serve to stifle any sort of move to incorporate new and creative approaches to teaching and learning. Institutions have responsibility for good governance, to offer value to their students, and above all, do no harm to them, “upholding these principles can stifle creativity and innovation ...this ‘duty of care’ can become a straightjacket which challenges any strategy that deviates from a tried and tested methodology” (para. 16). However sometimes sticking to these tried and tested approaches to teaching and learning may be a disservice to our students. Hill (2007) believes that the present education system retards the ability for students to create knowledge and Lundt and Wiles (as cited in Hill, 2007, para. 3) feel that even in the midst of accelerating social and technological change, “the paradigm for education has remained essentially static.” Many of today’s workers demonstrate a preference for collaboration, connectivity, instantaneity, and using technology in new ways and Rainie (2006) feels that we are leaving the knowledge age and entering the innovation age, and that universities should concentrate on developing critical and creative
thinking to facilitate the generation of knowledge and quotes some telling statistics to support this observation:

During their life, the typical 21 year old entering the workforce today has, on average, included 5,000 hours of video game playing, exchanged 250,000 emails, instant messages, and phone text messages, and 10,000 hours of mobile phone use. Add to that 3,500 hours of time online. This accelerated rate of change is causing disruption in how students learn, communicate and perceive the future. (para. 4)

Notwithstanding these challenges, ways can be found to incorporate creative approaches within the curriculum that add value to students’ learning, support them in creative endeavour, and help them pass safely through the learning experience with the requisite skills to compete in this creative age.

All of these issues have clear implications for curriculum design, and approaches to teaching and learning to support student creativity in fashion design and in other creative fields of study. Students need opportunities to develop critical thinking and problem solving skills, skills that are a critical part of the creative process. They need opportunities to work collaboratively with others, and they need the hard skills and a good solid knowledge of the tools of their profession in order to succeed.

Implications for curriculum design.

Hill (2007) suggests that creativity is the currency of the new millennium, and the schools should be an important partner in preparing students for the emerging needs of our economy. From that perspective, educational practitioners need to examine the ways that they approach designing curriculum, and use teaching and learning strategies that are effective in developing and supporting student creativity.

The results of this study as they relate to the role of curriculum design yield interesting implications foremost among which remain the issues of balance; both challenging students, while providing them with the freedom to explore, and at the same time providing sufficient direction with which to ground their work. Opportunities for critical thinking and problem solving were also important as was
working on meaningful projects. Faculty also need to ensure that students have the computer technology skills required to participate effectively as well as providing opportunities to work with others and collaborate on creative projects. Feedback, both from faculty and peers were also key components, and ways to incorporate this into the curriculum should be found.

Continuously building on existing skills needs to be balanced with opportunities for developing new ones and this is critical in the creative process—helping students to gain confidence in their skills and abilities, and rewarding the courage to try new and risky things in a safe environment are all challenges to curriculum designers, as is the choice of pedagogically sound teaching and learning strategies.

What does a creative course look like? Jackson and Shaw (2005) synthesized a number of studies and produced a list of the most common ideas academics associate with creativity and then went on to develop the following list of elements:

*Creativity as personal innovation* - something that is new to individuals. This is often about the transfer and adaptation of ideas from one context to another.

*Creativity as working at and across the boundaries of acceptability in specific contexts:* it involves exploring new territory and taking risks.

*Creativity as designs that promote the holistic idea of graduateness* - the capacity to connect and do things with what has been learnt and to utilize this knowledge to learn in other situations.

*Creativity as making sense out of complexity:* i.e. working with multiple, often conflicting factors, pressures, interests and constraints.

*Creativity as a process of narrative-making:* in order to present the ‘real curriculum’ in ways that conform to the regularly held expectations of how a curriculum should be framed.
In the above synthesis Jackson and Shaw have started the process of outlining the forms of variation that characterize academic conceptions of creativity. The following, based on a two part study conducted by Kleiman (2008) consists of an initial online questionnaire about the conception and experiences of creativity in learning and teaching in higher education, and a subsequent phenomenographic study which focused on the different ways in which individuals experience, perceive, apprehend, understand, and conceptualize creativity in learning and teaching.

Kleiman (2008) discusses his findings from a research project that set out to explore the variation in the way academics, across a range of arts, humanities and science disciplines, conceptualize their experience of creativity in relation to their pedagogic practice. He developed the following framework for understanding creativity in the context of learning and teaching. This framework has 5 elements, (a) a constraint-focused experience, a form of resistance to compliance and orthodoxy, (b) a process-focused experience, in which there are clear conceptual variants such as processes that lead to implicit outcomes and those that are not necessarily linked to any outcome, (c) a product-focused experience, based on the production of something new and original, or something in which novelty and originality combine with notions of utility and value, (d) a transformation-focused experience where creativity in learning and teaching is experienced as an engagement in a process that is transformative, and, finally (e) a fulfillment-focused experience where the experience of creativity is linked strongly to notions of personal and professional fulfillment. Table 26 explores these five categories in terms of their relationship to the data that emerged from this study as it pertains to understanding creativity within a teaching and learning perspective.

The following diagram is an emerging ‘outcome space’ that demonstrates the five key aspects that emerged from Kleiman’s research as discussed above, and which attempts to show the variations in the conceptions of creativity from my study and to depict those variations in a way that captures the fluid and complex nature of their relationships.
In Table 26, using Kleiman’s 5 categories, I have organized the implications of the data from my study as they relate to each of the 5 elements.
## Table 26

**Creativity in the context of learning and teaching: Five foci**

<table>
<thead>
<tr>
<th>Focus</th>
<th>Suggestions from the data</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Constraint-focused experience</strong></td>
<td>Constraints on faculty to enable student creativity</td>
</tr>
<tr>
<td>- Resistance to compliance</td>
<td>• Teaching no longer is creative for faculty who focus</td>
</tr>
<tr>
<td></td>
<td>who must focus on giving students tools to support</td>
</tr>
<tr>
<td></td>
<td>their own creativity</td>
</tr>
<tr>
<td></td>
<td>• Creative fulfilment comes from faculty’s own work</td>
</tr>
<tr>
<td></td>
<td>away from teaching</td>
</tr>
<tr>
<td></td>
<td>• Short period of time for class work - often restricted to</td>
</tr>
<tr>
<td></td>
<td>three hours per week</td>
</tr>
<tr>
<td></td>
<td>• Access to faculty is restricted due to workload</td>
</tr>
<tr>
<td><strong>Constraints on faculty to meet student expectations</strong></td>
<td>Constraints on faculty to meet student expectations</td>
</tr>
<tr>
<td></td>
<td>• The desire to be creative is tempered by concern</td>
</tr>
<tr>
<td></td>
<td>about possible consequences to students</td>
</tr>
<tr>
<td></td>
<td>• Students expect to be told what to do vs. having</td>
</tr>
<tr>
<td></td>
<td>freedom to explore</td>
</tr>
<tr>
<td></td>
<td>• Structure and approach to assignments</td>
</tr>
<tr>
<td><strong>Constraints on faculty to meet institutional expectations</strong></td>
<td>Constraints on faculty to meet institutional expectations</td>
</tr>
<tr>
<td></td>
<td>• New faculty feel the need to ‘go along’ with whatever</td>
</tr>
<tr>
<td></td>
<td>has been done in the past and avoid suggesting new</td>
</tr>
<tr>
<td></td>
<td>approaches hence desire to employ more technology</td>
</tr>
<tr>
<td></td>
<td>but deferring to traditional approaches</td>
</tr>
<tr>
<td></td>
<td>• Organizational culture/climate antithetical to change</td>
</tr>
<tr>
<td></td>
<td>• Access to technology - busy computer labs, different</td>
</tr>
<tr>
<td></td>
<td>equipment</td>
</tr>
<tr>
<td><strong>Process-focused experience</strong></td>
<td>Explicit outcomes liked to products</td>
</tr>
<tr>
<td>- Link (or not) to outcomes</td>
<td>• Student learning to produce something</td>
</tr>
<tr>
<td></td>
<td><strong>Implicit outcomes linked to learning</strong></td>
</tr>
<tr>
<td></td>
<td>• Student learning to develop understanding (process)</td>
</tr>
<tr>
<td></td>
<td>linked to intangible outcomes such as problem solving,</td>
</tr>
<tr>
<td></td>
<td>learning critical thinking skills</td>
</tr>
<tr>
<td>Product-focused experience</td>
<td>Production of something new and original</td>
</tr>
<tr>
<td>---------------------------</td>
<td>------------------------------------------</td>
</tr>
<tr>
<td>• Originality vs. utility</td>
<td>• A small portion of the fashion market focusing on promotional fashion for branding purposes - quite original but not of practical and saleable nature</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Transformation-focused experience</th>
<th>Creativity as desire to change (intrinsic motivation) or response to change (external motivation)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Engagement in transformative process</td>
<td>Process is transformative</td>
</tr>
<tr>
<td></td>
<td>Difficult for students who focus on marks/degree and lose sight of transformational experiences</td>
</tr>
<tr>
<td></td>
<td>Creativity as chance/serendipity aha moments but being able to exploit the opportunity</td>
</tr>
<tr>
<td></td>
<td>Need for risk taking and confidence</td>
</tr>
<tr>
<td></td>
<td>• Need to learn techniques first</td>
</tr>
<tr>
<td></td>
<td>• Freedom to take risks</td>
</tr>
<tr>
<td></td>
<td>• Willing to embrace disorientation</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fulfillment-focused experience</th>
<th>Creativity linked to notions of personal and professional fulfilment</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Personal and professional fulfilment</td>
<td>• Important element in the way academics experience creativity</td>
</tr>
<tr>
<td></td>
<td>• Trying out new teaching or assessment strategies that capture students imaginations</td>
</tr>
<tr>
<td></td>
<td>• Creativity involves personal commitment or investment</td>
</tr>
<tr>
<td></td>
<td>• Avoiding reusing things just because that’s always been the way things have been done</td>
</tr>
<tr>
<td></td>
<td>• Redesigning courses provides opportunities for creativity and fulfillment</td>
</tr>
</tbody>
</table>
Kleiman (2007) believes that the potential significance of these findings is that academics need to be perceived and involved as agents in their own and their student’s creativity rather than as deliverers of a creativity agenda. He goes on to say that the transformational power of creativity poses challenges on institutional settings that rely on compliance and constraint and challenges faculty to approach learning, teaching, and curriculum design as deep learning that challenges the student, and provides them with flexibility as they work on creative projects. Providing opportunities for collaboration are critical as well, as is the use of computer technologies in the creative process. Ultimately, according to Kleiman, a significant finding is that creativity is the means to an essential productive end, and “for those engaging in creative processes and producing creative outcomes is very much about personal and professional fulfilment, and escaping from or at least resisting the constraints and frustrations of daily academic life” (p. 215).

The data from my study also found faculty dealing with the institutional constraints surrounding the amount of time they have to work with students, and the need to closely follow tradition in terms of where and how they introduce technology in their curricula. They recognize and use collaborative activities in student work and are coming to realize the true value of technology not only to support collaborative activities but in the actual creative process as well.

**Implications for teaching.**

Nurturing creative productivity among college and university students can be problematic, according to Caridad Garcia-Cepero (2007) due to the fact that professors and instructors face many barriers to providing the type of instruction that will help to equip students with the skills they need in this new creative society. She feels that professors need access to tools that will help students develop high-end learning experiences that will foster interest and motivation, higher order thinking skills, and self-regulated learning. She adds that we need to acknowledge the student
as an active learner and the role of the instructor as mediator, based on Vygotsky’s (as cited by Kozulin, 2003) concept of mediated learning where the more experienced or competent instructor works with the student in his or her environment, selecting, changing, and interpreting objects and processes to facilitate the learning process of the student.

Hill (2007) suggests problem solving and creative thinking should be at the centre of any curriculum to educate students for life; not just for the next event—new curriculum must be developed to achieve optimum behaviour in mind capital and knowledge creation. Texas A & M University recognizes that human creativity is now powering the global economy and that universities need to prepare students for this new creative economy. Martin and Florida of the Martin Prosperity Institute, at the University of Toronto’s Rotman School of Business came to the same conclusion in the report commissioned by Premier Dalton McGuinty of the Ontario provincial government entitled Ontario in the Creative Age pointing out the need for strengthening creativity skills through education. They say that:

We must develop a broad education system—curricula, subject matter, and teaching styles that encourages creativity and cultivates both the analytical and social intelligence skills we need to compete at the frontier of the creative age. (Martin & Florida, 2009, p. 32)

High order learning occurs in authentic settings, which allows students to work on activities that are related to real problems that are meaningful to them, where the problems can be solved in a multitude of ways, and is conducive to developing critical thinking and problem solving skills that are critical to the creative process. This was particularly well done in the case of the major assignment that was the basis for the case study employed in this thesis. Students were working on ideas and products for a real organization in the fashion industry and this project provided them with opportunities to explore the entire gamut of the creative process within the domain of fashion design, from research, to design creation, through to developing and presenting a comprehensive marketing plan.
Caridad Garcia-Cepero (2007) stress that educational strategies such as lecture and direct instruction rarely engage students, based as they are on memorization and repetition, “seldom propelling the development of higher-order knowledge and creative skills” and she further feels that these practices may be “so restrictive, convergent, and repetitive that students’ creative productivity can actually decrease” (para. 17). She goes on to add:

If universities are interested in developing motivation and engagement, more knowledge, higher thinking skills, creative productivity ... higher education should include high-end learning and creative productivity experiences. (para. 18)

However, often students need to have critical thinking skills so important in the creative process modelled for them before they are able to actively engage in this process. Ways to achieve modelling need to be developed as an instructional strategy along with facilitating the development of skills in problem solving and working collaboratively. This is where the teacher serves as coach and mentor to the student. The teacher does not, however, abandon the student once these skills are developed but continues in the role of facilitator or mediator and is available and responsible for providing feedback and support. The participants in this study found that ongoing access to faculty feedback throughout the creative project was critical to their success. I also found that the student participants also felt that peer feedback was valuable. Providing opportunities for effective critique then would be a valuable instructional strategy in support of creative work.

As the student begins to develop in confidence with his or her critical thinking, reflection, and problem solving, the teacher as coach and mentor can then continue to challenge students to push to new levels, while ensuring that they are gaining as well in the manual and technological skills they will require in the creative process and in their creative domain. Foxell and Mitchell (2008) put it thus: “the ability to problem-solve and cope with a fast changing world may become highly prized, the ability to teach this even more so” (p. 4).
Implications for learning.

Once students have been introduced to and have had a chance to learn and develop analytical skills such as critical thinking, and effective problem solving they need opportunities to practice and further hone these skills along with opportunities to develop effective collaborative skills, and to have sufficient opportunities to practice and become effective in their use of computer technologies and become proficient in the manual and or technological skills of the creative domain in which they work.

Students need to bring to their learning experiences the willingness to challenge themselves and partner with teachers in finding ways to overcome the risk and subsequent fear inherent in creative work. As Hargreaves (2007) points out, the major barrier to creativity is fear—of the unknown, of ridicule, and of failure. Students invest a great deal of time, effort, and money into their course work, and need to be reassured that unpredictable creative ventures will be sufficiently rewarded.

Limitations to the Study

A potential limitation that applies to the research methodology (qualitative and quantitative) was the specific focus of the group of participants who took part in this research. The fact that they were students and faculty from a School of Fashion at an urban university would suggest that their perception of creativity would be aligned with the fashion industry and its unique position in the creative world. I clearly recognized that the fashion design and fashion communications participants would respond to interviews and questionnaires framing responses within that context. As well, the homogeneity of the participants would have a distinct impact on the results of this study; each student participant was an English speaking, white Canadian female, between the ages of 18 to 25. I might also suggest that there is also the possibility that their generational span might have some reflection on their technological abilities. Further limitations to this study are the fact that detailed background information on educational and technology-related experiences of the
participants was not gathered and shared in this study. While this may have allowed me to draw important conclusions about the relationships between certain experiences and characteristics and views on creativity, gathering and sharing this information could have identified the faculty members who took part in this study and compromised the confidentiality I have guaranteed them as participants in this study. Accordingly, I chose not to collect those data.

Potential limitations to the qualitative methods include the data collected by interviews due to the small number of participants interviewed; however the data collected constitutes rich data in terms of verbatim transcript analysis. The number of students who took part in the questionnaire was substantial relative to the population and care was taken to develop questions that emerged from the student interviews and to ask similar questions but in different ways.

Through the use of a mixed methods design, I had attempted to test out whether a larger and different group of students would support the earlier qualitative findings from the personal interviews and care was taken to frame these questions without researcher bias. When the qualitative data was analysed, I took care to approach it with a systematic approach, trying to avoid framing the results into my own framework and to consider alternative explanations for these results.

Finally, it must be pointed out that student perspectives are only one lens through which to look at and understand the ways in which collaboration and technology support creative work and a single data source lens can limit interpretations of the data and may not support an understanding of more complex and broader questions about the nature of the relationship between technology and creativity. Having the opportunity to draw on further sources of data such as observations may have supported being able to draw more extensive conclusions. However, the constraints of the program and data collection opportunities made the collection of observation data impossible.

Although I based my approach to this research on Creswell and Plano Clark’s (2007) case study structure which included observations however after two or so sessions in the computer labs scheduled for the course, virtually all students chose to
take advantage of the benefits of computer technology and did not return to class, instead relying upon various computer technologies to solicit developmental feedback from the course professor and other technology solutions for collaboration with their group members.

**Directions for Future Research**

Although the data that emerged from this study would indicate that technology is a vital and critical support for creative endeavour, we need to learn more about the use of technology in the creative process. Although this research study found that participants clearly believed technology changed the creative process, and the final product, they were only able to articulate this at a superficial level, pointing to benefits such as speeding up the process, replacing weak manual skills, and producing more professional appearing work. Looking further at how technology affects the creative process, for instance at a more fundamental level would be of benefit. Further research would be worthwhile in this area, particularly since the use of technology in all venues of education and creative work is becoming increasingly common.

Another important aspect of future research would be in looking at the various ways curriculum designers can incorporate pedagogical strategies to foster creativity into course design, and evaluating the instructional strategies they choose to employ. Having the courage to try new creative instructional methodologies needs to be weighed against some sort of empirical research on what works, and what does not.

We need to research and develop authentic assessment mechanisms that help alleviate fears of the unknown that students may experience in creative endeavour sand find ways to reward the process, perhaps and not only the final product.

Finally, following Hargreaves (2007) creative activities in learning contexts needs to be risk assessed and managed sufficiently to ensure student success and safety, and a great deal of further research is needed in this important area of creativity support in the field of education.
References


Blum, K., & Muirhead, B. (2005). The right horse and harness to pull the carriage: Teaching online doctoral students about literature reviews, qualitative and quantitative methods that drive the problem. *International Journal of Instructional Technology and Distance Learning, 2*(2), 29-45.


Appendix A
Letter of Introduction (Students)

Dear design student:

I am writing to invite you to participate in a research project I am currently conducting, exploring the value of technology and technology tools in the creative process. I am a Ph.D. candidate at the University of Toronto and I have been working with one of your School of Fashion professors, exploring creativity and technology.

Your involvement and feedback would be greatly appreciated and will help to further our understanding of the learner’s perspective about the use of technology in supporting collaborative, creative work. Not only will your participation and the results that emerge from this study help to inform the developing interest in technology tools for creative work but will also help to inform your professors and the administration about how students perceive technology and how to employ it best to suit your ends.

Should you decide to take part in this study, you will be asked to take part in a brief, online survey at the outset of your semester, participate in a video-taped focus group, and then volunteer to participate in a personal recorded interview with the researcher at the end of the semester. I recognize that taking time out from your busy schedules can be difficult and I am willing to offer as incentive, a draw of four $25.00 gift certificates for participating in the initial online questionnaire, and a draw for an iPod for any of those who volunteer to take part in the focus group and personal interviews.

There is a paucity of research on the topic of technological supports for creative innovation and results from this study will be used to further our understanding of the use of technology for students working on creative innovation. Results from this study will form the main body of the researcher’s doctoral dissertation and may also be disseminated in academic journals and at conference presentations. Participating in this study is entirely voluntary, and those who choose not to participate will not experience negative consequences. Should you volunteer to participate, you will be asked to sign an Informed consent Form acknowledging your willingness to take part.

Upon completion of this study a copy of the results can be made available to you should you be interested. Any other questions concerning this study in general can be forwarded to Julie Dixon at 905.271.6495 or by email at jdixon@oise.utoronto.ca. Additionally, concerns about your involvement in the study may also be directed to the Research Ethics officer at OISE, UofT, or the Research Ethics officer at XXXXXXX University.

Thank you for your interest and involvement in this study.
Regards,

Julie S. Dixon, Ph. D (Candidate)
Appendix B
Letter of Introduction (Professors)

Dear Professor:

I am writing to ask your support in encouraging your students to take part in a research project I am currently conducting, with the approval of the University of Toronto and XXXXX University exploring the value of technology and technology tools in the creative process. I am a Ph.D. candidate at the University of Toronto and I have been working with one of your School of Fashion professors, XXXXXXXXXXXXXXX, exploring creativity and technology. Ms. XXXXX will also act as an onsite liaison, should you wish to discuss this in more detail.

This research is focused on exploring the efficacy of technology tools in supporting collaborative, creative work. I am asking your willingness to support this work and to invite your learners to take part in these activities. Should your students decide to take part in this study, they will be asked to take part in a brief, online survey at the outset of your semester, participate in a videotaped focus group, and then volunteer to participate in a personal recorded interview with the researcher at the end of the semester. I plan to offer them incentives for taking part including draws for gift certificates and another draw for an iPod.

There is a paucity of research on the topic of technological supports for creative innovation and results from this study will be used to further our understanding of the use of technology for students working on creative innovation. Encouraging your students to take part and the resulting knowledge gained from this study will help to inform the developing interest in technology tools for creative work and will also help to inform you and your colleagues about students perception of technology and how to employ it to facilitate their creative work.

Results from this study will form the main body of my doctoral dissertation and may also be disseminated in academic journals and at conference presentations. I have made it clear that participating in this study is entirely voluntary, and those who choose not to participate will not experience negative consequences, and students who volunteer will be asked to sign an Informed consent Form acknowledging their willingness to take part.

Upon completion of this study a copy of the results can be made available to you should you be interested. Any other questions concerning this study in general can be forwarded to Julie Dixon at 905.271.6495 or by email at jdixon@oise.utoronto.ca. Additionally, concerns about your involvement in the study may also be directed to the Research Ethics officer at OISE, UofT or the Research Ethics officer at XXXXXX University.
Thank you for your interest and involvement in this study.

Regards,

Julie S. Dixon, Ph. D (Candidate)
Appendix C
Information Letter and Informed Consent Form

Creativity-Technology Study
Information Letter & Informed Consent Form

Title of Study: Connecting creativity, technology and communities of practice: Exploring the efficacy of technological tools in support of creative innovation.

Principal Researcher: Julie Dixon

Dear Design Student:

I am a doctoral candidate at the Ontario Institute for Studies in Education at the University of Toronto and I am inviting you to take part in my doctoral research, which focuses on technology, community and creativity. The goal of this study is to develop a clearer understanding of the ways that technology supports creativity and to help inform the major portion of my doctoral research. You are being invited into the research process because of your experience as a design student and your upcoming experiences using technology to collaborate in the design process. Your participation would involve -

- Taking part in a personal interview (estimated time ½ hour - 45 minutes)
- Responding to an online questionnaire (estimated time 20 minutes)

Participating as above may constitute the extent of your involvement in my research however, should you wish to do so, you might also choose to take part in a focus group discussion which will be scheduled to take place after the personal interviews.

Taking part in this research will add to your institutions and the academic community in general's developing understanding of the ways in which technology supports creative practice as well as an opportunity to look at the impact of technology on the creative process.

Information regarding your participation in this study
- I have been given and have read the Information Letter provided by the principal researcher
- I understand that this study in which I have agreed to participate will involve my taking part in a personal interview with the researcher and completing an online survey. It may also involve taking part in a focus group session.
I understand that my involvement will take place during the period of one semester.

I understand that my participation will in no way risk my experience as a student at XXXXXXX University and that participation is entirely voluntary and that I may withdraw from the study at any time and for any reason without penalty.

I understand that there is no obligation to answer any question that I feel is invasive, offensive or inappropriate.

There are no reasonably foreseeable risks, harms or inconveniences to participants.

I understand that there will be no payment for my participation other than the chance of winning through a random draw one iPod.

I understand that all personal information will be kept strictly confidential and that my responses will be coded so that the name of the organization, faculty, course, and my name will not be associated with any of my answers. My identity will remain completely anonymous and confidential, including all reporting of results in the authors dissertation, in scholarly publications, or in conference presentations.

I understand that the principal researcher is the only individual with access to my data, and will maintain my name and data in separate and safe locations, and that this data will be destroyed within one year.

I understand that the results of this study will be part of the researchers Ph.D. dissertation and otherwise may be distributed in full or part in academic journal articles and conference presentations and that a summary of the results will be made available to XXXXXXX University as well as any participants in the study who indicate an interest in receiving such information.

As indicated by my signature below, I acknowledge that I am participating freely and willingly and I am providing my consent.

If you have any questions, require further information, or at a later time wish to withdraw from this study, please feel free to contact either of the following:

Julie Dixon 905.271.6495 jdixon@oise.utoronto.ca
Dr. Clare Brett 416.923.6641 x2596 cbrett@oise.utoronto.ca
Should you wish to receive a summary of the results of this study, they will be available in June of 2008. Please contact Julie Dixon at 905.271.6495 or jdixon@oise.utoronto.ca

Thank you for considering taking part in this study. Should you wish to volunteer your participation will be greatly appreciate and might help to improve the creative experiences of future students as well as inform the academic community in general.

If you have any questions or concerns about your participation in this study, you may contact Julie Dixon at 905.271.6495 or by email at jdixon@oise.utoronto.ca or through the Research Ethics departments at University of Toronto or XXXXXX University as noted here.

This study has been reviewed and approved by University of Toronto Research Ethics Board 416.946.3273 reference number 21631 and XXXXXX University Research Ethics Board 416.979.5000 reference number REB 2007-157. Your signature below indicates that you have had an opportunity to review the document and any questions or concerns have been addressed to your satisfaction, and that you also acknowledge receipt of a copy of this consent form.

Informed Consent Form

Name of participant: ___________________________________________ (Please print)

I also volunteer to take part in a focus group discussion:

☐ YES

☐ NO

Signature ________________________________ Date _________________

Email address ________________________________
Appendix D
Interview Questions for Students

Creativity
• What is creativity - can you define it?
• What makes something a ‘creative’ work
• Who decides something is creative
• How does creativity happen - where does it start, how does it flow?
• Could you speculate on skills that might be necessary to be creative?
• Do you think your teachers are creative in their curriculum design?

Collaboration
• Do you feel collaboration/group work is important in the creative process?
• Do you see creativity as an individual or collaborative thing
• Are you asked to work collaboratively very often in your course work?
• Effectiveness of developing new ideas
• Importance of receiving feedback from peers and professors
• Overall perception of the importance of collaboration in creative work
• What benefits, if any, do you believe you gain working collaboratively

Technology
• How effective is computer technology in supporting collaboration
• Use as a repository of ideas, models, templates, etc. ie not having to recreate
  the wheel over and over
• How was your sense of using technology in your recent creative work?
• Overall perception of the value of technology in creative work
• Are you generally comfortable using computers and computer software?
• Where do computers and computer technology belong in the creative process?
• Do you feel that the way curriculum is designed helps to foster or support your creativity?
• What benefit, if any, do you believe you gain by using technology
Appendix E
Interview Questions for Faculty

Creativity

• How would you define creativity?
• Where does it start and how does it flow?
• What makes something creative and how do you go about assessing it?
• Are there specific skills required in being creative?
• Can you teach people to be more creative or do anything to help foster this ability?
• Do you see your curriculum as exemplifying a creative approach to design and helping students be creative?

Collaboration

• Do you feel collaboration is an important part of the creative process?
• Do you see creativity as an individual or collaborative thing?
• Do you ask your students to work collaboratively?
• If so, how do you group them together?
• How do you usually see them work in groups, i.e. divide up the work or work on all aspects together?
• How important is it for your students to receive feedback from peers or faculty?
• What do you see as the benefit for having students collaborate?

Technology

• Please comment on your perspective of the effectiveness of technology in supporting collaboration
• Do you see it as a repository of ideas, models, templates etc. or as a full partner in the creative process?
• How do you generally see students using technology in their creative work?
• Has this changed over the years?
• Do you think they would like to use technology more or less than they currently do?
• Are you comfortable with all the technological supports your students use?
• What do you see as the benefit of using technology?
Appendix F
Written permission from Sage Publications

From: Hutchinson, Adele [Adele.Hutchinson@sagepub.com] on behalf of Permissions (US) [permissions@sagepub.com]
Sent: June-18-09 1:09 PM
To: jdixonc543@rogers.com
Subject: Permission for use of table

Dear Ms. Dixon,
Thank you for your request. Please consider this written permission to use the material detailed below in your dissertation. Proper attribution to the original source should be included. This permission does not include any 3rd party material found within the work. Please contact us for any future usage or publication of your dissertation.

Best,
Adele

From: Julie Dixon [mailto:jdixonc543@rogers.com]
Sent: Wednesday, June 17, 2009 9:24 AM
To: order@sagepub.com
Subject: Permission for use of table

I am writing to seek permission to reproduce a table found in Creswell and Plano Clarks (2007) Designing and conducting mixed methods research, found on page 148. This table would be employed in my doctoral dissertation.

Julie Dixon, Ph.D. (Candidate)
OISE University of Toronto
Appendix G
Written permission from G. Fischer

From: Gerhard Fischer [gerhard_l3d@hotmail.com]
Sent: June-17-09 12:29 PM
To: jdixonc543@rogers.com
Subject: RE: Requesting permission for use of tables

Hi Julie,

Sure: you have my permission!

I am always glad if people find my work useful!

Please send me a copy of your dissertation when you are done!

Cheers

Gerhard

From: jdixonc543@rogers.com
To: gerhard@l3d.cs.colorado.edu
Subject: Requesting permission for use of tables
Date: Wed, 17 Jun 2009 11:53:31 -0400

I am requesting permission to reprint one of your tables from the article: Social creativity: Turning barriers into opportunities for collaborative design, from your papers table 1: Overview of barriers in which you discuss the spatial, temporal conceptual and technological barriers

And

Published in the Int. J. Human-Computer Studies 63(2005) table 1 Differentiating Communities of Practice and Communities of Interest on p. 489.

I am a Ph.D. Candidate at the University of Toronto, and these tables would be used in my doctoral dissertation in which I am exploring the ways that technology can support collaboration and creative design.

Your work has been quite helpful in starting me off on my exploration of this topic.

Julie Dixon,
PhD. (Candidate)
OISE, University of Toronto
Appendix H

Written permission from P. Kleiman

-----Original Message-----
From: Kleiman, Paul [mailto:p.kleiman@lancaster.ac.uk]
Sent: July-14-10 10:36 AM
To: Julie Dixon
Subject: RE: Permission to use a diagram of yours

Dear Julie,

Of course you are very welcome to use the diagram, and thank you for asking.

You may not be aware that my paper and the same diagram (although in rather boring black and white rather than colour), along with a number of other papers from the conference are in a special edition of the peer-reviewed journal Innovations in Education and Teaching International, Vol. 45, No. 3, August 2008, 209 - 217. The diagram is on page 211.

That may provide a better reference for your purposes.

Here's a link to the journal:

http://www.tandf.co.uk/journals/routledge/14703297.html

Note that the title of the paper has changed to 'Towards Transformation: conceptions of creativity in higher education' otherwise it's essentially the same.

Good luck with your PhD.

Best wishes

Paul
* * * * * * * * * * * * * *
Dr. Paul Kleiman
Deputy Director
PALATINE
Hi Paul, I am writing to seek permission to reproduce a diagram you developed in your article "Thinking, Making, Doing, Solving, Dreaming: Conceptions of creativity in learning and teaching in higher education" part of the Creativity or Conformity? Building Cultures of Creativity in Higher Education (Cardiff January 8-10,2007). It is the conceptual map (Diagram 1: Conceptual map of creativity in learning and teaching.

This diagram would be included in my doctoral dissertation.

Julie S. Dixon Ph.D. (Candidate)

OISE, University of Toronto
Appendix I

Samples of presentation boards