Exploring students' course-related communication behaviour outside of postsecondary classrooms

Adnan A. Qayyum

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Abstract

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Adnan Qayyum, Ph.D.
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Students interact with peers and instructors for course purposes both within and outside of class spaces. This study explored how post-secondary students communicate outside of class for course purposes, and how they use information and communication technologies (ICTs) to do so.

Sixty-nine students were interviewed during a qualitative pilot study to explore their communication and study patterns outside of class. Pilot results were used to create a survey.

Survey results (N=438) indicated six factors motivated students to communicate with peers and instructors outside of class for course purposes: students' perceived usefulness of their peers; trust of peers; their perception of instructors; preference to work independently; overall perception of the course; and, perceived threat (i.e. sense of vulnerability about their ability). Perceived threat, perception of instructors, and students' preference to work independently were significant in predicting whether students turned to instructors outside of class. These findings reinforce and advance existing research on students' formal help-seeking behaviour.

Students communicated with peers and instructors both in person and via ICTs. However, it was difficult to associate ICT preference with generation. There was no significant difference between the Net Generation and non-Net Generation in their use of email to communicate with peers for course purposes. There were significant differences between generations in how often they used instant messaging, text message, Facebook and WebCT when communicating with peers for course purposes. There were also significant differences between how often the two groups talked with peers in person and via phone for course purposes. The uneven results and small effect sizes suggest generation may not be a strong nor consistent variable for understanding students' ICT use in education.

Finally, results indicated students used institutionally provided ICTs, such email and WebCT, far less than commonly available ICTs, such as personal email accounts, instant messaging and text messaging when communicating with peers of their own volition.

The findings suggest that educators need to better understand the social dynamics by which students communicate and use ICTs, in order to inform policies and decisions.

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When I began at Concordia I was a single student with a Masters degree. Five years on, I am married with two joyful children, a third on the way, and a doctorate. So this is for Humera, who makes it all possible.

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Chapter 1: Introduction

The purpose of this study was to research student interaction patterns outside of class with the goal of helping instructional designers and educational planners make decisions about how to support student learning. The general subject of this study emerged from personal experience. I was teaching a "technology in education" graduate course when a student indicated she had not taken a course, or even had a single class, fully online. Many other students added that they, too, had not taken a course online. It was agreed we would hold a class fully online using Elluminate Live, a synchronous conferencing software that allowed for real-time meeting and discussion. The software included a shared whiteboard space, one-to-many audio and video tools, a text chat forum, icons for students to raise their hands to "clap" or ask questions, and a real-time polling feature. The week before the online class, an orientation session was held with all students in a computer lab so they could become familiar with basic features and navigation of the software.

The course was a seminar, and each class session involved one or two students presenting a summary of readings each week. The summaries were a launching point for the class discussion and, sometimes, for the hands-on activities in the computer lab. This format was retained for the fully online class. Two students led the discussion using the one-to-many audio feature. (Video required more bandwidth than some students could access from their home connections). The two presenters posted PowerPoint slides on the Elluminate whiteboard space for others to view on their monitors. All students were in

remote locations, except for the two presenters who facilitated the class from a computer on campus. Fearing technical glitches, they thought it would be easiest to work together in the same place on campus. During class, they presented their reading summaries. Other students asked presenters a few questions. Students also asked each other several questions in the text chat forum. The topics of the week were covered in detail.

A debrief was held the following week, back in the classroom. Some comments were expected: "it was nice to not have to come to campus"; "I missed seeing see other people's gestures"; "I enjoyed learning the software". All of these are familiar responses that are well-documented in education technology literature, broadly conceived. (See Keegan (1980) and UNESCO (2002) for literature on the access that technology-based education provides. For research on physical gestures and technology-based education, see Dale (1946) and Swan (2002). See Clark (2006) and Johnson (2005) about the importance of learning software while using software). Then, came some less expected comments.

"I couldn't follow the presentation because it just seemed like too much information" said one student. "It required a lot of concentration".

"It was different than in the classroom," stated another student. "I didn't take notes. Honestly, I didn't pay very much attention." When asked why, the student responded, "Well, I checked email and the web while listening to the presentations. Because that's what I do when I'm online. That's how I am on the Net. I do a lot of things at once."

One student-presenter acknowledged he found the learning environment difficult because there were no cues from others indicating whether they were engaged or even listening to what he said. "I felt like I was speaking into a black hole. I got no feedback so I kept going with my presentation. I was busy so I only checked the text chat box from the corner of my eye now and then." He was right. There was little feedback from students, even using interaction features such as hand-raising and hand-clapping icons. Most students participated infrequently in the text-based chat box, and when asked by the presenters or me to provide feedback.

When the class was asked about this, one student commented: "I talked and chatted less because there was no social dynamic during class. I felt everything we said had to have a reason. I'd have said even less in the discussion if I didn't know the people beforehand. Because even knowing them, I didn't feel as connected to the group. There was no before and after class interaction, no out of class interaction. It was a different experience."

Leaving the classroom, entering the hallway

That is the starting point for this research: how students interact before and after class and outside of class. The people and, generally speaking, the subject matter was the same for the online class as in the classroom. But students' interactions differed, affecting their dynamics and perhaps their learning.

This experience led to many questions about student interaction: why do students interact outside of class, not for social purposes, but to help themselves learn in their courses?; how do students interact outside of class; what role do information and communication technologies (ICTs) play in this interaction; is student interaction with others outside of class a signal of an important factor in their learning, or just noise?; does it improve their academic performance?

At a general level it seems obvious that there may be a relationship between what and how students learn out-of-class, to what they learn in courses. The student, in the story above, hinted that the time before and after class, in hallways and social places, are important interstitial times and spaces where students can learn in their interactions with others. Senior decision-makers and researchers (i.e. campus planners, educational economists) in post-secondary institutions have recognized for a long time that student interaction throughout campus may be important for learning. They analyze education at a campus-wide level. Educational economists, for example, speak of education as a customer-input service. The quality of the output (i.e. learning) partly depends on customer inputs (i.e. other students). So, for example, one reason students are selected by institutions is that they will influence the learning of their peers. Hopefully, "good fellow students will lead to better learning than poor fellow students", (Winston, 1998, p.5). To support and foster this "peer effect" on student learning, institutional resources exist to support student interaction with others outside of classrooms.

Many senior decision-makers and planners in post-secondary institutions have historically created classroom and non-classroom spaces for students to gather, socialize, work and learn with their peers. In the 1990s interaction in these spaces became strongly associated with ICTs. As is often the case, new technologies render familiar practices strange. With the growth of the internet, student interaction habits became a focal topic. Campus planners worried about campus learning and social spaces becoming archaic. ICTs afforded students the opportunity to, in the common catchphrase of the era, "learn anytime, anywhere". This partly referred to learning online from any location. It also meant accessing online resources from anywhere –home, work, campus. Internet growth stoked a discussion about where students learn and could learn. Senior decision-makers were being asked if they were allowing students to access technologies that allowed for ubiquitous "anytime, anywhere" learning opportunities. Combined with the larger dot-com hype of the 1990s, the discussion soon concentrated on ICT provisions: what type of ICTs should be provided to students and where, so they could learn anytime, anywhere? Educators worried about falling behind technologically (Bates, 2000, p.18). In formal learning spaces, this resulted in the drive to create "connected classrooms".

Some planners, though, questioned if it was adequate to provide online access only in classrooms, computer labs and libraries. They argued that social gathering spaces and hallways were also important spaces of student interaction and learning (Brown & Lippincott, 2003, p.14). They even suggested that more learning takes place outside of class than ever before. Though these were anecdotal arguments not based on supporting research, they had some impact. Eventually, most Canadian post-secondary institutions

provided online access throughout campus –classrooms, libraries, hallways, social gathering spaces. This was due to various reasons, including advances in wireless communication that made it more cost-effective to provide wireless access than installing Ethernet or other landline connections.

Some institutions went further than providing campus-wide online access. They also created specific gathering spaces with online access in order to foster student interaction. Sometimes these were new spaces and other times they were library spaces transformed. Often they were called "learning commons" or a similar name, for students to gather, socialize and study (Brown, 2005; Moore, 2007).

Ubiquitous ICT access and even learning commons were seen as not just nice but necessary for learning (Brown & Lippincott, 2003). These were also anecdotal and at times speculative arguments that ICTs were changing how students learn and what they needed to learn. Decisions and investments have been and continue to be made about non-classroom spaces, and ICT provisions for these spaces (Moore, 2007). Yet, it is unclear how and why students interact outside of class, and whether and how it relates to in-class learning. One still finds educational planners and policymakers advocating for more investments in these spaces at forums like EDUCAUSE (Johnson & Lomas, 2005; EDUCAUSE Proceedings, 2005). This then, is why it may be useful to study student interactions outside of class. The results of the study will hopefully provide educational planners and instructional designers with insight about how to support student interaction and communication in social spaces in ways that can help students in their courses.

With the goal of moving outside the classroom, the working image for this research is the Buddhist metaphor of the wheel. A wheel is made of a rim and a hub connected by spokes. In Buddhism, they speak of the spaces in between the spokes as also being an important part of the wheel. A goal of this study is to explore student dynamics between the spokes, their interaction habits before and after class, in hallways and social spaces, as it relates to courses.

In looking between the spokes, this study is part of a larger educational trend of studying learning environments, more broadly conceived rather than just looking at what occurs in class. Most formal learning environments involve relationships with classmates and instructors, relationships that do not stop in the classroom. This social aspect of learning environments is increasingly acknowledged in educational technology research (Winn 2002, p.339).

Focusing the research

The primary purpose of this research, then, was to describe student-generated interaction outside of class, as the interactions relate to courses. A literature review was conducted to determine what research had already been conducted on this topic, where there may be important gaps in existing research, and indeed, if this was a topic worth exploring at all. The literature review is the focus of the next chapter.

Chapter 2: Literature Review

In this chapter existing research is reviewed on student interactions with peers and instructors. The literature review was used to clarify which topics to research further and to develop specific research questions. At the outset, two research problems were of interest. First, do students communicate with others outside of class for course purposes? If so, why? Second, do students' communication behaviours outside of class differ according to generation? These were the topics of the literature review.

Literature review process

Identifying Keywords and Terms

Keywords and terms were used to search for these topics in existing literature. Identifying keywords was an iterative process. At the outset of the literature review the net was cast broadly. An initial search on the Educational Resources Information Center database (ERIC) using the word "interaction" yielded over 35,000 results. It was necessary to parse how the term "interaction" is used in education. Educators usually identify four to five kinds of interaction that can affect how and what students learn. Interaction between a student and course content, between a student and instructor, and between a student and peers are commonly accepted (Moore & Kearsley, 1995; Pratt, 1998). Some researchers have argued the interaction between a student and the artifacts in her learning environment are also important (Salomon & Perkins, 1998; Young, 2004). More recently, educational designers have argued learner-interface interaction is important for learning (Hill et al., 2004, p.435). The interest in this study was on the second and third type of interaction, between students and instructors and among

students. There are two types of student interaction: that which is instructor-generated and required, and that which is student-generated. Student-generated interaction was the focus of this study. (Admittedly, student-generated interaction can be informed by other interactions, such as a student's interaction with course content). Thus, the following keywords were searched: student-generated interaction (and synonyms such as student-driven interaction, student-initiated communication); interaction outside the classroom (and synonyms such as student communication outside the classrooms, students' hallway communication, learning outside the classroom).

For the second topic the following keywords were searched: generations and ICTs (and synonyms like generations and IT use, generations and educational technology, etc); digital natives, digital immigrants, Net Generation and Millennial Learners.

Sources searched

These terms were searched on databases and prominent educational journals, particularly those focusing on educational technology. Databases included ERIC and PsychInfo. Journals included *Review of Educational Research*, *Educational Researcher*, *Contemporary Educational Psychology*, the *American Educational Research Journal*, *Educational Technology Research and Development*, the *British Journal of Educational Technology*, the *Canadian Journal of Learning Technology*, *Distance Education*, the *American Journal of Distance Education* and *Journal of Distance Education*. Journal articles were searched from the year 2000 to 2008. After this search, the bibliographies of relevant journal articles were perused for other titles and keywords that seemed

relevant to the research topics. From these sources additional keywords seemed important and were searched. These included peer trust, peer support (and the synonym classmate support), peer usefulness (and the synonym peer benefits) and peer learning.

Search results

Student-generated interaction

The titles and abstracts of several hundred articles were read to examine if they were relevant to either of the two research topics. For the first topic the search yielded numerous studies on student-generated interaction and peer dynamics. But most of these focused on interaction inside the classroom. For example, there were studies on student-generated questions within classes (Colbert et al., 2007), on student-generated content using ICT tools such as wikis (Wheeler et al., 2008) and students' optional assessment of their classmates work (Xiao & Lucking, 2008). However, these were all focused on dynamics occurring at the behest of the instructor and usually in classrooms. Even research on peer dynamics was classroom focused. Topping (2005) provides an overview of research on peer support. Most of the focus is on tutoring, mentoring and cooperative learning inside the classroom. The same focus is evident in a meta-analysis of peer learning conducted by Ginsburg-Block et al. (2006). It quickly became apparent that the main sieve for reviewing literature on this topic would be whether the article or book was about what occurred outside of class.

There was some research about student-generated communication outside of class but they were about topics like youth culture and bullying (e.g. Anderson & Swiatowy,

2008). Few were about interaction as it related to courses or classroom demands. However, using the keyword search "learning outside the classroom" led to useful overlapping research under the general topic of "informal learning".

Informal learning is an elusive concept. It is quite vogue currently and seems to be used to describe a wide-range of learning activities including: on-the-job learning; networking and mentoring in workplaces; learning at museums; organizational learning; incidental learning; and online resources used by students to support their classroom learning. However, the term is not recent. Decades ago Mocker and Spear (in Lowry, 2002) created a useful matrix to parse informal learning from other related terms (see Table 1).

Table 1: Differentiating formal, informal, non-formal and self-directed learning

CONTROL OF MEANS/ OBJECTIVES	INSTITUTION	LEARNER
INSTITUTION	Formal	Non-formal
LEARNER	Informal	Self-directed

The matrix is based on who controls the decisions about the objectives and means of learning. In formal learning, the institution controls the objectives and means of learning. Training and classroom education are considered formal learning. In informal learning, the institution controls the objectives but the learner controls the means. With non-formal learning, the learner controls the objectives but the institution controls the means. Learning in museums might be considered non-formal learning (see for example, Carliner, 2001). Finally, in self-directed learning, the learner controls the means and

objectives of learning. An example of self-directed learning might include a graduate student surfing the internet to learn about how to address his infant's ear infection. This matrix is quite useful for clarifying phenomenon on students' course-related work outside of class. Here, the instructor (i.e. institutional representative) sets objectives. However, both instructors and students decide on the means of achieving these objectives. Thus, this research can partly be considered informal learning.

Within the body of informal learning research there are two streams relevant for this study: workplace informal learning, and academic help-seeking. Most search results on informal learning originated from the fields of workplace learning and performance improvement. The studies focus on how people learned for objectives determined by the organization and also determined by themselves to meet organizational needs.

Cheetham and Chivers (2005) have the most extensive research on informal learning in the workplace. They studied how professionals in the United Kingdom develop work-required competence through informal learning. They interviewed and surveyed over 700 professionals in order to identify how important various informal learning methods are. The learning methods, in declining level of importance, were: on the job learning; working alongside more experienced colleagues; working as part of a team; self analysis or reflection; learning from clients/customers/patients; networking with others doing a similar job; learning through teaching/training others; support from a mentor of some kind; use of a role model (or role models); and pre-entry experience (p.183). They

conclude their research by proposing a "Taxonomy of Informal Professional Learning Methods" (pp.203-205).

Enos, Kehrhahn and Bell (2003) conducted a one-group descriptive survey of 84 corporate managers (of 188 for a 45% return rate) about the relationship between informal learning, formal training, managerial proficiency, transfer climate and transfer of learning. Among the measures studied, managers were asked whether they learned core managerial skills mainly from formal or informal learning activities. Managers reported learning 20 core managerial skills mainly from informal learning activities (M=3.0, SD=.40, where 1=learned only from formal learning activities and 4=learned only from informal learning activities). Managers reported, in their own words, 247 learning activities they used to learn core leadership skills. Of the activities, 70% were informal and 30% formal. Informal activities included interacting with others (63%), on the job experience (23%), observing others (12%) and reflecting (2%). Formal activities included training (55%), reading (12%), academic classes (12%), seminars (7%), audio and video material (4%), workshops (4%), military experience (4%) and conferences (1%). Researchers found no relationship ($r = -.01$) between informal learning and transfer of learning, and a small negative relationship ($r = -.15$) between informal learning and transfer climate factors. To facilitate managerial proficiency, the researchers advocate increasing focus on informal learning opportunities and shifting from formal training of managers. This conclusion has been reinforced by other studies on workplace informal learning (Cross, 2006).

Informal learning seems to be so vogue that the University of Winnipeg created a Workplace Informal Learning Matrix (Centre for Education and Work, 2006). It can be used to measure the types, amount and effectiveness of informal learning. Managers and performance improvement personnel can also use it to help staff create their own learning plans. These plans encourage workers to learn outside the formal training settings via their own means but for objectives (i.e. skills and knowledge) relevant to the organization. All of the above workplace articles show that informal learning is used, at least in the workplace. However, they do not discuss in much detail why people use informal learning approaches.

Laiken et al. (2004) do partly discuss people's reasons and motivations. They studied how workplaces use organizational learning approaches to embed continuous informal learning in work processes. They gathered data using interviews, focus groups and on-site observation at four Canadian workplaces in depth, for three years. Several themes emerged. First, they found basic social processes are important avenues for informal learning. These include processes such as problem solving in groups or teams; making mistakes and reflecting on the experience; applying learning in practice; participating in organizational decision-making; and learning technical skills from peers. Second, informal learning can happen in many social interactions but is more difficult in workplaces with formal hierarchies where there is less autonomy, and thus opportunity for performing and learning new tasks. Third, team environments provide important opportunities for dialogue and problem-solving. However, for informal learning to take place effectively within a team, the organization must provide a formal context, such as

task-focused reasons for creating teams. Fourth, an explicit safe culture of no-blame can provide opportunities for people to learn by dealing through conflict with colleagues, and also learn through making mistakes and reflecting on these mistakes. Finally, continuously evaluating progress can foster a culture of reflection and analysis to improve performance.

Gray (2004) conducted a study that includes both professional learning and higher education. She studied an adult education professional association who used an online conferencing tool (WebCT) for informal learning. Forty-three educators who worked part-time in rural communities participated in the grounded theory study. Data was collected through a participant survey, review of online discussion forum postings, live chat transcripts and email correspondences. Eleven participants were also interviewed on-site at their workplace. She found the online conferencing space provided participants an enculturation space to learn job skills and connect with colleagues. More importantly, she analyzed why participants turned to this informal learning space. "Motivations to participate included an opportunity to learn new skills and work practices, a means of social and professional connection to colleagues, and a mechanism to reduce the isolation that was inherent in the job function and geographical location" (Gray, 2004, p.20).

However, education is a different context than workplace learning or professional development. Learning objectives, or at least course objectives, are often more specifically and externally defined for the learner. In educational research, studies on help-seeking were relevant to the topics of students' communication behaviour outside of

class. Karabenick and Knapp (1988, 1991) have conducted the most extensive research on help-seeking. They distinguish formal from informal help-seeking. Students seek formal help when they ask instructors or student services for help or when they ask questions in class. The seek informal help when they ask classmates, other peers, friends, work colleagues or even a helpful instructor who is not the course instructor.

Karabenick and Knapp (1988) compared how students used formal and informal help-seeking options. They surveyed undergraduate psychology students (N=612) about whether they needed help in courses and whether they used five formal sources (i.e. student tutors, instructors, and three support services provided by the university) and two informal sources (classmates and friends). They found that 63% of students received help from friends at least once while 57% received help from classmates (p.225). Only 47% turned to instructors and less than 20% of students used any of the other formal help-seeking options. Overall, more students (approximately 70%) used at least one informal source than used at least one formal source (62%). This difference was statistically significant ($z = 4.16$, $p<.001$) based on a test of correlated proportions. Students were less willing to turn to more formal channels even though most students stated they could use help in their studies. Karabenick and Knapp conclude that "in light of students being less reluctant to rely on other students and friends, professional help-givers may wish to consider additional ways to employ other students as paraprofessional help-givers" (p.227).

Karabenick and Knapp (1991) published another article from the same data set on a different dimension of help-seeking. They focused on the relationship of help-seeking with other learning strategies. These other strategies included studying more, attending classes more, lowering aspirations and dropping courses. Karabenick and Knapp found that students' help-seeking behaviour was related to their self-esteem. Specifically, students' seemed less likely to seek help if they already felt vulnerable about their knowledge or ability in a course. Perceived threat to self-esteem was inversely related to students' formal help-seeking tendencies ($r = -.28, p < .001$) and informal help-seeking tendencies ($r = -.13, p < .01$) (Karabenick and Knapp, 1991, p.224).

Kistantis and Chow (2007) conducted a rich study on informal help-seeking and perceived threat. They examined how college student's help-seeking tendencies differed across learning environments. They surveyed students (N=472) in eight courses in four different learning environments (three traditional classroom courses, one distributed class with a Web component, three online DE courses with only synchronous interaction and one DE course that had asynchronous and synchronous interaction). They found that students in courses with an online component were more likely to seek formal help and informal help. These students also felt less threatened in seeking help than students in traditional classrooms. (A sub-scale was used to measure perceived threat). Chi-square analysis indicated there were significant differences among the four learning environments ($\chi^2(12) = 82.50, p < .001$). Contacting instructors via electronic tools was preferred over seeking help in person or via phone. For informal help-seeking, there were also significant differences among the learning environments that students were

likely to use (χ^2 (12) =89.48, p<.001). Again, more students preferred to use ICTs to contact classmates for help (f = 301) than in person (f = 119) or by phone (f = 54). Beyond examining how students sought help, Kistantis and Chow also examined how perceived threat to students' self-esteem made a difference in how often they sought help. There was a significant difference for how threatened students felt about seeking help in different learning environments, F(3, 470) =110.21, p<.001). Post hoc Tukey tests revealed that students in traditional classes felt more threatened in seeking help (M = 3.07) than students in the distributed class (M = 1.63, p<.001), the DE courses with only synchronous interaction (M = 1.37, p<.001), or the DE course with both synchronous and asynchronous interaction (M = 1.49, p<.001) (p.390). Kistantis and Chow also correlated help-seeking and perceived threat. There was a strong negative relationship between perceived threat and formal help-seeking (r = –.48). This was a larger effect size than Karabenick and Knapp (1991) found above (r = –.28). However, Kistantis and Chow found a similar small negative relationship between perceived threat and informal help-seeking (r = –.14) as Karabenick and Knapp did (r = –.13). These consistent results suggest that students may prefer to seek help informally partly because it is less threatening than formal channels are.

Due partly to this research, help-seeking is increasingly acknowledged as an important learning strategy. McKeachie is one of the authors of the Motivated Strategies for Learning Questionnaire (Pintrich et al., 1993), the well-used self-regulated learning instrument. After reading research on help-seeking, McKeachie confesses that most work on self-regulated learning has simply overlooked this important learning strategy.

Indeed, he concedes help-seeking may be one of the most useful learning strategies students' use (McKeachie, 2006).

Summary

In summary, existing literature indicates that students are using informal learning strategies when they communicate with classmates and others outside of class for course purposes. Informal learning strategies are extremely common in workplaces, according to research from workplace learning and performance improvement. Additionally, informal learning is more likely in settings that allow for comfortable social processes among learners. Also, having a relatively risk-free, no-blame trusting environment helps foster informal learning. In higher education, researchers have rigorously studied one dimension of informal learning –informal help-seeking. The research on informal help-seeking indicates it is more commonly used than formal help-seeking as a learning strategy. Additionally, there is a negative relationship between perceived threat and informal help-seeking. However, higher education research has focused on only one dimension of informal learning. There is little research on other informal learning strategies like discussing projects together, student-initiated study groups and student-created online study spaces. Therefore, the research question for this topic is quite broad and exploratory, given the results of the literature review:

- What factors motivate students to communicate with others outside of class for course-related purposes?

Generations and technology use

For the second topic on generations and ICT use, there were many articles about the Net Generation, Digital Natives/ Digital Immigrants and Millennial Learners. The terms are commonly found in business and social sciences literature (Seely Brown, 2000), official reports (Pedro, 2006 for the OECD) and the popular press (O'Reilly, 2007). The terms Millennials and Digital Natives seem to be more common in social sciences and mainstream media while Net Generation seems to be used more in education, although one finds all three terms in education and training. They are discussed from three perspectives: those who accept the existence of this generation and discuss implications for various aspects of education and training; those who assuredly ascribe particular traits to this generation; and those who are unconvinced these traits or even this generation exists.

First, there is a large body of literature that accepts the Net Generation/ Digital Natives have unique attributes. These authors make specific generational claims such as their unique learning styles (Costello et al., 2008), how their academic expectations and needs differ from other generations (Wood, 2006) and even the particular challenges of academic cheating posed by this generation (Milliron & Sandoe, 2008). Others make more broad claims about how this generation is creating a "sea change" in higher education (Johnson, 2006) and how educators can better meet the needs of this generation (Hutchison et al., 2008). The terms are so readily accepted as fact that a couple of publications have dedicated entire issues to the Net Generation (see *New Directions in Student Services* (Coomes & DeBard, 2004) and *Planning in Higher Education* (2008)).

Yet few articles provide evidence (or any data at all) to support claims about this generation. To support their claims, most of these articles cite a few authors who were the strongest and often earliest voices about this generation.

Tapscott (1998), Prensky, (2001a, 2001b) and Oblinger (2003) are the most commonly cited authors of the terms Net Generation, Digital Natives and Millennial Learners. Tapscott was an early promoter of the idea that a distinct generation exists because they have grown up surrounded by digital media. From this observation, he makes dozens of claims about how the Net Generation is different from predecessors. His claims are based on interviews with parents, business leaders, educators, policymakers and discussions over one year with over 300 children and youth. The participants were from different locations, socioeconomic and cultural backgrounds, gender and age. Importantly, discussions with children and youth were held in online forums. So there is a serious concern about a technophile bias in the sample. He wrote about the Net Generation at the height of the 1990s dot-com frenzy and some of his claims have to be understood in that context.

Tapscott asserts that the role of digital media is so pervasive and important that it effects all facets of this generation's life, including how they shop, manage their finances, participate in politics, socialize, and, most importantly for our purposes, how they communicate and learn (Tapscott, 1998, p.5). In particular, he claims that Net Gen students demand more interactive learning since technology-based interaction is a core attribute of this group. He argues that because they were raised in a digital landscape, the

Net Gen need more learner-centred, discovery-based, customized, fun, hypermedia learning. Unfortunately, they currently receive teacher-centred, linear, one-size-fits-all, broadcast learning (p.143). Tapscott is a technology industry funded writer on how digital technologies affect all facets of our lives. He uses broad brushstrokes to portray this generation and makes many claims that are readily dismissed in hindsight (e.g. the Net Generation "live and breathe innovation" (p.70)). At core, however, is the belief that this generation uses ICTs more and differently in all facets of their lives than other generations.

Prensky compares generations more overtly than Tapscott does. Tapscott mainly describes the actions of one group and other generations serve as background for comparison. Few claims are made about how other generations use digital technologies. Prensky differs in his approach. Also, he focuses on education and not larger social trends. He more directly describes two groups that he calls "digital natives" and "digital immigrants". He contends that a generation of students has grown with digital technologies as an everyday, normal part of their lives. They differ from those who are aware of digital technologies as novel and can remember a time before the internet. This latter group is digital immigrants as they "like all immigrants, some better than others... always retain to some degree, their 'accent', that is, their foot in the past" (Prensky, 2001, p.2). He asserts that digital immigrants are not as fluent or comfortable with digital technologies as digital natives are. Indeed, Prensky goes further, stating that digital native students "think and process information fundamentally differently from their predecessors" (Ibid, p.1). Certainly, his distinction seems to make sense that some

people have grown with digital technologies and others have not. From this distinction, Prensky ascribes several attributes and behaviours to these two groups. His thesis is based on his general observations, interspersed with quotes from a few students and one administrator. Nonetheless, the term "digital natives" has been very influential and is now part of the educational and social science lexicon.

Oblinger's writings about the Net Generation may have arguably had more impact among higher education senior administrators. Oblinger explored what we know about a generation of students "heavily influenced by information technology" (Oblinger, 2003, p.7). Other groups are really just background in her writings for what is mainly a discussion about one generation. She asserts that Millennial students have different attitudes and behaviours than Boomers or Generation X. "Along with differences in attitudes, Millennials exhibit distinct learning styles. For example, their learning preferences tend toward teamwork, experiential activities, structure, and the use of technology" (p.9). She makes fairly broad social claims about Millennial students' preferences for group work, their relationship to their parents, homework patterns, internet habits and television watching behaviour etc. Her claims are based on articles cited about students at several campuses, demographic studies about students on campuses, and discussions she had with senior administrators at universities and colleges in the United States and Canada.

She later anthologized her early articles (2002, 2003) with other writers into a book (Oblinger & Oblinger, 2005) about the Net Generation. (She uses the terms Millennial

students and Net Generation interchangeably). Authors in the book discuss the implications of the Net Generation on many facets of higher education, including curriculum design, faculty development, learning spaces, and student services. Yet few articles in the book are based on data. Indeed, the strongest, empirically-based article is ambiguous at best about Net Gen claims and contradictory at worst.

In Oblinger's book, Kvavik (2005) reports on a study conducted for EDUCAUSE[1] about how students use technologies in higher education. As he states, much work about the new generation of technology-savvy students is based on intuitive and qualitative data and observations. In response, he led a quantitative study at 13 American universities (N=4,374) to address what ICTs students use and prefer, their skill level with ICTs, how it contributes to their overall educational experience and to their learning. Importantly, nearly the entire sample is of Net Gen students (95%) and no data is provided about the attitudes and behaviours of non-Net Generation students. Kvavik found Net Gen students used ICTs foremost for classroom activities and studying (M=4.01 on a six point scale with 1= do not use and 6= 11 or more hours per week[2]) and word processing (M=3.76) (Kvavik, 2005, p.7.3). Academic use was strongly related to academic major and year of program. Of the 13 universities surveyed, students spent the most time using ICTs for

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[1] EDUCAUSE is a non-profit association of 2000 universities and 200 corporations that promotes ICT use in higher education and manages the ".edu" internet domain.

[2] Sic. Kvavik reports means even though the scale is ordinal. Standard deviations are not reported.

classroom activities at the University of Minnesota, Crookston. There, the curriculum design required students to use ICTs more (Ibid, p. 7.5). He also found students ICT skills were fairly low for any moderately difficult or complex applications such as creating spreadsheets, graphics and web pages. Students' skills were highest for using email, instant messaging, word processing, surfing the internet and creating PowerPoint presentations. He reports Net Gen students did not overwhelmingly prefer to have more ICTs in class (M=3.07 on a five point scale with 1=do not prefer to use technology in class and 5=prefer taking courses that are taken totally online). On this item, the distribution was a bell curve with a slight preference "for more moderate use of technology in the classroom" (p.7.8). Students responses differed for this item based on their major, with Engineering, Business and Science students preferring more technology in classes and Social Science, Education, Humanities and Fine Arts students preferring less. Students stated that the best effect of ICTs was that it improved communication with instructors and classmates. Kvavik concludes: "We expected to find that Net Generation students would demand greater use of technology in teaching and learning in the classroom. They did not. What we found was a moderate preference for technology" (p.7.17). Later he states "student and faculty use of instructional technology is more limited than is often portrayed" (p.7.17). Just as importantly, the study found a fair amount of variance within the Net Gen based on program and year of study.

Yet despite this strong research couched in the middle of Oblinger's book, other authors in the book uncritically boast claims about the unique digital preferences, knowledge and needs of the Net Generation. Oblinger, the editor of the book, argues in the second

chapter that the Net Gen is a distinct group with particular technology preferences and knowledge. She asserts the Net Gen are digitally literate, always connected, want immediate information and feedback, and prefer learning by discovery, in teams with visual and kinesthetic interaction (2005).

Kvavik's article portends the third trend in Net Gen/ Digital Natives literature; skeptics. These include literature reviews by Reeves and Oh (2007), Bennett et al. (2008), and a study by Guo et al., (2008). Reeves and Oh try to address whether generation really makes a difference in education. They want to understand whether instructional designers need to account for generational differences when developing instruction, games and simulations. First, they note there is a lack of standardized nomenclature about the Net Generation/Digital Generation/Millennials. This differs from Boomers and Generation X. The lack of consensus about naming this putative generation calls into question whether there are adequate generational differences worth considering. Much of their review focuses on the work of Howe and Strauss. The latter are demographers and private consultants who have written a series of influential books about Millennials (2000, 2003). Reeves and Oh indicate that studies by Howe and Strauss and others have substantial sampling problems. They contend most articles about Net Gen/Millennials combine statistics from reliable sources with anecdotes, observations and highly unrepresentative surveys. For example, they point out the few quantitative studies that exist do not cut across socioeconomic status or level of education. Howe and Strauss base their arguments on a survey completed in a Virginia suburb that is one of the most affluent in the United States (p.298). Their work, like most Net Gen/Millennial research,

focuses on "people who will eventually pursue white collar or knowledge-worker careers" (p.297). Reeves and Oh also found that many authors acknowledge a great deal of variance exists within any given generation. If there is greater difference within a group than between groups, can group differences be considered significant or important? Clearly Reeves and Oh are skeptical. "The bottom line on generational differences is that educational technology researchers should treat this variable as failing to meet the rigor of definition and measurement required for robust individual difference variables" (p.302). They warn against using questionable research from profit-oriented consultants, a remark directed at the likes of Howe and Strauss, and Tapscott. They conclude that more substantive research is needed.

Bennett et al. (2008) are also skeptical about the generational arguments. They conducted a rigorous literature review of the digital natives debate. They summarize that there are two key claims about digital natives: a distinct generation of digital natives exist; and education must fundamentally change to meet the needs of these digital natives. They found that claims about a distinct generation were based on "limited empirical evidence (e.g. Tapscott, 1998), or supported by anecdotes and appeals to common-sense beliefs (e.g. Prensky, 2001a)" (Bennett et al., 2008, p.777). They also highlight that later writers cite this same group of authors repeatedly and uncritically. This gives the impression of a large body of work about digital natives. In fact, there is "scant evidence" to support the idea of "digital natives". Indeed, they cite recent research that challenges the idea of a homogenous generation with technical preferences, knowledge and a distinct learning style. Bennett et al. also make an important distinction

sorely lacking in most articles, pro and con, about the Net Generation. They distinguish between the way young people use technology inside and outside of school settings. "Technology plays a different role in students' home and school lives". One cannot assume that students want or need to use ICTs in school just because they may do so in their social lives. They cite Kvavik and others who provide evidence that students are not demanding more ICTs in their education. Bennett et al. contend the digital natives argument is an academic version of a "moral panic". A moral panic is used in social sciences "to explain how an issue of public concern can achieve prominence that exceeds the evidence in support of the phenomenon" (p.782). Clearly, Bennett et al. think the digital natives issue has received far more attention than the evidence warrants. While they accept that young people are immersed in ICTs, they are unconvinced this group has uniform ICT use or skills or that this behaviour transfers from everyday to educational settings.

Guo et al. (2008) conducted a study that seems to refute the digital natives position. The study compared the ICT competencies of digital natives and digital immigrants in a Canadian teacher education program. Participants were asked to self-report their ability to use several ICT applications that students need to learn to be effective teachers, their frequency of using these ICTs, and attitudes toward technologies. The ICT items include, for example, asking students to judge their skills using scanners, creating and modifying database documents and using a digital camera to create an image on a computer. The survey was administered before and after the teacher education program during two separate academic years. The study was conducted during the 2001 to 2002, and 2003 to

2004 academic year (i.e. 2001 pre-program (N=877), 2002 post-program (N=615); 2003 pre-program (N=828) and 2004 post-program (N=554)). The results were analyzed for several independent and dependent variables. For our purposes, the most important analysis was for generation as the independent variable and ICT competency scores as the dependent variable. (Frequency of ICT use or attitudes toward technology was not reported in the study though was apparently measured in the survey). Guo et al. found no significant differences between digital natives and digital immigrants in their ICT competencies. The F value for generation effect was: $F(1, 2248)= 1.876, p =.171$, where digital natives were defined as between 20 and 24 years old and digital immigrants were over 25 years old. They conclude that "the differences between digital natives and digital immigrants has been exaggerated" (Guo et al., 2008, p.251).

There is also a recent, partly related, study for the British Library conducted in partnership with the U.K. Joint Information Systems Committee about students' research skills (British Library, 2008). They found that younger students have fairly poor research skills beyond searching the first few pages of Google. Thus, they have termed this group the Google Generation and are highly skeptical that being immersed with ICTs has made this group more skilled at using it.

So there seems to be a tension in the literature. Those who assert the Net Generation is a distinct generation seem to have had a lot of influence. This is evinced by the sheer number of articles that take the traits and existence of the Net Gen as a given. However, their evidence seems to be wanting. On the other hand, some authors are incredulous

about the Net Gen/Digital Natives while others argue the claims about Net Gen/Digital Natives are simply wrong. A fair study about the Net Generation needs to compare their ICT behaviour with those who are not Net Generation. This is lacking in most articles about the Net Generation. We have little sense of how students of other generations are using ICTs, with the exception of Guo's study. We do not know, for example, if perhaps the ubiquity of ICTs is affecting all people in similar ways.

Given this existing literature, the second research topic will focus on the following questions:

- Are Net Gen students more likely to use ICTs for interacting with classmates than non-NetGen students?
- Additionally, are NetGen students more likely to use ICTs than face-to-face communication when interacting with classmates for course-related purposes?

These questions have several advantages. First, both questions focus on student use of ICTs. ICT use is the most common, oft-repeated theme by those who speak favourably about the Net Generation. One constantly sees statements about just how much this generation uses ICTs. Even their adeptness with ICTs is often attributed to how much they use ICTs. Second, both questions focus on what is occurring within education and not in students social lives. This addresses the concern by Bennett et al. about distinguishing educational and social uses of ICTs. Third, the first question allows for comparing between groups as well as seeing variance within groups. The ICT habits of other generations have been notably under-studied or at least under-reported in most

articles about the Net Generation/Digital Natives. Fourth, as Kvavik showed, students found that using ICTs to be most useful for interacting with classmates and instructors. Ostensibly, then, if the Net Gen should be using ICTs for anything in education, it should be to communicate with classmates and instructors. Thus, the second question also compares ICT versus face-to-face options for communicating with classmates. Finally, both questions look at what students are doing with ICTs of their own choice, not because they are required to use it for their program. Guo et al. focus on ICT skills required by the program. The terms Net Generation/ digital natives, etc are useful for educators if students are indeed preferring to use ICTs for learning and interaction of their own volition. This is most readily visible by leaving the classroom and entering the hallways, where students choose their communication channels.

Research questions

Given the results of the literature review, the following research questions were the focus of this study:

- What factors motivate students to communicate with peers outside of class for course-related purposes?
- Are Net Gen students more likely to use ICTs for interacting with classmates than non-NetGen students?
    - Additionally, are NetGen students more likely to use ICTs than face-to-face communication when interacting with classmates for course-related purposes?

A qualitative pilot study was conducted to explore how students were communicating for course purposes outside of class, to identify key themes, and to use these themes to create specific items for the quantitative survey. The method and results of the qualitative pilot study are discussed in the next chapter.

Chapter 3: Pilot Study Method and Results

In this chapter the method and results of a pilot study are presented in detail. The pilot study explored how students interact outside class for course purposes and how ICTs affect this dynamic. The results of the pilot study are compared to relevant existing literature to help identify the main themes and inform the quantitative survey.

In brief, a grounded theory approach was used to design the pilot study, generate and analyze data, and create mid-level theories worth investigating. Results of the pilot are grounded in data from: 29 student focus groups and interview sessions with 69 students; 14 instructor interview sessions with 15 instructors; observation notes; institutional documents; and student blogs. The grounded theory method that was used to analyze data involved identifying a central phenomenon in the data. In this study, the central phenomenon was that students wanted "practical solutions" when communicating with classmates and instructors. *Outside of class students sought access to practical solutions for their course-related issues and ICTs were often not the most practical solution.* Students communicated with classmates and instructors outside of class about solutions to their academic and administrative problems and issues. Their motivation for if and how they communicated with classmates seemed to be based on issues of access, time management, safety, accurate knowledge, quick communication, relevance, and efficiency. The availability of ICTs was not driving students' decisions for if and how they communicated with classmates outside of class. Other factors were drivers, such as program design, trust of peers, the quality of students' relationship with instructors, the

course content/knowledge domain, course design and existing institutional supports. The details of the qualitative pilot study are discussed below.

Student Learning Outside the Classroom: A Pilot Study

Research Design: From Pilot to Theory

The research design for the pilot study was shaped by the initial research questions. Students can learn from many deliberate and incidental interactions and activities outside of class. Not all are relevant for courses. In the pilot study the goal was to explore how students interacted with others outside of class and if and how this was related to their courses. These are exploratory process-oriented questions about actions and interactions among people. The aim was to describe behaviour patterns and to identify themes within these patterns. To do so, it was important to use an open-ended approach to understand students' dynamics with classmates and instructors so that pre-defined categories were not used to describe what was occurring. The phenomena needed to name itself. But the research needed to be designed in order to give shape to the phenomena. A qualitative research design was chosen as it allowed for collecting open-ended data and developing themes from the data.

Grounded theory seemed most suitable among the many qualitative research methods. Like other qualitative methods, grounded theory requires trying to understand phenomena in situ, by collecting open-ended data. It also allows for participants to voice their experiences and perspectives. The advantage of grounded theory is the main focus and output is to create a *substantive middle-range process theory*. The output is a theory

because it provides an explanation and testable predictions of phenomena (Popper, 1968). It is a process theory because it tries to explain a process of events or actions. The theory is middle-range because grand claims cannot be made about phenomena based on grounded theory findings. Grounded theory hypotheses are "tentative and suggestive" at best (Merriam, 2002, p.6). The theory is substantive because it is localized to a real-world situation.

The pilot study was designed, then, as a grounded theory research with the purpose of exploring how students interacted with others outside of class. The goal of the pilot study was to build a substantive middle-range process theory of these interactions. How grounded theory was used is discussed in detail later in this chapter.

Research Setting

The pilot study was conducted at the British Columbia Institute of Technology (BCIT). Post-secondary students were the subjects of this study so purposeful sampling seemed more useful than probabilistic sampling. Purposeful sampling involves selecting "information-rich cases for study in-depth" (Patton in McMillan & Schumacher, 1997, p.397). Among various purposeful sampling strategies, site selection was chosen because it fit with the research questions. Conducting the study at one site allowed for multiple forms of data gathering from multiple participants. It seemed important to observe students outside of class, approach and interview them about their actions and interactions, and talk with instructors and other institutional staff for contextual information about students' interaction with others outside of class.

Three post-secondary institutions were approached to be the research site: one in Montreal, Saskatoon and Vancouver. These sites were approached because each was a rich possible source of data and because I knew people who worked in each institution. The Vancouver site was chosen for two reasons. First, unlike the institutions in Montreal and Saskatoon, I do not and have not had any formal affiliation with BCIT, as a student, employee, consultant, recipient of funds, etc. Second, an acceptable, symbiotic agreement was reached with BCIT about gathering research data that would be useful for everyone.

In 2004, BCIT launched a four year $25 million Educational Technology/ Information Technology (ET/IT) initiative to enhance student learning and instructor teaching through technology. This involved making ongoing investments in: "state of the art teaching and learning tools", creating "smart learning spaces", encouraging web-based collaboration through blogs, e-portfolios, portals, web-based file sharing programs and providing online spaces for networking. This was a teaching and learning initiative between the BCIT's *Information Technology* department and *Teaching and Learning Unit.* The ET/IT initiative was built on prior investments in computer labs and classrooms: landline and wireless network connections for most parts of campus; many software applications like WebCT, assignment sharing applications and administrative software; course websites for instructors; creating new learning and social spaces; and funding new staff to use and support these resources. In the winter semester of 2007, BCIT initiated an ambitious research agenda to evaluate and examine "the process of change and the

factors that may be facilitating or inhibiting the diffusion of learning innovation across the institute" (BCIT, 2007).

Their research agenda was fairly detailed. It was roughly organized by Rogers' popular "diffusion of innovation" curve (Rogers, 2003) and work about the "localization of technology" (McLaughlin et al, 1999). Localization refers to the idea that "technologies do not enter organizations fully-formed but rather are constructed and adapted by users who play a key role in defining the value of the technology" (BCIT, 2007, p.2). Localization is about local use and adoption. The purpose of the BCIT research agenda was to evaluate and examine the extent to which the ET/IT innovation had diffused across campus, how it had or had not changed teaching and learning, and how technologies were localized.

BCIT had specific research questions they wanted to examine such as: how widely has the ET/IT initiative diffused across campus; what are some of the motivators/facilitators of student, instructor and staff involvement in the ET/IT initiative; what are perceived barriers; what organizational and individual factors influence the diffusion; how do learners perceive the initiative; and are learning technologies being localized by students in ways that were not expected?

This last question potentially overlapped with the research interests of this study. BCIT included this question with an interest in "the social relations that drive the technology adoption process" (Ibid, p.2). The interest in students' social relations dovetailed nicely

with the topic of students' interactions with classmates and possibly instructors. In initial discussions, it was agreed that there might be a connection between how students interacted with each other and BCIT's interest in student use of ICTs, particularly given the extensive ICT provisions for students there. Discussions were held about how to balance the respective interests, so the research on interaction was not biased towards technology-based responses. It was agreed that I should collect data primarily with an interest in student interaction with classmates and instructors, and secondly about ICTs. The research design and data collection, especially interview questions, were designed to reflect this priority. However, BCIT would also use the data for their research interests in ICT use by different students. Thus, the research project title reflected the interest of BCIT's ET/IT research interest in how students were using digital technologies outside the classroom. This allowed BCIT researchers to justify and get support for the research project from the institution. The hope was that in the project more data would be gathered than either party needed. This is sometimes the case with research where more data is generated than can be used.

BCIT agreed to let research to be conducted at their institution because it would help them advance their research agenda, save staff time, and increase the credibility of their ET/IT evaluation by having an external non-BCIT staff lead part of the research. In return, I was given the blessing and active support of BCIT senior administrators to: access many institutional documents; use meeting rooms to conduct pre-arranged interviews; and use BCIT letterhead for any letters of initial contact, consent forms, interview questionnaires, explanatory letters, etc. Crucially, BCIT provided student,

instructor and staff contact information. The staff from the Teaching and Learning Unit was critical for recruiting interview participants. The staff was met from BCIT's *Teaching and Learning Unit* to discuss if the information being gathered was relevant to their research goals. (These last two points are discussed in detail in the data collection section below). This was, of course, all pending ethics approval for the research.

Ethics Approval

BCIT requires their *Research Ethics Review Board* to review all research projects involving human subjects or research conducted on BCIT campuses by external researchers. The ethics process and forms at BCIT followed the requirements of the Government of Canada "Tri-Council Policy Statement for Ethical Conduct for Research Involving Humans".

On BCIT's ethics form, the project was given a broad title: "The experience of BCIT Millennial learners using learning technologies". While Millennial Learners refers to students born on or after 1982, the forms indicated that information would be gathered from students of all ages. On the ethics form I was identified as the Principal Investigator for the study, with the dissertation supervisor listed as the Faculty Advisor and Direct Supervisor of the study. It was clearly identified on the ethics form that "this research is being conducted as part of a doctoral degree being pursued by the Principal Investigator at Concordia University". The form was completed and allowed for collecting a range of qualitative data including: observing and interviewing students on campus, in informal spaces such as hallways, cafeterias, open labs, and social spaces; conducting pre-arranged

semi-structured interviews and focus groups with students, faculty and instructional design staff; and accessing institutional research documents.

BCIT's *Research Ethics Review Board* approved the research project, granting permission to conduct this study. However, they required submitting another request to them for ethical review when the site would be used for any further data collection like a survey.

A Summary Protocol Form (SPF) was also completed and approved at Concordia University for this pilot study, as per the requirements for any graduate student conducting research with human subjects. On the Concordia protocol form, the project was titled: "Student experiences of using technologies for learning and interaction". The title differed from the BCIT form for two reasons. First, the Concordia form was not research site specific as there was a possibility of conducting this study at a second site as well. Second, the Concordia SPF was submitted after the BCIT ethics form. In the interim, a dissertation committee member recommended not to limit the research to only learning technologies. Rather other technologies should be considered that students may use for interacting with peers outside the classroom.

Having received ethics approval, the pilot study was designed according to the grounded theory method.

Data Collection

Techniques

Designing the research from a grounded theory method did not require specific techniques for collecting data (Charmaz, 2000, p.510) or specific forms of data to be collected. In grounded theory many techniques (e.g. observations, interviews, document gathering) can be used to collect various textual, audio and visual data. However, grounded theory encourages researchers to collect data iteratively. Grounded theorists advocate researchers collect data, analyze it for preliminary categories, collect more data, compare it with existing categories to refine the categories, and continue this process until reaching a saturation of categories. In this emergent process, data collection and analysis zigzag back and forth (Creswell, 2008, p.442). After saturating the categories, the researcher should generate a theory by proposing a statement about the relationship among categories. The statement should tell the story of "what seems to be going on here" (Strauss & Corbin in Creswell, 2008, p.447). Again, consistent with the iterative process of grounded theory, it may take several attempts to write a sentence that concisely describes the phenomenon. The proposed theory statement needs to be grounded in the data. I generally followed this process while collecting data.

However, grounded theorists differ about what to focus on when collecting data and how to analyze data. I wanted to focus on what students were doing. I also wanted some analytic flexibility to make connections among data while creating the categories that informed the theory. I chose to follow the *emerging design* grounded theory method advocated by Glaser (1992). Unlike constructivist grounded theory (Charmaz, 2000),

there is less focus with emerging design grounded theory on collecting data about the feelings and values of subjects being studied. Though these are very important, this study was not initially focused on students' emotions and beliefs. It is focused on describing and seeing patterns in their actions and interactions. I also decided against the systematic design approach advocated by Strauss and Corbin. This approached required organizing data in a predetermined analytic framework, a framework that might inhibit the analytic flexibility I sought.

Given these research design decisions, data was collected that allowed for describing how students interacted with classmates and instructors, whether this was related to their course work, the reasons for these interactions, and the context for these interactions. Data was collected via several techniques. These included:

- interviewing students and instructors;
- observing student activities throughout campus, including hallways and social gathering spaces;
- gathering existing documents;
- reviewing BCIT student blogs;

Interviews. The pilot study relied most heavily on interviews. The starting point for data collection was interviewing and observing students. The purpose of interviews was for students to describe their behaviour. Interview questions were created to excavate if and how students involve others in their learning outside the class, without leading students to specific answers. Thus it was important for questions to be in plain language

and open-ended. Interview questions were created in consultation with the dissertation research committee. It was agreed that these interviews would be semi-structured. So questions were not always asked in sequence but according to the conversation flow. It was important, however, to make sure all topics from the questions were addressed. The initial set of student interview questions were as follows:

1. Through what channels do you communicate with classmates?
2. Name four topics you communicate about?
3. Where are you when you communicate with classmates?
4. Describe what channels you use to communicate with your instructor.
5. Does the instructor require or encourage you to communicate with classmates?
6. When you have a problem or issue in your courses, what do you do?
7. What communication options would help you learn in your courses?

Instructors were also interviewed, in order to provide course context about if and how students involved their classmates and others to support their learning. Instructor interviews also provided a triangulation source for the main data, student interviews. For example, a lecture course in a large auditorium with individual assignments might result in different student learning dynamics than a course requiring lab partners. It was important to learn about this context. Initial instructor interview questions were as follows:

1. Do you require students to work in teams for any parts of the course?

2. How do students communicate with you outside of class?
3. For what purposes do you communicate?
4. Do you know how students communicate with each other outside of class?
5. What digital technologies (e.g. computer, mobile phones, other handheld digital devices) do students bring to class?
6. How do they use digital technologies during class?
7. What software programs or applications do they use?
8. Are they usually online while in class?
9. Are these activities part of the curriculum?
10. Of the technologies you've mentioned, which are provided to students by your program? Which are their own?
11. Overall, how do digital technologies affect your course?
12. What would you keep the same or change?

Instructor interview questions were more directed than student interview questions. For example, for students, technology use and provision questions were not asked as part of the main questions. However, if students stated they were using particular technologies, probing questions were asked. (E.g. Can you provide more details? Can you give an example?). For instructors it seemed appropriate to ask some of these questions at the outset as instructors were a source of context and cross-checking students' responses.

Contacting Subjects and Collecting Interview Data

The initial plan was to interview students in a focus group format. Focus group participants were recruited through instructors. Tanya of BCIT's *Teaching and Learning Unit* sent an email to 15 instructors the unit had worked with previously. The instructors were requested to participate in the study and invite students to participate in a focus group (see Appendix 1 for the "Request to Participate" email). The email included a "Focus Group Contact Letter" for instructors to share with their students (see Appendix 2). This approach was very unsuccessful. The contact letter read by instructors indicated students should contact me if they were willing to participate. No phone calls were received and only one email from students. Tanya then offered to announce the study in some classes and recruit students on the spot within those classes. There were 12 time slots over six days (two per day) for students to participate in various focus groups. The student turnout to the focus groups was poor even though incentives were provided (i.e. food, an opportunity to win a $200 gift certificate). Only eight students came to the focus group sessions and no students came in the first two days of sessions.

Given that I was already on BCIT campus and now had free time, BCIT staff and I decided on the first morning of scheduled sessions, to use the option of interviewing students in their social spaces. This was more successful. Most students were willing to be interviewed when asked[3]. A set protocol of dialogue was used that was pre-approved

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[3] Perhaps this difference between pull and push approaches to data collection is an important lesson for future data collection. If participants need to make the effort to go

by BCIT Ethics Review, when students were approached (see Appendix 3). All students who participated were provided and signed an interview consent form (see Appendix 4).

At the end of interviews with instructors, several instructors were asked to suggest or solicit students to participate in the study. A few helped to recruit more students. A Business school instructor arranged for interviewing his students who were working on a project outside the building at the time. Two instructors who taught distance education (DE) courses said they would ask their DE students if they were willing to participate in the study. This helped overcome the problem of having to make "cold calls" to DE students, which would have required more complicated ethics approval. Of the two instructors, the Health Sciences instructor was able to provide contact information for seven students. Unfortunately, no students from the Engineering instructor responded to his request for participants.

Between instructors and students, there were 43 interview sessions with 84 people. Instructor and student interview sessions took place over a span of 20 days. The majority of student interview sessions and all instructor interview sessions were conducted during a ten-day span on BCIT campus. Phone interview sessions with DE students occurred after I returned to Montreal. In total, there were 29 student interview sessions. I stopped at 29 interview sessions although I had contact information for a few more students I could interview via phone. Creswell states that in grounded theory research the general

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somewhere, need to be pulled, they did not. If they were approached, they were willing to make the time to answer questions.

rule for theoretical sampling is to conduct at least 20 to 30 interview sessions (Creswell, p.449). So I thought it best to analyze the interview data I collected to see if I needed to interview more students or if other data was more useful. I decided that other sources would provide richer data, as I discuss below.

Of the 29 student interview sessions, 11 were pre-arranged while 18 were interview sessions with students "on the spot". Of the 29 sessions, only four were in the interview room. Six were conducted in classrooms (usually lab spaces), 14 were in social spaces (i.e. student lounge spaces, cafeterias, hallways, picnic tables outside of buildings) and five were via phone to students at home. Table 2 provides a breakdown of the group size for each student interview session. A total of 69 students were interviewed. Nine of the sessions were with individual students while another 20 were with students in groups of two or more.

Table 2: Group size for each student interview session

Group size	Number of interview sessions of this group size	Total number of students interviewed
1	9	9
2	11	22
3	4	12
4	2	8
5	1	5
6	1	6
7	1	7
Total	29	69

Fourteen instructor interview sessions were conducted with 15 instructors. One of the instructor interview sessions was with a group of two instructors who were interviewed

together in their lab office. All 14 instructor-interview sessions were pre-arranged. For this pilot study, the instructor interview sessions were useful for two purposes. One was to provide rich context for the student interviews. The second was to foster support and interest in the research project.

Participants

Student participants were asked a few demographic questions. On the consent form they were requested to include their date of birth, identify the program in which they were enrolled, and write their contact information. From these I was able to calculate their age and identify their school and program. I noted participants' gender at the beginning of each interview. I also asked participants if their program was fully on campus, mixed-mode or via distance education, if it was not already obvious in the interview. (Please see Appendix E for a table of students interviewed, including their gender, age, course and program of study. All identifiable attributes of students have been removed to keep their identity confidential).

Figure 1 shows the age distribution of student participants. The median age of participants was 22 years old.

The vast majority of participants were male (68.1%). This initially concerned me. However, this became less of an issue when I compared this result with the overall gender distribution at BCIT (see Table 3). The gender distribution of participants was

close to that of BCIT as a whole. BCIT is a polytechnic institution and as such seems to attract nearly three times as many males to females.

Figure 1: Age of Student Interview Participants

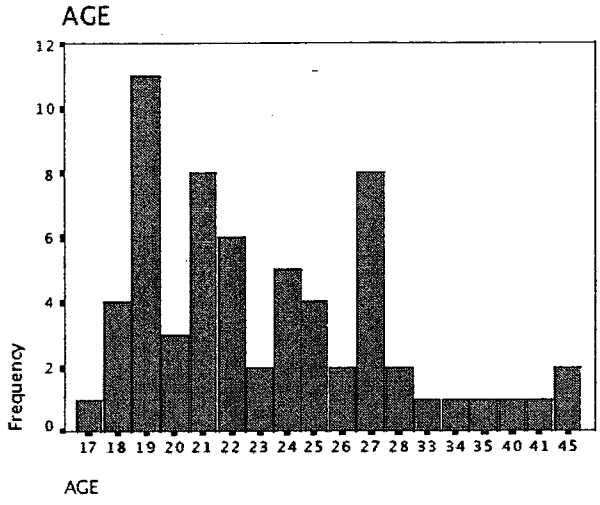

Table 3: Gender of student interview participants and BCIT enrollment

Gender	Students interviewed	Students interviewed (%)	Gender distribution of BCIT students (% in 2007)
Female	22	31.9%	29%
Male	47	68.1%	71%
Total	69	100.0%	100%

Participants were from all six schools at BCIT (see Table 4). This included: seven participants from the School of Business (i.e. Finance, Marketing and Operations Management); eight from Computing and Academic Studies (i.e. Journalism, Computers, Robot Computing); 12 from the School of Construction and the Environment (i.e. Architecture, Geology, Forestry); 14 from Health Sciences (i.e. Nursing, Radiology, Cardiology); 23 from the School of Manufacturing and Engineering (i.e. Electrical

Engineering, Synthetic Manufacturing, Metal Manufacturing; and five from the School of Transportation (i.e. Mechanical Engineering and Automotive Engineering).

Table 4: Program area of student interview participants

School	Frequency	Percent
Business	7	10.1
Computing and Academic Studies	8	11.6
Construction & the Environment	12	17.4
Health Sciences	14	20.3
Manufacturing and Engineering	23	33.3
Transportation	5	7.2
Total	69	100

BCIT staff identifies programs generally by whether they are "trades" or "technology" programs.[4] Technology programs include all programs in the schools of Business, Computing & Academic Studies, and Health Sciences. Trades include all programs in the schools of Construction & the Environment, Manufacturing & Engineering, and Transportation. Twenty-nine technology students and 40 trade students were interviewed.

[4] The distinction is loosely based around how much the goal of learning is to physically apply knowledge. Students in "trade" programs are being prepared to work in trade industries where the work often involves creating, shaping and changing physical objects. Trade students learn the basic knowledge of a field and how to develop and apply psychomotor skills. Students in "technology" programs learn mainly knowledge and knowledge-based skills such as writing, computer programming, interacting with clients and patients, etc.

The vast majority of participants interviewed were on-campus students (see Table 5). This was mainly a function of conducting interviews on campus. But as mentioned above, a concerted effort was made to contact DE students, with modest success. All DE students were in the Cardiology program. The mixed mode students were in the Nursing program where they took courses online while doing their practicum semester in a clinic or hospital setting. I made no deliberate effort to interview mixed mode students but rather encountered them randomly.

Table 5: Delivery mode of program of students interviewed

Mode	Students interviewed (N)	Students interviewed (%)
On campus	58	84.1
Mixed	6	8.7
Distance	5	7.2
Total	69	100

Observations

I was in Vancouver to conduct interviews for ten days in the Spring of 2007. From the first day, I began taking observations notes of student interactions, starting on the bus ride to BCIT campus. Throughout much of the first three days at BCIT, observation notes were made. This stopped, however, at the end of the third day. The main reason was exhaustion after conducting five to eight interviews a day for several days in a row, while also regularly analyzing and writing memos of the interview data during the days and evenings. This roughly parallels, what Campbell and Stanley (in McMillan & Schumacher, 1997, p.186) call an instrumentation threat to internal validity in the case of an experimental research design. In this case, I was the data collection instrument that

was less reliable due to fatigue. However, more notes were written reflecting on my observations a couple of weeks later after I returned to Montreal and had the energy, time and focus to engage with the research again.

Gathering existing documents

I collected documents about BCIT before, during and mainly after the time I was on BCIT campus. Before going to BCIT campus, I perused their calendar online to get background information about the mandate and programs at BCIT. While at BCIT campus, I learned about some previous research by the Teaching and Learning Unit about technology use by BCIT students and instructors. The researchers shared these documents with me. After coding student interview data, BCIT's institutional research papers were accessed from their website. BCIT staff also provided relevant BCIT policy documents related to the ET/IT initiative and other BCIT publications such as newsletters. BCIT's website was perused for relevant information the interview data was analyzed in depth.

Student blogs

While interviewing a group of students, I learned that one of the students was writing a blog for BCIT. He informed me that BCIT had a project where they asked select students to write blogs about their experience of being BCIT students. These students were asked to blog because of their writing skills and to reflect a broad range of BCIT programs. BCIT had planned to use information from these blogs for marketing their programs. I perused several of these blogs as they were available for anyone to read.

Data capture and storage

All interviews were recorded using digital audio recorders. All audio recordings were copied to my computer and the file-share program at BCIT. All audio and textual data that could identify participants were password protected, as per requirements BCIT ethics requirements.

Data analysis and validation

Data was analyzed during and after collecting interview data. Data analysis during interviews was a bit looser, where I would note initial impressions from interviews. These impressions were used to modify questions and select who was interviewed. For example, in early interviews some students mentioned they communicated with classmates using MSN chat and conversing via cell phones. I asked students a few probing questions about this, including asking if they used "any other digital technologies for communicating". When reflecting on the responses to this in the first few interviews, I realized this question fell flat. These first few students all responded by discussing what computers they used. This is what digital technologies meant to them. I, however, was wondering if they used WebCT, email and MyBCIT, without wanting to say so. All of these are provided at BCIT. I realized many of these students do not consider MSN chat, WebCT, or even mobile phones as technologies. They are just applications that are part of their everyday life. So I had to modify the question to the more generic statement "anything else you use?"

Also, I discussed the student interview process with BCIT staff after the first morning of interviews. It occurred to us that in the first five interview sessions, all eleven participants were males. So in the next few interviews, a conscious effort was made to talk with female students. As mentioned above, however, the result was still far more males than females interviewed.

The bulk of analysis occurred after all the interviews were completed. I listened to each of the 29 student interview sessions, several more than once, over a two and a half month span. Only one session was fully inaudible: session 23 with the Mechanical Engineering student and the Broadcast Journalism student. The duration of interviews ranged from just over 5 minutes to 70 minutes. The median time for interviews was 12 minutes. Not surprisingly, on-the-spot interviews in public spaces were shorter than pre-arranged interviews. In the latter, participants had expected to be interviewed for up to an hour and thus seemed willing to take time to answer questions in depth.

Coding

In the first step of data coding, I took verbatim notes of student responses during the interviews and made extra field and open coding notes about interesting comments they made. Then, I organized student responses in the order of the original questions, even though in most cases questions were not asked in the original order. While I did not want to use predetermined categories for analyzing the data, as advocated by Strauss and Corbin in their systematic design method of grounded theory, I did want to organize the

data in order to be able to compare across interviews more easily (for a sample, see Appendix 5).

In the second step, I made notes in the margin of each of the 28 audible interviews, trying to distill the key points from each interview. The key points from all interviews were aggregated into one document. Throughout this process I re-read notes made during interviews, perused observation notes, collected and read existing BCIT research documents, listened to instructor interviews and read student blogs. While reading the interviews and other data, I wrote memos about ideas, random thoughts, etc that came to mind about the study (for a sample see Appendix 6). These are encouraged in Grounded Theory and part of the final theory generation.

Next, I listed major themes (also called categories by some grounded theorists) that emerged from the data. As I reviewed data, I grouped together responses that were similar. From these similar responses, I chose a keyword that captured the similar responses. These were the themes. Finally, I constantly compared these themes with each other and the data. Themes were listed, reviewed, edited, removed and added until I felt the themes saturated the data. As I went back and forth comparing themes and data I regularly asked core grounded theory questions: how are the themes connected? what is the data a study of? and what is happening here?

To validate the research, and make sure I was not finding just what I wanted to find, I sent a copy of emerging findings and analysis to three staff members from BCIT's

Learning and Teaching Centre. They were familiar with the data as they were using it for their own research purposes. Their perusal of and feedback on the research served as a peer review regarding the congruency of emerging findings with the raw data. The emerging findings were also presented to instructors at BCIT's Professional Development Day on February 26, 2008, in Vancouver. Two of the 20 attendees at the presentation were instructors who were interviewed for the study. Their feedback provided a sort of member check. Finally, findings about students' relationship with instructors were triangulated with existing BCIT documents and research about student perceptions of instructors.

Findings

In reporting the findings, I first discuss students' current practices interacting with peers outside of class and their use of ICTs, as indicated by their response to the first three interview questions. Then I discuss if and how this related to their courses. Finally I discuss the major themes and the core phenomenon that emerged about student interaction with peers outside of class. It should be noted that student responses to interview questions about peer interaction were written according to what they mentioned most. However, this should not be read as a precise count of channels students used to communicate with peers, what topics they discussed and from where. For example, in the case of some group interviews, one student might mention a channel of communication or a topic, and another student might agree. It is difficult to know if the second student would have mentioned on her own the same communication channel or topic. The responses are not meant to indicate precise numbers but do portray possible trends.

Channels of communication

The first interview question was "through what channels do you communicate with classmates?" Students interacted with classmates outside of class time by talking in person and via cellphones, and by writing to each other via chat programs (mainly MSN, though some used Yahoo), email, Facebook, MySpace, WebCT and cellphone text messages.

The most common method was for students to talk in person, as determined by counting student responses to the first interview question. Many students said "talk on campus", as one student put it (Interview Session[5] 13, Engineering student). It was not surprising that many students mentioned communicating in person first. Instructor and student interviews, and course calendar documents evinced that BCIT students spend a lot of time on campus because in many cases their programs required it. In most programs in the School of Business, for example, students were required to be on campus for 30 hours a week for courses and group work. A Finance student mentioned he "spend[s] 6 to 7 hours a day on campus, Monday to Friday. We don't get to plan our schedule here" (Session 5). A group of Forestry students stated they were "on campus 40 hours a week" (Session 20). Some programs, such as Manufacturing, even had required attendance that was taken everyday. This is because many of the students were eighteen and nineteen

[5] Sessions are numbered chronologically. So numbers for instructor interview sessions intersperse numbers for student interview sessions.

year olds who needed the discipline of attendance, according to one instructor (Session 7, Manufacturing instructor).

Given that most students were on campus so much, it was interesting how many mentioned MSN as a vehicle of communication. I approached a group of Geology students, asking if I could take 15 minutes of their time for this study on how students interact outside the classroom. Before I could finish my sentence or asked any interview questions one student blurted "MSN." "It's all about MSN", said another (Session 8, Geology students). A Robot Computing student seemed to capture a common practice when describing how he communicated with classmates. "In school, usually talk. Out of school with MSN" (Session 3). Of the various instant messaging applications, most students mentioned MSN while only one mentioned Yahoo Messenger.

Many students seemed to keep their classmates on their contact list or even have a contact tab on MSN for various groups and projects. "I have everyone on my contact list. I use it for everything, social, course related. I categorize my groups. I have my BCIT group. I have my church group. I have my UBC people. Yeah" (Session 24, Health Sciences student with a previous degree from UBC). For many of these students, MSN was useful on campus and off. Several students stated that whenever online, they "always have MSN on in the background" (Session 38, Operations Management student). "MSN. Yeah, 24/7" (Session 14, Engineering student). Some students stated they even used it while in class. One Architecture student said, "when someone is in front of the class, like a teacher, you don't have to, like, lean back to talk to someone. You just chat

on your laptop". "Talking might raise a raucous" said his classmate (Session 4). Another student said he was not usually online using MSN in class but then he hesitated. "Ah no. Not unless it's a boring class. But generally no" (Session 5, Finance student).

Email was also an important way students contacted peers, though this varied and seemed to have specific uses. Some said they used "a lot of email" (Session 2, Robot Computing student) while others said they "don't use email as much" (Session 1, Robot Computing student). One student mentioned email was more commonly used "on weekends", from off campus (Session 6, Finance Student). Several students echoed the sentiment of an Engineering student who said email was preferred because one "can attach files and stuff" (Session 12). Another mentioned that email was useful "if you want to send something to the whole class" (Session 4, Architecture student).

Facebook and MySpace were somewhat surprising vehicles of communication among students. One motivated group of Engineering students described their decision to use Facebook:

> *There's a discussion board on Facebook. We just message each other if there's a common question and say, anyone who looks at it can answer the question.*
>
> *It's not really based on one person. We started a group.*

Yeah, it's a whole group. The whole set.[6]

Our set, when we were first introduced, the first day we decided to have a discussion board. So we're like, let's go to Facebook, cause that's the most common one.

So we all made IDs on Facebook and profiles and stuff and made the discussion board. (Session 14).

What is a bit surprising is the timing and purpose of their use of Facebook. Facebook is now pervasive. However, these students started using it from the first day of their course in September 2006, when Facebook was fairly nascent. And they were not alone. A group of Nursing students also discussed using Facebook and MySpace. "Some of us are also going into MySpace and discussing there." (Session 19). MySpace and Facebook were certainly not part of the Nursing program. Students started this themselves. These students were using Facebook and MySpace not just for social purposes but also course-related work.

A few students mentioned WebCT was important. BCIT uses WebCT as their course management platform. It is used for on campus and DE courses at BCIT. Interestingly,

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[6] A set is a subgroup within a program. The number of students within a set varies from program to program, but instructors indicated numbers ranging from 8 to 24 students.

though, only students in either mixed mode or DE programs mentioned using WebCT, even though many on-campus courses used WebCT. A student in Radiology, a mixed mode program, stated, "we have a lot of courses done through WebCT... We have an online group set up. We use WebCT just within our group. Because we have a little chat set up just within our group and our teacher likes to monitor what we're talking about. So in those cases we use WebCT. However, she mentioned that "sometimes in those courses we still use our regular email" (Session 11).

A couple of Cardiology students seemed relieved to finally have WebCT as an option to communicate with peers. The Cardiology program was making a transition from being DE print correspondence to being DE online via WebCT. "Now the ECG interpretation class is in the same [WebCT] format. It's really good because it's these discussion groups and stuff. You know, you can talk to these other students. So if someone's having a problem, you kind of help each other out and that sort of thing" (Session 41). Another Cardiology student concurred. "I know for one of the nuclear medicine courses, it was totally online based, WebCT. And I found that to be the easiest class to have discussions with other students. Cause they always had an open discussion board where you could put your ideas and comment on procedures" (Session 43).

Students mentioned using cell phones in various ways to communicate with peers. For some, cell phones were very important. "Cellphones are big, text and talking", said an Automotive student (Session 34). "We do have most of each others cellphones [phone numbers] too" said a Robot Computing student (Session 2). For others cellphones were

useful for specific, short communication. A Nursing student mentioned she preferred "phone if it is urgent" (Session 18). A Finance student mentioned he used a cell phone because "usually, it's just one question I have or something. Or they'll have one question for me" (Session 5). Some students saw cellphones as useful for organizing other communication. An Architecture student mentioned that he prefers using MSN. And if someone is not on MSN, he calls them "to tell them to get online" (Session 4). Most students used cellphones for talking though a couple mentioned using it for text messaging, like the Automotive student above. A student in Synthetic Manufacturing said "sometimes we call, or text message, or agree on a set time. We text more than we call. A lot more. It's cheaper" (Session 27).

Many students compared the benefits of interacting through various communication vehicles. A Nursing student mentioned she preferred email to MSN because of the time flexibility and because MSN was too social (Session 18, Nursing student). Indeed, this was a concern at times about MSN, that it was time consuming and distracting when trying to get work done. An Architecture student called it "addictive" (Session 4). After one Marketing student in a group interview mentioned they used MSN in class, I asked the other student if he did. "Unfortunately", he responded. (Session 10, Marketing students). Another Architecture student called MSN distractive. He said, during the end-of-term interview, that "it also helps not to sign in at all when you need to work. I haven't been signed in at all in the last week and a half" (Session 4).

Topics of interaction

The second interview question was "name four topics you communicate about". Most students only mentioned a few topics. Students communicated about a variety of social and course-related topics in their interactions with classmates. Indeed, much of the interaction was a blur of these two, a dynamic concisely summarized by a Finance student: "sometimes we socialize, sometimes we work" (Session 5). Students most commonly mentioned communicating about the following course-related topics with classmates:

- Discussing school projects and assignments: e.g. "discuss assignments we're working on" (Session 1, Robot Computing student); "discuss projects" (Session 6, Finance student); "discuss online assignments" (Session 24, Health Sciences student)
- Discussing general school issues: e.g. "talking about the program and how realistic or unrealistic we think it is" (Session 20, Forestry student); "discuss school" (Session 3, Robot Computing student)
- Seeking and sharing information about course administrative issues; e.g. "if you need information about an assignment you forgot to write down" (Session 5, Finance student); "when things are due" (Session 10, Marketing student); "inform [others] about course changes" (Session 11, Radiology student)
- Organizing for school work: e.g. "organize project partners getting together" (Session 2, Robot Computing student); "group organizing" (Session 17, Nursing student); "organizing meetings, changing locations" (Session 10, Marketing student)

Other course-related topics they communicated about included:

- Studying in groups: e.g. "study in groups a lot" (Session 13, Engineering student); "a lot of group study, during final exams, we help each other out" (Session 26, Synthetic Manufacturing student)
- Seeking help about course content: e.g. "asking [classmates] if I have a question. I might want to talk to someone on MSN about that" (Session 2, Robot Computing student); "questions about the course" (Session 11, Radiology Student)
- Working on assigned group projects: e.g. "with PBL [problem-based learning in the Nursing program] we do a lot of group work" (Session 17, Nursing student)
- Reviewing each others work: e.g. "send [an English assignment] over to a friend and say, this is what's wrong with it and email it back to them with amendments and stuff" (Session 8, Geology student)
- Sharing resources: e.g. "For software we need, we find the link on the internet, download it and post the link on Facebook" (Session 14, Engineering student)

These responses indicate that, for some students, interactions outside of class time were very much related to their courses. Many students seemed to actively involve their peers in course-related work outside class time. They discussed assignments and school issues, studied with peers, sought help from them about course content and administrative issues, shared information and resources for courses, studied in groups and organized and worked on group projects. In some cases they were required to do so, like the Nursing

students in a problem-based learning program with a lot of group work. But in many cases they were not. "In terms of group assignments, we don't get very many. It's all individual assignments", said a Geology student who worked with classmates a lot (Session 8).

Location

The third interview question was "where are you when you communicate with classmates". As discussed earlier, many BCIT students spend 30 hours or more on campus each week. So it was not surprising that students responded that they communicated with peers mainly from campus. BCIT campus is large with over 50 buildings. Like most campuses, the vast majority of space is for offices not for classrooms or gathering spaces (Fink, 2002).

Within these spaces, students identified specific locations. The most commonly mentioned locations were campus spaces that allowed for a blend of social and work interaction. These included cafeterias, the Great Hall (a large social space in the student union building) and the lounge space in the Recreation Centre. "We have the same timetable. With all of us, we hang out, like here, during lunch", said an Engineering student interviewed with four peers in the lounge space of the Recreation Centre (Session 14). I asked Geology students at a picnic table outside a cafeteria about where they communicate with classmates. "Outside of class. What we're doing right now… Nobody really has a fun party house to do it at" said one student (Session 8).

Designated spaces for course work were also popular. These included labs, manufacturing workshops, studios, and the library. A Robot Computing student summarized the sentiment when he said he worked "mostly at school. We spend most of our time here in the lab" (Session 2). "Mostly get together in the library" said a first year Nursing student (Session 17). "Usually in the studio. I don't really use other spaces around campus. We have enough space in the studio" (Session 4, Architecture student). Many students also mentioned communicating from home: "On the computer at home" (Session 1, Robot Computing student); "Usually doing emails from home" (Session 11, Radiology student).

Several students stated they used a variety of spaces. "Library, or the Great Hall. It's hard to be productive there. Everyone just wants to chit chat. And when its really busy, like finals, there's a room near the janitors. And over by the gym [the lounge space in the Recreation Centre]" (Session 10, Marketing students). One student overtly identified interstitial spaces as being important. "Maybe outside of class, in the cafeteria maybe. Hallways when I'm walking to and from class. And I guess my room [at home], when I'm on the computer (Session 3, Robot Computing student).

A couple of students mentioned purely social spaces as locations where they communicate with peers about courses. At "a restaurant, over a beer" (Session 24, Synthetic Manufacturing student) and "the pub" (Session 5, Finance student) were stated.

Few students mentioned spaces off campus. The vast majority of student interactions with peers seemed to occur on campus. BCIT is a commuter campus. "People are coming from different parts of the Lower Mainland", explained a Finance student when stating she and her classmates work on "assignments at the library" (Session 6). A Synthetic Manufacturing student said he communicated with classmates "predominantly on campus. Maybe in finals we come to my house" (Session 27). Nursing students mentioned communicating with classmates from their clinic and hospital settings (Session 18). This was a mixed mode program. Students in Cardiac Science, a DE program, turned to co-workers in hospitals about students' course-related questions, in lieu of classmates (Sessions 39, 40, and 41).

Summary of findings

In summary, interview findings indicate that students do interact with classmates outside of class for course related purposes. They communicate with classmates mainly in person but were also using ICTs such as MSN, email, Facebook, MySpace, WebCT, and cellphones. These interactions ranged from: a) incidental conversations between classes to; b) more intentionally communicating about specific course content, notes, assignments, resources and administrative questions to; c) studying together in loosely structured groups to; d) collaborating on and reviewing assignments with peers. Classmates, outside of class, were a source of information, feedback, resources and motivation. Most of this interaction seemed to be initiated by students though in some cases students were required in courses to work on group projects with classmates. These interactions outside of class occurred inside and outside formal course spaces. Students

would communicate in formal course and study spaces like workshops, labs, studios and the library. They also communicated outside of formal course and study spaces both on and off campus. On campus, spaces included social gathering spaces like the Great Hall, lounges, cafeterias, hallways and outdoor tables around campus. Off campus communication occurred from home and, in the case of DE and mixed mode students, in workplaces. Students also communicated with instructors outside of class and seemed to prefer talking in person and using email as their most common communication channels.[7]

Factors affecting student interactions outside of class

Through grounded theory analysis key themes emerged about if, how and for what purposes student interacted with others outside classroom for course-related purposes. The themes emerged by constantly comparing, reviewing, and editing these themes with each other and the data. These themes included the importance of:

- program design
- trust of peers
- quality of students' relationship with instructors
- course content/knowledge domain
- course design

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[7] It should be noted that it was difficult know if student responses about their communication behaviour was indicative of strong or weak patterns of behaviour or were isolated responses. The goal of this pilot study however, was to identify all possible resources and patterns that could be studied in primary quantitative study.

- institutional supports

Program design

Many students communicated with others about course-related work because of how their program was designed. Two facets of program design were important, the cohort model and the schedule. Most BCIT programs were based on the cohort model. Students were with a common group of classmates for the duration of their program, which ranged from one to three years. This allowed potential relationships to develop, so students had familiar people they could approach about course-related issues.

The programs also required students be on campus a lot. Students in most programs at BCIT were required to spend over 30 hours per week on campus, but not all of this time was in classes. "We have tons of breaks between classes", said a Management student (Session 38, Finance student). It was during this interstitial time that some students communicated with classmates about course related work. "Our schedule is accommodating enough that we can do things during the break" said a Finance student in the same interview. Even those who were "on campus five days a week 30 to 40 hours week just in class" (Session 8, Geology students) stated they would communicate with classmates during interstitial times. "Usually lunch time, breaks, after school. It's usually on campus." So program schedule seemed to be an important factor affecting how and where these students communicated with classmates. The schedule afforded students regular physical access to classmates making it easy to communicate. "We just go over and talk to each other" said a Robot Computing student, indicating how easy it was to

communicate with classmates (Session 1). A Finance student echoed this sentiment, saying he turned to classmates "because there's usually people around" (Session 5). It required little energy and effort for many students to contact classmates.

Trust of peers

Access to and familiarity with classmates were necessary but not sufficient reasons for interaction outside of class. If and how students communicated with classmates also depended on whether they trusted their classmates. Trust had three main dimensions: affective; perceived utility; and reliability. The affective dimension was about the level of emotional comfort students felt about communicating with classmates. Many students felt very comfortable discussing course related issues with their classmates, as they were sharing a common experience and purpose while going through a program with common assignments, deadlines and administrative requirements. They had a relaxed dynamic that allowed for interspersing course work and socializing. "Often we discuss assignments we're working on or assignments we're doing. General conversation I guess. Yeah, there's a lot of talk about our school and labs and the hockey game" (Session 1: Robot Computing). Others did not have this comfort. A couple of international students said they communicated with few classmates, indicating they only had "just a few classmates on the [MSN contact] list, not the entire class" (Session 33, Electronic students). A Manufacturing instructor observed, after class "a couple of guys will get together. Over time, they'll develop friendships and start hooking up a bit. That would be mostly the higher-level students. The lower level students...after class, they're not doing a lot" (Session 7). He suggested age might be a factor that made some students

less comfortable or motivated to communicate with peers outside of class. "They're very young this class. Literally, they're just out of high school".

A second trust dimension was what might be called perceived usefulness; whether students had confidence that working with peers helped them with their course work. One feature of perceived usefulness was accurate knowledge. "I turn to another guy in my set because he always somehow has the answers" said a Finance student (Session 38). "I ask Perry. He's already graduated from a university and has already taken some of the courses we have" said a Management student in the same interview. Guidance and feedback were important reasons for these students to work with peers. Others were not as confident about their classmates' knowledge of particular content. "Physics is one of those courses I think pretty much everybody in the program is a bit lost with... You can try five different people and get five different answers", lamented a Geology student (Session 8).

Motivation was another feature of perceived usefulness. Some students mentioned that working with classmates kept them going in their studies when they might otherwise be less driven to continue in their work. "Many people just work on it [assignments] with other people because it's easier to get through together", said another Geology student (Session 8)

Finally trust also related to reliable, timely communication. Some students turned to peers because they trusted that their peers could provide a quick response *when* they needed.

This was particularly important when students were communicating off-campus. One student mentioned he turned to peers because they could be relied for a speedy response "when it's 11'o'clock the night before the test" (Session 8, Geology student). Another said, "me, I always want information, like, whenever its due, five minutes before that. If someone doesn't answer in five minutes, I'm kind of t'd off" (Session 14 Engineering student). This is why she created a Facebook account for their set. It had an asynchronous discussion board, the Facebook "wall", where anyone could reply to anyone else's question. "If anything is due or any important thing, like whatever, you go and ask [on the Facebook discussion board]. Someone will reply", said her classmate in the same interview. Student communication with peers, then, seemed to be partly influenced by whether students were comfortable with communicating with peers, trusted the accuracy of their knowledge and trusted they would be timely and reliable in their responses.

Relationship with instructors

Some students did not communicate with peers about course related issues, or not always, even if they had access to and a trusting relationship with them. The quality of students' relationship with instructors affected if and how they interacted with peers. There were three dimensions of students' relationship with instructors that seemed to matter. First was access. Some instructors were in their offices regularly and had an open door policy where students could always approach them. A Robotic Computing student said, "anytime there's a real problem you can pretty much find them in their office" (Session 2). For others, it was "harder to find them in their office" (Session 13, Engineering

student). Student access to instructors was only partly shaped by students' program schedule. It also depended on the instructors schedule and commitments.

Interestingly, lack of communication access to instructors was a reason mentioned by both DE and mixed mode students. One Cardiology student lamented, "most of my problems weren't with the course content. It was getting in touch with tutors... In one class, I had a horrible tutor. She wanted to do a lot of communication by email. But she would never answer it". So the student turned to peers, not classmates but co-workers. "So there was actually a girl that had taken the course right before me. So I kind of ask her for help more than anything. We both work at the University hospital" (Session 41, Cardiac Science DE student). A Nursing student mentioned she asks course related questions "sometimes [to] the nurses if I can't find my instructor. The people that are there" in the clinical setting (Session 18, mixed mode student).

Earlier research by BCIT reinforces that students valued the opportunity to communicate with instructors about course issues. In 2005, BCIT conducted a study where 100 hundred students were approached in cafeterias and social spaces and asked one open-ended question: "what are the qualities of a good instructor?" The most common response was "willing to help students solve problems –take extra time" (BCIT, 2005).

A second dimension of quality of students' relationship with instructors was affective, whether students felt comfortable approaching them. Automotive students felt very comfortable approaching their instructors because "they'll go the extra mile for you"

(Session 34). "Most teachers are forthcoming with giving information", said a Marketing student (Session 10). Some students were more hesitant. A Synthetic Manufacturing student said that whom he turned to outside of class "has a lot to do with the teacher, whether he or she is welcoming" (Session 27). Some students hesitated about approaching the instructor, only turning to them as a last resort. When asked what channels they use to communicate with instructors, one Engineering student replied, "we don't (laughter from others in the group). Only when there are troubles the whole set doesn't solve. That doesn't happen." "Sometimes it does", said his classmate (Session 14). An Architecture student hinted at the sense of threat he felt at times about communicating with instructors. He would turn to peers because "there's something you don't want the teacher to hear from you" (Session 4). Later he said "rarely would you ask the teacher. You basically canvas all your friends. Then check the book. Then ask the teacher". He felt more comfortable communicating with peers first about course issues. For a Geology student his comfort with instructors depended on his own behaviour, which affected how he communicated with instructors, not if. "I email instructors all the time cause I don't like to talk about it [coursework] face-to-face cause they can catch me on all this stuff I don't do". "Yeah, me too", concurred his classmate in the same interview (Session 8).

A third dimension was whether students trusted the knowledge of their instructors. A Health Science student said he would communicate with classmates or instructors about course content "depending on if we feel the teacher or classmate will teach us better" (Session 24). A Synthetic Manufacturing student in the same interview spoke frankly.

"Quite a few [instructors] are not qualified to teach it [the content]". He "normally turns to classmates first, then teachers".

While some students preferred to interact with peers, others felt they had to because of their dynamic with instructors. Still others preferred to communicate with instructors. It depended on students' access to and trust of their interlocutors.

Knowledge domain/course content

Just as interesting as those who communicated with peers were those who did not. I noted in my observations that BCIT seemed to provide pretty good wireless access. I saw students online with their laptops at more than a dozen social spaces around campus. This cursory observation about wireless access was reinforced by student comments in the interviews and a review of BCIT institutional documents about ICT provisions. One student summarized this point when he said "internet connection is fast" and indicated that on campus he and other students regularly used bandwidth-hogging movie and music file sharing programs like Bit Torrent without any issues (Session 27, Synthetic Manufacturing student). "95% of the time the signals pretty good. The odd time its down", concurred a Marketing student (Session 10). Some students did complain about particular applications. For example, one Marketing student discussed using MyBCIT to check his grades but stated "it's down an awful lot" (Session 10). However, for the most part students seemed quite content with the many ICT options BCIT provided. BCIT Institutional Research and Planning conducts a regular survey about students and faculty ICT use and satisfaction. In a 2006 survey, 85% of students reported "networks were

'always' or 'often' reliable. This was an increase from the 2004 survey when this response for these items was 75% (BCIT, 2006). Unfortunately, the survey does not ask about specific ICT options.

Yet despite all this, many students did not use ICTs to communicate with peers or even instructors, outside of class. In the interviews with Automotive students, none indicated communicating with classmates outside of class. For them, communication with peers seemed to be informed partly by the course content and the knowledge domain of the program. These Automotive students had mainly psychomotor, tactile information needs for their courses. Most of their time on campus was spent in class or the auto shop. They might talk in class with classmates as they completed assignments and improved their skills using various machines. However, if they were not in a space where they could work on automotive parts and other machinery, then they were not working on courses or, it seems, talking "not so much with classmates" about course content (Session 34). For these students, it did not seem to matter if they had in-person or digital access to peers outside of class. Neither option seemed to add value to their mainly hands-on psychomotor learning needs. To them, working on course content required access to physical resources. Access to peers or provision of ICTs was not changing this need. The knowledge domain of the program, then, seemed to be an important factor affecting if and how students interacted with peers outside of class. As an Engineering student put it, "for my program, everything we do is here. We have to do it in the lab. Like electrical lab, manufacturing lab. Without our lab, there's not much we can do" (Session 13). This was also the case in the Manufacturing program where students were learning to use

machinery to manufacture metals, fabrics or, most commonly, paper for British Columbia's large forestry industry. So while peers were on campus 40 hours a week and could be reached via ICTs from off-campus, these communication options were not used.

This was the case for some technology students also. Students in trade programs (i.e. the schools of Construction & the Environment, Manufacturing & Engineering, and Transportation) worked with specialized physical equipment and machinery. Many students in "technology" programs also required specialized machinery. Journalism students needed photography, video and editing equipment that was available only on campus (Session 15, Journalism instructor). Being at a polytechnic, BCIT students have many hands-on courses where they use equipment or resources that are most readily or only available on campus. The knowledge domain also affected if and how students could even feasibly use ICTs to communicate with peers.

A Geology student said, "you can't really convey a lot of concepts in Mathematics via MSN. Unless you know all the ASCII codes (laughter from other students in the group interview)" (Session 8). The knowledge domain required learning and using graphic resources that were not easy to discuss with peers or instructors via ICTs. Thus some students preferred to communicate in person with peers. A Radiology student said it's "easier to ask in person, or show the diagram of what I don't understand" (Session 11, Radiology student).

Course design

The way courses were designed certainly affected if and how students communicated with peers outside of class. For many courses "there's a lot of group work required. For example, Operations" (Session 27, Synthetic Manufacturing student). Students would communicate with classmates to organize and complete this group work. A Management student said she interacted with classmates through various means to complete group assignments. "It depends on the group for me. Like you may come on the weekend and do it from here [BCIT]". Or "when we have a conversation [on MSN] or are working on a group project, we'll go into a conversation. And we'll do our work from there" (Session 38). Nursing students were also required to do group work, especially in their problem-based learning courses. This necessitated they communicate with peers outside of class. Sometimes they used ICTs to do so. "Sometimes if you're doing group work, then you might use Facebook or MySpace" (Session 19).

Course design certainly influenced if and how mixed mode and DE students communicated with peers. "For a WebCT course we have right now, it's a supplement to the Oncology course. Each group has to work through a question. Each person [in our group] would do a separate part of the question, then we'd post and respond to each other and make any changes. And then one person would put it together and post the answer" (Session 11, Radiology mixed mode student). However, one Cardiology student indicated he was glad to not have group work because interacting with peers was precisely what he did not want. It's why he took a DE program. "I'm doing DE because I work 40 hours week. I haven't got that flexibility for it [group work]" (Session 42).

Workload was another feature of course design that affected if and how students interacted with peers. Many students expressed concerns about a heavy course load. Some would "divide stuff up" (Session 20, Forestry student). A couple of Management students explained why they also did this. "It makes sense because if you were to do that stuff on some of these projects alone, you'd have to do a lot more than what we usually do which wouldn't make sense cause there's not enough hours in the day" (Session 38). Other students hoped to collaborate in such a way. When asked what would help them learn in their courses, one student said: "I think mainly in terms of course load, its pretty heavy. So maybe in the future, if the students could collaborate more" (Session 24, Health Sciences student).

Institutional supports

At BCIT there were often many sections within a course, especially larger courses. A popular program, like Finance Management, might have 12 sections. Students in each section elected a representative, a Set Rep, for short. This person acted as an intermediary between students and instructors. One student who was a Set Representative said that if there were course related issues "everyone will turn to me and I always turn to the teacher" (Session 11, Radiology student). However, few students interviewed even mentioned Set Representatives at all. Set Representatives may affect if and how students interacted with peers about course-related issues. But it was difficult to conclude this from how seldom they were mentioned by students.

Summary of factors affecting interaction dynamics

If and how students turned to classmates was shaped by a mix of structural and personal factors. Structural factors were beyond the control of students. These included how the program was designed, how specific courses were designed and the knowledge domain of a subject area. Personal factors were those over which students had some control. There were two dimensions of personal factors: attitudinal and behavioural. Attitudinal dimensions included whether a student trusted peers, her opinions about how useful and reliable peers were, and her perception about how available, safe and knowledgeable instructors were. These attitudinal factors seemed to influence the behavioural dimension. Students did turn to classmates and instructors for course purposes outside of class time. However, they seemed to do so far more in person than via ICTs. Often talking in person was a quicker and more effective channel of communicating with peers for course-related issues than using ICTs. When students did use ICTs, they preferred communicating with classmates via commonly available ICT tools and with instructors via institutionally provided ICT tools. Thus, more students mentioned using MSN messenger and even Facebook with peers than institutionally provided tools like WebCT and MyBCIT.

Central phenomenon

The central phenomenon grounded in the data was that outside of class, *students sought practical options to address their course-related issues*. Sometimes turning to peers was the practical thing to do. At other times, asking instructors or searching the web was more practical. Sometimes using ICTs was the most practical channel of communication

but *often ICTs were not the most practical option.* What made an option practical? It depended on whether it was an accessible, quick, safe or effective option.

Program design, peer trust and other factors listed in the previous section were important because they affected access, time management, safety, accurate knowledge, quick communication, relevance, and efficiency. "Program design" was important because two dimensions of program design –the cohort model and program schedule– affected access to classmates and instructors outside of class and how students managed their time. Some students would turn to classmates because, due to the cohort-model, they became familiar with and perhaps developed a relationship with classmates over the weeks and months as they faced common issues and goals. The cohort model provided regular access to classmates and a basis for trusting relationships. The program schedule affected time management. Students would often talk with classmates in person about course-related issues because they were on campus together so much. For many, it made sense to use the time in between classes to study together, seek help about administrative issues from classmates, etc. Program design often made talking in person the most practical channel for student communication with peers outside of class.

"Trust of peers" related to issues of safety, accuracy and time. If students trusted a peer affectively, they felt less risk approaching them about a course-related issue. But at times this was not enough. Some also wanted to be confident that interacting with peers was useful. Finally, some students turned to peers because they received help from them quickly, when they needed it.

"Quality of relationship with instructors" related to issues of access, safety and accurate knowledge. Approaching instructors instead of classmates for course-related issues often made sense if students found instructors physically accessible and emotionally safe. For some, however, they also had to trust that instructors' knowledge was accurate.

"Knowledge domain/course content" related to issues of relevance and efficiency. For some Trades students, for example, it was just not an appropriate option to communicate via ICTs with classmates about course-related subject matter that was mainly psychomotor. For most students, their ICT options were for textual or audio communication. For some of these students, ICT options would require too much time and would perhaps be less effective for, discussing say, physics formulae or a graphic with annotated notes. One Cardiology DE student summarized this efficiency point, referring to electrocardiographs, saying "there's a lot of stuff its not easy to describe [in WebCT]. Its easier to point to a picture and say 'what the heck is this'" (Session 40).

"Course design" related to issues of power and efficiency. Students certainly interacted with classmates outside of class for course purposes if institutional powers required they do so for course assessment. "We use [the WebCT chat] because our teacher wants to monitor our progress, how we work with case studies" (Session 11, Radiology student). Course design also related to work efficiency. Some students communicated with classmates because sharing a large workload saved time while effectively meeting course requirements.

Finally, some students used the institutionally sanctioned support of Set Representatives. These were a safe, quasi-anonymous way of addressing course-related issues. However, most students did not mention using this channel, perhaps because other channels were more accessible, trustworthy, accurate and efficient.

What this research reveals is an emerging portrait of students seeking practical options when communicating outside of class for course-related purposes. Turning to classmates was a common choice among students but by no means universal. Sometimes students preferred to talk to instructors instead. It depended upon structural and personal factors. These factors also influenced which options students used to communicate outside of class. Face-to-face was by far the most common channel of communication mentioned during the interviews. It was also noteworthy that ICTs were not predominant as a channel of communication among students, especially among younger students. There did not seem to be a difference in the response between younger students (i.e. those just out of high school) and older students (i.e. those who had left school before returning to BCIT). A biographical factor such as age of students did not seem to effect students' communication choices as much as structural and attitudinal factors did. There was not evidence to indicate that students did or did not use ICTs just because they were younger "digital natives" as opposed to older "digital immigrants".

Types of ICT used by students

It is also noteworthy which ICTs students did mention when they communicated via ICTs. They seemed to use MSN and personal email far more than they used WebCT or BCIT email. Commonly available ICTs seemed to be used more than institutionally provided ICTs. This was an unexpected finding. A literature search was conducted to see if this was a common trend. The same sources were used as were searched in the main literature review in Chapter Two. There were numerous articles about various ICT applications used for communication in postsecondary education. Most were about how students use various ICTs (e.g. e-portfolios, class blogs, etc.) and even how much they use them. No articles were found about how much students used commonly available ICTs like MSN and gmail. There were three relevant articles though.

The first article was about a controversy at Ryerson University in Toronto. A student was facing expulsion for coordinating and running a study group on Facebook (Tossell, 2008). He asked all participants of the study group to share and discuss their solutions of a Chemistry assignment. The instructor had stated in the handout that assignments had to be done alone. The student was charged with cheating. His defenders stated he was doing online what students did all the time in person: collaborate on course work outside of class time. The issue highlighted that students are using commonly available ICTs, and not just institutionally provided ICTs, to communicate with classmates about course work.

A second article was from the Chronicle of Higher Education (Carnevale, 2008). It indicates that hundreds of college campuses in the United States have left their email client systems and are using gmail or hotmail instead. These colleges save costs and staff hours required to run and troubleshoot their own email services. Google and Microsoft have both been offering email services to colleges and universities for free. They have been encouraging educational institutions by stating that they can focus on what they do best, education, and leave the technology services to tech companies. Apparently, several colleges switched to gmail or hotmail because of pressure from students who say they already use these applications and do not want to use yet another application. The article implies that students prefer commonly available ICTs to institutionally provided ones. Yet no research is cited to buttress this claim.

The third article was a variation of this issue. Lakehead University in northern Ontario replaced its e-mail network with gmail (CAUT, 2007). The faculty association filed a grievance about switching to an email client that was based in the United States and subject to American privacy laws. The article highlights how controversial it is to use commonly available ICTs in postsecondary education.

The sparse literature suggests that commonly available ICTs are used and popular on campuses. But all the articles are journalism pieces and none are based on or cite research. Thus it seems worthwhile to explore how much students use these ICTs compared to institutionally provided ICTs. Based on the findings of the pilot study

another research question was added to the two from the literature review. This third question was:

- Do students use institutionally provided ICT tools for peer interaction for course purposes more than they use commonly available ICT tools?

It is premature to conclude if any findings from this pilot study were common trends across BCIT. To study these trends more broadly a research survey was created based on the results of this pilot study and existing literature. The creation and administration of the survey are discussed in detail in the next chapter.

Chapter 4: Primary Study Method

In this chapter the research design for the study is discussed including the survey instrument design process, sampling, data collection, data entry, screening and cleaning. The chapter concludes with a discussion of statistical techniques used to analyze the data for each research question.

To address the research questions, a survey was designed to gather information about students' communication and study habits and attitudes. Most of the survey instrument focused on psychological and behavioural items, as the instrument was designed to measure personal factors related to how students' communicate outside of class. Other data sources were used to gather information on structural factors (e.g. program and course design). To gather information on these structural factors, instructors were asked to complete a brief open-ended survey. Information was also gathered from program documents. To keep the study manageable and focused, structural factors and these other data sources, while used, became a secondary priority of research design and analysis. Data on structural factors were added as categorical variables within the larger data file of psychological and behavioural items.

Survey design process

The survey instrument was created in a three-step process. First, a question inventory was created. Second, it was reviewed for content validity. Finally, it was pilot tested for usability. The results of the pilot test were used to assess reliability.

Research variables and survey items

A question inventory was created based on the variables within the three research questions. The three questions required some overlapping but mainly distinct measures in the survey. The first question was about what factors motivated students to communicate outside of class. It was the most complex research question to address. The attitudinal items created for this question derived mainly from the pilot study and from articles discussed in the literature review, particularly Karabenick and Knapp's help-seeking studies (1991, 1998), Kitsantis and Chow's study on help-seeking and perceived threat (2007), Nicholson's (2002) study on virtual hallways, the Pedagogy and Technology Survey conducted by the Centre for the Study at Learning and Performance at Concordia University (2004), Picciano's (2002) study on student interaction patterns, Pintrich's Motivated Strategies for Learning questionnaire (1993), and Rovai's Classroom Community Scale (2002).

The second and third research questions were more straightforward. They required measures about students' communication patterns and ICT use. Communication and ICT options that were listed on the survey derived from the qualitative pilot study and BCIT's survey of ICT access and use patterns by new and incoming BCIT students (BCIT TEK, 2008).

The result of this stage was an initial eight-page, 160 item question inventory. These were reviewed and eventually culled to a six-page pool of 122 items.

Content Validity

In the second stage, these items were reviewed for clarity and relevance. Five researchers and practitioners in educational technology, uninvolved in the research, reviewed the survey in the Spring of 2008. They were asked to rank and judge the questions for clarity and relevance to the topic of each section of the survey. These topics were indicated in explanatory notes throughout the survey. After feedback from these reviewers, items were removed or edited resulting in a four-page 76 item survey.

This stage also involved important back and forth with BCIT, as it was the research site for the survey. It was agreed that they would include related items in the survey for their own research purposes. In exchange, they allowed access to their campus as a research site and provided institutional support for the research. The survey was sent to BCIT's Director of Planning and Institutional Research for him to add or edit items. He had knowledge of the campus research that already existed on related topics and thus provided important comments and suggestions. His approval helped secure institutional buy-in and support for the data collection stage of the study. (For example, when instructors and students were approached, it was helpful to say BCIT's Planning Office supported the research). Fortuitously, the Planning Director was also on BCIT's research ethics board and could advise if there were any questions of concern for BCIT. After his feedback and approval, the survey was sent to the research team at BCIT's Learning and Teaching Centre. They were keen to use the survey results for their decisions. Three members of their research team reviewed the survey and added questions about the location and time of where students studied, as well as about students' personal interests.

Survey Instrument

From this process, the resulting survey had four sections (see Appendix H for a copy of the penultimate survey being discussed here):

- section one included biographical and demographic items
- section two included behavioural items about what students do to address academic and administrative questions
- section three included behavioural items about student communication habits, including use of ICTs
- section four included mainly attitudinal items about students' study preferences, perception of peers, instructors, and their programs

Items from section one and three were designed to help address research questions about whether NetGen students were more likely to use ICTs than face-to-face communication, and whether students used commonly available ICTs more than institutionally provided ICTs. Items from sections one, two and four were created to address what factors motivated students to communicate with peers outside of class for course purposes.

The instrument included groups of items to measure the two personal attributes identified in the pilot study; trust of peers and perception of instructors[8]. Several items were

[8] These measures have been called "attributes" rather than "constructs". In doing so, a more conservative definition of constructs is being used. Attributes indicate how a

necessary to measure these attributes, as there were no direct measures of peer trust and perception of instructors. Peer trust had three dimensions. The affective dimension of trust was the most difficult to operationalize. The following items were used based on existing studies:

- I trust other students in this program.
- I enjoy discussing my ideas about course content with other students.
- I feel isolated from other students in this program. (This was a negatively worded version of the item "I feel connected to others in this course". Both the positively and negatively worded items are in Rovai's Classroom Community Scale (2002)).

Measuring the reliability dimension of peer trust was more straightforward, with the following items used:

- I can rely on classmates to help me.
- I can rely on classmates to respond to my course questions quickly.

To measure the usefulness dimension of peer trust, the following items were used:

- I work with classmates because it helps me understand course content better.

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person feels, behaves or thinks (Creswell, p. 124). Constructs are groups of items used to measure an attribute indirectly (Cronbach & Meehl in Lissitz & Samuelson, 2007, p.439). Indirect measures are being used in this research, such as "trust of peers" and "perception of instructors". However, constructs are usually indirect measures based on prior research. That is not the case with the indirect measures here. At best, the output of this study could be used as constructs in future research.

- I work with classmates because I enjoy it.
- I work with classmates because it saves time.
- I work with classmates because it keeps me motivated to keep working.
- I work with classmates because classmates provide useful feedback for my work.

These items were derived from the qualitative pilot study. For these items, a "Not Applicable" option was added to the Likert scale.

To measure students' perception of instructors, the following items were used:

- Instructors are available when I have any question in a course.
- Instructors are approachable if I have any questions in a course.
- I don't want to look stupid so I don't ask instructors questions outside of class.
- Instructors in this program are knowledgeable.
- I would not hesitate to ask an instructor for help.

For all scale items, behavioural and attitudinal, a four point Likert scale was used. The middle points of the Likert scale were not defined, allowing the scale to be a true ratio scale. There was an important exception. For the items in section three, on communication habits and ICT use, the Likert scale was defined with numerical usage rates. This was at the insistence of BCIT's Planning Office. Unfortunately, this scale was used, a decision that would later limit the robustness of statistical analysis (as the scale was now ordinal instead of continuous).

Pilot-test

After this stage of the survey instrument design, the resulting four-page 92 item survey was pilot-tested in a class at Concordia University. The goal of the pilot was to test the usability and reliability of the instrument. "Teaching Science Concepts in the Elementary Classroom" (EDUC 382) was chosen for the pilot test because it is an undergraduate course and most students had some science background. This paralleled most courses at BCIT, which are mainly science and trades courses at a college and undergraduate level.

At the outset of the pilot, students were informed of their consent rights, their right to not participate and the purpose of the survey and pilot. Respondents were also asked to make comments and suggestions while completing the survey about the clarity and format of the survey. After all surveys were completed, a ten minute question and answer session was held with students to get their thoughts and feedback of the survey for clarity, sense of relevance and ease of completion. Students (N=40) were also timed for how long it took to complete the pilot survey. (It took 7 to 12 minutes).

Data was entered from the pilot test and factor analysis was run for all attitudinal items. The aim was to identify attributes (i.e. factors) that clustered together and see if these were consistent with the qualitative pilot study results. The analysis resulted in four factors that were both greater than an eigenvalue of one and before the inflexion point on the scree plot curve. There was a fifth factor above the eigenvalue of one. It was not

retained as it was a sole item and appeared after the curve in the scree plot began to plateau (see Appendix I for scree plot).

Overall, factor analysis found four attributes to measure students' attitudes of why they communicate with peers outside of class (see Table 6). The attributes "usefulness of peers" and "perception of instructor" (i.e. factor 1 and 2 respectively) were found and were consistent with the results of the qualitatively pilot study. Items for the other two attributes of peer trust –affective trust and reliability– clustered in a pattern together (i.e. factor 3). Not all of the original items loaded on this factor. The fourth factor was called "help seeking". The two items that loaded for this factor were originally included to measure student attitudes toward their program and toward their instructors respectively.

Factors three and four were retained as attributes (i.e. peer trust and help-seeking). In the grounded theory research, too fine a distinction may have been made when measuring the attribute "peer trust". The affective dimension of peer trust was separate from the reliability dimension. The observed patterns from the factor analysis show these two dimensions may be strongly related. This seems to indicate that peer trust can be measured, but different items need to be used than suggested from the grounded theory results.

The fourth factor, "help-seeking", was not an attribute identified in the qualitative pilot study but it was discussed in the literature review. The two items in this attribute were originally included to measure student attitudes toward their program and toward their

instructors respectively. This fourth attribute was used and retained, as it was a re-emerging theme in the literature, just one that had not been initially highlighted.

Table 6: Factor analysis of attitudinal scales for student communication habits

	Factor loading			
Items	1	2	3	4
17a I work with classmates b/c they help me understand content better	0.785			
17b I enjoy working with classmates	0.780			
17c I work with classmates b/c it results in better work	0.755			
17d I work with classmates b/c it saves time.	0.709			
17e I work with classmates b/c it motivates me.	0.862			
17f Classmates provide useful feedback for my work	0.745			
19a Instructors are available when I have questions		0.901		
19b Instructors are approachable when I have questions		0.924		
19d Instructors in program are knowledgeable		0.826		
19e I would not hesitate to ask an instructor for help		0.690		
16a I trust other students			0.848	
16b I rely on other students in this program to help			0.877	
16c I can rely on classmates to respond quickly			0.879	
18b I need help in this program				0.743
19c Don't want to look stupid				0.720

Factor	Eigenvalues	% of variance	Cumulative %
1	4.306	22.665	22.665
2	3.400	17.894	40.559
3	3.123	16.439	56.999
4	1.712	9.011	66.010

Rotation Method: Varimax with Kaiser Normalization.

Reliability

The reliability of all items used was checked with Cronbach's alpha coefficient. Reliability analysis results showed acceptable levels of Alpha coefficient for the entire instrument (0.78 for 38 items) and for each attitudinal subscale, ranging from 0.81 to 0.89

(see Table 7).

Table 7: Reliability of subscales

Scale	Number of items	Alpha coefficient
All items	38	.78
Trust of peers (affective and reliable)	3	.89
Usefulness of peers	6	.89
Perception of instructors	4	.87
Help-seeking	2	.81

As a result of the pilot test, changes were made to the final version of the instrument. The following items were removed:

- I prefer to work in groups because it ends up being less work for me.
- I would rate my educational experience in this program very highly.

The following item was added based on feedback from students and reviewers:

- I would not hesitate to ask an instructor for help.

Several other items were edited for clarity. (Please see Appendix J for final survey instrument).

Sampling

The survey was administered at BCIT, the same research site as the qualitative pilot study. Thus, the quantitative data could be readily related to the qualitative pilot data. The BCIT Planning and Institutional Research Office provided a spreadsheet of all courses offered during the Fall semester of 2008. From this list, all level one and two courses were removed, as these were courses taken mainly by first year students. These

first year students were removed from the sample because the survey was being administered early in a new academic year. Most first year students would have little experience at BCIT to draw on to complete the survey.

A table of random numbers was generated to select courses to survey from the remaining list of courses. The goal was to ensure that at least 350 students responded to the survey. This is a good sample size for conducting most statistical techniques (Creswell, 2008, p.156) and for factor analysis it is considered "good" to have at least 300 cases (Comrey & Lee in Field, 2005, p.639; Tabachnick & Fidell, 2006, p.613). Initially 16 courses were randomly selected. Instructors from these courses were asked via email to participate in this research project by allowing me to come to their class to survey students (see Instructor Contact email, Appendix K). A follow-up email was sent to non-responding instructors four days later. Only seven of the sixteen instructors consented to participate. During the second round of sampling, an additional 11 courses were selected and instructors contacted. Seven of these instructors also consented to participate. The final list of 14 courses surveyed is indicated in Table 8, in the order in which they were surveyed.

Of the 14 courses, four were from the School of Business, four from the School of Construction and the Environment, three from the School of Health Sciences, two from the School of Manufacturing, Electronics and Industrial Processes and one from the School of Computing and Academic Studies. No courses were selected from the School

of Transportation. This was unfortunate though not fully surprising as the School of Transportation is by far the smallest school at BCIT (BCIT, 2007b, p.3-2).

Table 8: Courses where the survey was administered

COURSE TITLE (and PROGRAM)	SCHOOL	NUMBER OF RESPOND-ENTS
1. Introduction to Mineral Processing (Mining and Mineral Exploration)	Manufacturing, Electronics and Industrial Processes	27
2. Applied Physiology 2 (Nuclear Medicine)	Health Sciences	8
3. Object Oriented Programming in C++ (Computer Systems)	Computing and Academic Studies	36
4. Design of Steel Structures (Civil Engineering)	Construction and the Environment	6
5. Heating, Ventilating and Air Conditioning (Building Engineering)	Construction and the Environment	93
6. Technical Communication 2 for Electronics (Electrical and Computing Engineering)	Manufacturing, Electronics and Industrial Processes	21
7. ArcGIS 3: Customization and Modeling (Geographic Information Systems)	Construction and the Environment	33
8. Business Planning Principles (Marketing Management)	Business	79
9. Management Accounting Administration (Business Management)	Business	22
10. Transportation Economics (International Trade and Transportation)	Business	20
11. Video Production (Broadcast and Media Communications: Television)	Business	35
12. Systematic Inquiry Research (Nursing)	Health Sciences	23
13. Sanitation for Food Processing (Food Management)	Health Sciences	13
14. 3D Computer Rendering for Interior Design (Interior Design)	Construction and the Environment	22
TOTAL	---	438

For each course I went to the classroom at the agreed time and administered the print survey[9]. An outline rather than a script was used to introduce the survey (see Appendix L). Students were informed about the purpose of the survey, told they were free to participate or not without any negative consequences to their class standing. They were also told their responses would be kept anonymous and results of the research would be published. Finally, they were given details about the process of completing the survey. Most students in the courses participated but a few did not. The final number of usable respondents in each course is also indicated in the table above.

While the students were completing the survey, instructors were asked to complete a short survey that provided background information about the course (see Appendix M for the instructor survey). Information from instructor surveys and BCIT's website were used to create categorical variables. (To provide some context of the courses surveyed, the content of these courses is included in Appendix N).

Data Entry, Screening and Cleaning

Data entry

Data was entered manually from the print surveys into an Excel spreadsheet before later being imported into SPSS. It was not feasible to proofread the entire data file, given the large number of data cells (roughly over 36000 data points). Thus, data was examined for accurate entry using a random check of surveys, descriptive statistics and graphs.

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[9] An online version of the survey was created using Vovici, BCIT's survey tool. Unfortunately, in the end there were no online participants in this study.

Forty-five surveys were chosen via a table of random numbers and checked for accurate data entry. Then, frequencies were run and histograms created for all items of the survey. These were perused to see if all values were within range, and if the means and spread seemed plausible. In a few cases, respondents chose their own responses, rather than those provided in the Likert scale. For example, a few students wrote in responses like "2.5" on the scale, between option 2 and 3. In such cases, the responses were entered as 2 or 3 depending on which was closer to the mean for the item.

Missing Values Analysis

There were originally 449 surveys completed. Eleven were discarded as they had so few items complete as to not be useful (or in the case of three of these eleven surveys, they were completed with joke responses). Missing values analysis was conducted on the remaining 438 surveys. Two items had missing values of more than five percent. Item two, on date of birth, had 24 missing values (5.5%). Twenty-two values, or 5%, were missing from item 19e, "I can rely on instructors to respond to my course questions within a few hours". There are no firm guidelines on how much missing data is acceptable but the pattern of missing data does matter. For the above items there was no identifiable pattern for the missing data. The amount of missing data was tolerable, then, as data seemed to be missing completely at random and were a relatively small percentage.

Testing for assumptions of normality

Histograms were created for all behavioural and attitudinal scale items to test for assumptions of normality. For large samples, Tabachnick and Fidell (2007, p.80) recommend looking at the shape of the distribution to judge for skewness and kurtosis rather than using formal inference tests. From the graphs, there were no concerns about kurtosis. There was, however, for skewness. Normal probability plots and detrended normal probability plots were then created for items that were skewed, whether positively or negatively. After skewness analysis, there was a slight negative skewness for several items but not enough to violate the assumption of normality.

The one exception was for an important behavioural item where respondents were asked how often they talk to a classmate when they have a question about course content (item 9b). There was a very strong negative skew (M=3.62, SD=0.60, N=433). This was important because the main focus of the first research question was about students talking to classmates for course related purposes. The responses indicate that students do turn to classmates very regularly to address academic questions. But because the responses were not normally distributed or even close to normality, the lack of variance meant the item could not be used for any meaningful correlation or regression analysis with the results of the attitudinal items. (See Appendix O for the histograms, normal PPlots and detrended normal PPlots for this item in contrast to, say, responses for (item 9a), how often students turned to instructors for academic questions).

Outlier analysis

Z scores were calculated for all relevant scaled items in order to reveal univariate outliers. Twenty-six values (from over 18,000) were found to have standardized scores greater than 3.29. With a larger sample size this amount of outliers is acceptable. Indeed, this number of outliers is to be expected, as nearly 99.9% of scores were within plus and minus 3.29 standard deviations and only 0.1% of univariate outliers were in excess of 3.29. Thus, these 26 univariate outliers were left unchanged.

Multivariate analysis was important for the research so multivariate outliers needed to be identified[10]. Mahalanobis' distances were calculated and interpreted for items that were to be used for multivariate analysis. This was done by calculating multiple regression to a dummy variable (i.e. the survey number). The output created an extra column with Mahalanobis distance numbers. Results indicated 16 cases exceeded the critical chi-squared value ($\chi^2(24)=51.18$, $p<.001$). For these 16 cases, means were calculated for all 24 items and compared to the means of these items for cases where Mahalanobis' distances were less than χ^2 critical. Four of 24 items were identified as having a

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[10] A multivariate outlier is a response that does not seem to make substantive sense when two or more variables are combined. For example, say one was conducting a survey at a hockey game. A 15 year old completing the survey would be normal. A person who earns $50000 a year is also not unusual respondent to the survey. However, 15 year old who earned $50000 a year would be an unusual respondent and would be considered a multivariate outlier.

substantial difference between means (greater than 0.9 for a four point scale). The values for these items in the 16 cases were eliminated, an acceptable option for reducing the influence of outliers (Tabachnick & Fidell, p.76).

Multicollinearity

Correlations were calculated for all scaled survey items to assess if any items might be multicollinear. In particular, there were concerns that two items were the same or very similar. Item 16d stated "I enjoy discussing my ideas about course content with other students" and 17b stated "I work with classmates because I enjoy it". For these items the correlation was 0.43. No perfect or near perfect correlations were found.

After the process of screening and cleaning, data was now ready for analysis.

Chapter 5: Primary Study Results

The results for each of the three research questions are presented in order below. The process of analyzing each question is discussed, followed by the results and interpretation of results. Detailed discussion of the implications and limitations of these findings are in the next chapter.

Research question 1: What factors motivate students to communicate outside of class for course-related purposes?

Addressing this research question involved three analyses. First factor analysis was conducted of items measuring students' attitudes about their courses, classmates, instructors and study habits. The attitudinal factors resulting from this analysis were then correlated with behavioural factors. This required conducting factor analysis of behavioural items and creating factor scores for both behavioural and attitudinal factors. Finally, a regression model was created using the factor scores and correlation results. Realistically, only the first step, factor analysis of attitudes, was necessary to answer the research question. The other two analyses were useful for examining the value of the factor analysis and strengthening the findings.

Factor Analysis

Factors were extracted for all attitudinal variables of the survey by using a cut-off point of 0.6 for loading factors. Factor loadings are considered high if they are above 0.6 and moderate if they are above 0.3 (Kline, 1994, p.6). Variables were analyzed several times,

with non-loading factors removed each time to help create a tighter model. After three iterations, all items loaded on a factor above an eigenvalue of one and before the point of inflection in the scree plot. During these analyses, varimax rotation was used. However, when oblique rotation was used, the factor correlation matrix (see Table 9) showed two factors, (factors 1 and 3), with a correlation of -.43.

Table 9: Factor correlation matrix

Factor	1. Peer Usefulness	2. Perception of Instructors	3. Peer Trust	4. Independ-ence	5. Perception of course	6. Threat
1. Peer Usefulness	1.00					
2. Perception of instructors	.07	1.00				
3. Peer Trust	-.43	-.15	1.00			
4. Independence	-.13	.09	.10	1.00		
5. Perception of course	-.06	-.29	.05	-.09	1.00	
6. Threat	.01	-.27	.09	-.20	.19	1.00

Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser Normalization.

Tabachnick & Fidell state that "if correlations exceed 0.32 [or are less than -0.32] there is 10% or more overlap in the variance among factors, enough variance to warrant oblique rotations" (2007, p.646). In this case, there was 18% variance overlap between the factors 1 (i.e. peer usefulness) and 3 (i.e. peer trust). This was not surprising as some researchers claim that orthogonal rotation "strains reality" as there is usually some relationship between factors (Tabachnick & Fidell, 2007, p.637; Field, 2005, p.637). Thus, an oblique rotation was chosen (i.e. oblimin) to ensure that only the unique

Table 10: Pattern matrix[a] of attitudinal variables

Factors	1. Usefulness of peers	2. Perception of instructors	3. Peer trust	4. Independence	5. Perception of course	6. Threat
Eigenvalues	5.28	3.11	1.67	1.39	1.06	1.01
Percentage of variance	26.42	15.57	8.35	6.96	5.29	5.04
Cumulative percentage	26.42	41.99	50.34	57.30	62.60	67.63
Questionnaire items						
17a Classmates help me understand course content better	.753					
17b Work w classmates because I enjoy it	.685					
17c Working w classmates results in better work completed	.911					
17d Working with classmates saves time	.901					
17e Working with classmates keeps me motivated to keep working.	.812					
17f Classmates provide useful feedback for my work	.711					
19a Instructors are available when I have any questions.		.811				
19b Instructors are approachable		.698				
19d Instructors in program are knowledgeable		.672				
19e I can rely on instructors to respond to course questions within a few hours.		.771				
16a Trust other students in the program			-.835			
16b Rely on classmates to help me			-.835			
16c Rely on classmates to respond to course questions within a few hours			-.826			
16d Enjoy discussing my ideas about course content with other students			-.655			
14a Prefer to do schoolwork on my own				.805		
14c Prefer to learn by trying things for myself				.854		
18c. I feel this program has a manageable workload. -					-.872	
18d. I would recommend this program to others.					-.722	
19cR Reverse of "Don't want to look stupid"						-.894
19f I would not hesitate to ask an instructor for help.						-.741

Rotation Method: Oblimin with Kaiser Normalization.
a. Rotation converged in 5 iterations.

relationship between each factor and observed variables was included in the model. The results of the tightest pattern matrix are in table 10.

The pattern matrix yielded six factors with eigenvalues greater than one (ranging from 5.28 to 1.01) and before the scree plot flatlined (see Appendix P for scree plot). The six factors accounted for over two-thirds of variance in the measure (67.63%). The structure matrix provided a useful double-check of factors extracted in the pattern matrix and also ensured shared variance among factors was not ignored. The same items load on the same factors in the structure matrix as in the pattern matrix (see Appendix Q for structure matrix).

Factors were named by two criteria. If they loaded consistently with the characteristics from the quantitative pilot test, they were given the characteristic name. Otherwise, they were given a name that reflected the common theme among variables in a factor. The first factor comprised of items related to usefulness of working with classmates and was shortened, in the tables, as "usefulness of peers". The second factor incorporated items related to students' "perception of instructors". The third factor comprised of items related to "peer trust". The fourth factor incorporated items about respondents' independence. The fifth factor incorporated items related to how respondents' perceived

their courses. For the sixth factor, items related to respondents sense of threat and their willingness to seek help from instructors. This was labeled "threat" for short.[11]

All items within factors 3, 5 and 6 had negative signs. Kline (1994) states that "the signs of the loadings are only relatively and not absolutely important". That is to say, the valences of items within columns represent their location in vector space. Valences do not indicate a positive or negative correlation between factors. Valences of factor loadings should be interpreted within columns only and not across factors. "It should be possible to reverse the signs [of items] in this factor (or any factor) without in any way changing its interpretation" (Kline, 1994, p. 107).

The first three factors, "usefulness of peers", "perception of instructors" and "peer trust" were consistent with attitudes students indicated in both the qualitative pilot study and the quantitative pilot test of the survey. This would seem to indicate that students' opinions about the usefulness of working with classmates, their perception of instructors and their sense of how much they trust classmates may be important factors for why students communicated outside of class for course purposes. However, it was unclear if there was a relationship between these attitudinal factors and students' actual behaviour. Furthermore, it was uncertain if the factor model of attitudinal items could predict

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[11] It is notable that for most factors, variables loaded in clusters of the survey item numbers. The issue of survey structure bias is an important one, which is discussed in the limitations section of chapter six.

behaviour? That is to say, did students' attitudes about their peers, instructors and courses relate to their communication behaviour?

Correlation of attitude and behaviour

Assessing the relationship between attitudes and behaviour involved creating factor scores for attitudinal variables, creating a factor model for behavioural variables, creating factor scores for behavioural variables and finally, correlating attitudinal and behavioural factor scores.

Factor scores were calculated for attitudinal variables using the Anderson-Rubin, Bartlett and weighted averages methods. The Anderson-Rubin method was eventually chosen as it produces factors scores that are uncorrelated. This was important as the factor scores were later used as predictors in regression analysis. Having uncorrelated factor scores thus addressed concerns of multicollinearity.

Behavioural factors were analyzed using a cut-off point of 0.6. When oblique rotation was conducted, there was no correlation among factors above 0.32. So varimax rotation was conducted and used as it had similar loadings as oblique rotation and is easier to interpret. Factor analysis results are displayed in Table 11.

After two iterations, all items loaded on a factor above an eigenvalue of one. The factor matrix yielded five factors with eigenvalues ranging from 1.70 to 1.44. The five factors accounted for over two-thirds of variance in the measure (71.26%). The first factor was

about whether students turned to the set representative for academic and administrative issues respectively. (A set representative was a student chosen by classmates to represent them to instructors and program staff). The second factor comprised of items about whether students talked to non-classmates such as friends, family, work colleagues or students not in their class. The third factor comprised of items related to whether students turned to BCIT staff who were not instructors, for administrative questions. The fourth factor incorporated items about whether students talked to instructors for academic and administrative questions. The fifth item comprised of items related to whether students addressed their academic and administrative questions on their own.

Table 11: Behavioural factor loading matrix

Factor	1. Set Rep	2. Non-classmates	3. BCIT staff	4. Instructors	5. Self
Eigenvalue	1.704	1.704	1.545	1.451	1.435
Percentage of variance	15.49	15.49	14.05	13.19	13.05
Cumulative percentage of variance	15.49	30.98	45.02	58.22	71.26
Variables					
9c Set representative (academic)	.897				
10c Set representative (admin)	.916				
9d Other students (academic)		.683			
9e Another person (academic)		.800			
9h Work colleague (academic)		.709			
10e Program head (admin)			.852		
10f Admin staff (admin)			.875		
9a Instructor (academic)				.835	
10a Instructor (admin)				.812	
9i Address it on my own (academic)					.828
10h Address it on my own (admin)					.838

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 5 iterations.

There was little indication or concern about survey structure bias for behavioural factor analysis results as there was for attitudinal factor analysis. Indeed, it is notable how items loaded on the same factors about similar resources (e.g. Set Representatives) even though they were located in different parts of the survey.

It is important to note that survey items about "talking to classmates" did not load on any factors. This was despite the fact students nearly always turned to classmates as their number one option, for academic and administrative questions. When asked what do they do when they have a question about course content, students said their first choice was talking to classmates (M=3.62, SD=0.60, N=433). This was more than the next highest choice of "trying to address it own my own" (M=3.26, SD=0.73, N=429). Classmates were also the first choice when students were asked what they do when they have an administrative question about a course or the program (M=3.28, SD=0.88, N=434). This was slightly more than the next highest choice of talking to the instructor (M=3.19, SD=0.91, N=435).

Classmates were such an important resource for students that responses to items about classmates violated the assumptions of normality. Over two-thirds of respondents (67.9%) stated they "always" talk to classmates when they have a question about course content and no respondents (0%) stated they "never" talk to classmates. (The Likert scale ranged from 1=Never to 4=Always). Over half the respondents (50.5%) stated they "always" turn to classmates when they have an administrative question about a course or the program and only 5.8% stated they "never" talk to classmates. Thus, there was a

strong negative skew for responses about "talking to classmates" (see Appendix O for histograms). Given this ceiling effect, items about talking to classmates did not load on any factors. The lack of spread in responses meant that items about "talking to classmates" could not correlate with other items and thus were not in the factor model.[12]

However, it was still possible to explore if students' behaviour were related to their attitudes about why they communicate with others for course purposes. To explore this relationship, factors scores from the attitudinal factor model were correlated with factors scores from the behavioural factor model. The results of the correlation matrix are indicated in table 12.

Seven correlations were significant (all at $p<.01$) in the correlation matrix of attitudinal factors (i.e. about students attitudes to classmates, courses, instructors and study habits) and behavioural factors (i.e. about their behaviour for addressing academic and administrative questions). Five of the seven significant correlations were about whether students talked to instructors for academic and administrative questions (behavioural

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[12] Reasons for talking to classmates could not be explored in this research but given the importance of this resource to students, their reasons for talking to classmates probably should be explored. Future research would benefit from more items and more varied items about students' talking to classmates for course and academic purposes. These items would also benefit from using a wider scale (perhaps a six or seven point scale) to allow for more variability than the four point scale used in this research.

factor 4). Of these five, only two were moderately inter-correlated with attitudinal factors. There was a medium effect between students' perception of instructors (attitudinal factor 2) and whether they talked to instructors (r=.31 or 9.7% of total variance explained). There was also a medium effect size between students' perceived sense of threat (attitudinal factor 6) and their tendency to ask the instructor about academic or administrative questions (r=-.37, representing 13.8% of total variance). These correlations make sense substantively. As students had a more positive perception of their instructors, they seemed more likely to talk to them about course and administrative issues. It also seems that the more threat students' felt, the less inclined they were to talk to the instructor. The moderate strength of the relationship between the factor "perceived threat" with students' actual behaviour is an unexpected finding which will be discussed in more detail later.

Table 12: Correlation of attitudinal and behavioural factors

	Behavioural Factors				
Attitudinal Factors	1. Set Rep	2. Others non-classmates	3. Resources	4. Instructor	5. On own
1. Peer Usefulness	.140*	.088	.043	.125	.042
2. Perception of instructors	-.011	-.102	.056	.312*	.038
3. Peer trust	-.089	.034	-.031	-.145*	-.105
4. Independence	-.054	.007	.011	.184*	.249*
5. Perception of course	-.021	-.014	.051	-.150*	-.015
6. Threat	-.021	-.019	.025	-.372*	.010

*Significant at p<.01

Two significant correlations were not about students' behaviour with instructors. Respondents who were more independent were more likely to address their academic and

administrative questions on their own (r=.25 or 6.3% of variance explained), according to the correlation of "Independence" (attitudinal factor 4) and "Working on one's own" (behavioural factor 5). This relationship seems straightforward enough, showing that those who prefer to learn on their own do indeed try to address academic and administrative questions on their own. The finding may also suggest correlations of attitudinal and correlation factors can make sense substantively and are not just random statistical correlations. If anything, it is a bit surprising how small the effect size is.

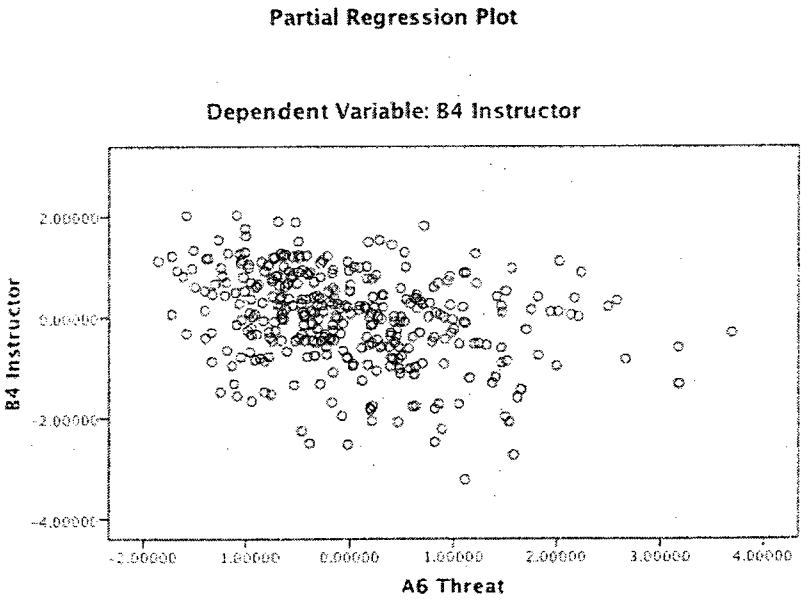
The last significant correlation indicates that students who found it useful to work with classmates were likely to turn to their Set Representative for course and administrative questions (attitudinal factor 1 and behavioural factor 1). However, not too much can be read into this result as this was a fairly small effect, r=.14, explaining only 2.0% of total variance.

Regression of attitude with behaviour

Multiple regression analysis was conducted to see if students' attitudes could be used to predict their behaviour. Results of regression analysis depend upon the predictors selected and how they are entered into the model. Correlation analysis above indicated that nearly all attitudinal factors showed significance to one behavioural factor, "use of instructor". So the former factors were obvious choices as predictor variables with "use of instructor" as the criterion variable.

Hierarchical entry was used to enter five predictors into the model based on which predictors had the largest effect in the correlation analysis. Model one had one predictor, "perceived threat", model two had two predictors, "perceived threat" and "perception of instructors" etc, corresponding to the correlation analysis. Thus, there were five models in total. Of the five predictors, only two showed noticeable patterns in the partial regression plots. For the predictor "perceived threat" there is a noticeable negative relationship: so with less perceived threat students were more likely to use the instructor for academic and administrative questions (see Figure 2).

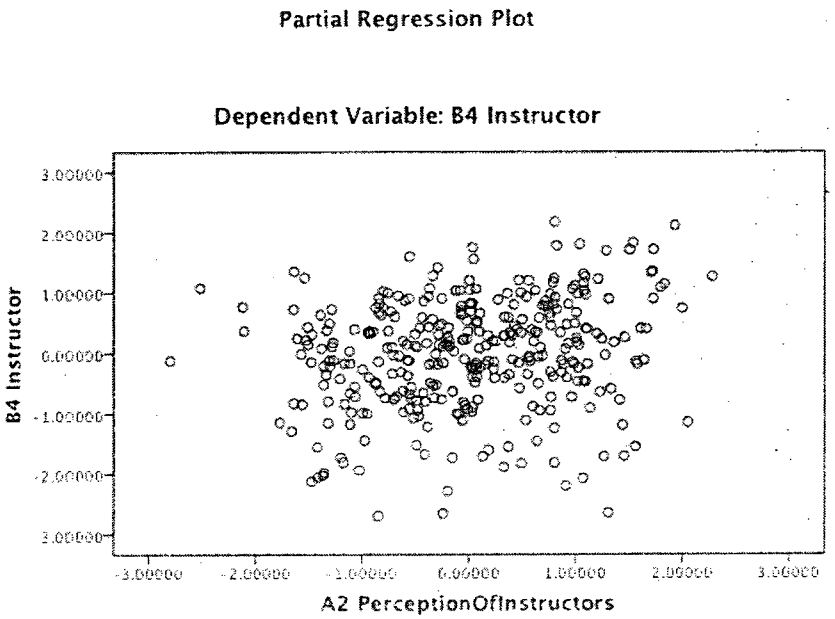
Figure 2: Partial regression plot of factors "perceived threat" and "use of instructor"



For the predictor "perception of instructor" there seemed to be a slight positive relationship with "use of instructor" as the criterion (see Figure 3). No relationship was

easily visible in the other partial regression plots (see Appendix R for the other regression plots).

Figure 3: Partial regression plot of factors "perception of instructor" and "use of instructor"



Thus, the model would likely have at least two significant predictors. Field (2005) recommends that all models with two or more significant predictors should also be analyzed using Forward Stepwise analysis. This was done and yielded similar results as the Hierarchical Entry method. The final regression results are indicated in Table 13.

Table 13: Students' attitudes that predict whether they talk to instructors for academic and administrative questions

	B	*SE B*	*β*
Step 1			
Constant	0.02	0.05	
Threat	-0.36	0.05	-.37*
Step 2			
Constant	0.02	0.05	
Threat	-0.30	0.05	-.31*
Perception of instructors	0.23	0.05	.23*
Step 3			
Constant	0.02		
Threat	-0.28	0.05	-.29*
Perception of instructors	0.22	0.05	.23*
Independence	0.11	0.05	.11**

Note R^2=.14 for Step 1; ΔR^2 =.05 for Step 2 (*p*s<.001); ΔR^2 =.01 for Step 3 (*p*s<.05). *p<.001, **p<.05.

Three attitudinal factors were significant for predicting Use of Instructor, not two as expected from observing the partial regression plots. The strongest predictor was Perceived Threat (β= –.29), followed by Perception of Instructor (β= .23), and Independence (β= .11). However, only the predictor "Perceived Threat" explained much variation in students' use of instructors for academic and administrative questions. In the final model, Perceived Threat accounted for 13.8% of the variation in students' likelihood of talking to instructors for academic and administrative questions. Perception of instructor accounted for an additional 4.9% of variation. Independence accounted for only 1.1% of variation. Thus, including Perception of Instructor and Independence as predictors explained only a small amount of variation in students' likelihood of talking to instructors. Nonetheless, they were statistically significant and thus kept in the final model.

The regression results indicate that attitudinal factors were useful for predicting students' communication behaviour. Students' attitudes did predict their behaviour for talking to instructors for academic and administrative questions. In particular, students' perception of threat (i.e. concerns about looking stupid or other hesitations) was a moderate predictor of how likely they were to seek help from instructors.

Research question 2: Are NetGen students more likely to use ICTs for interacting with classmates than Non-NetGen students? Are Net Gen students more likely to use ICTs than face to face communication when interacting with classmates for course-related purposes?

This research question had two parts: the first was a comparison between generations and the second was a comparison within the NetGen. Both parts required first identifying whom Net Gen students are. Oblinger and Oblinger (2005) use the term Net Generation to identify people born during or after 1982. However, they also state that Generation X was born from 1965 to 1982 (Oblinger & Oblinger, 2005, p.2.9). Where, then, should students be categorized if they were born on 1982? The term Net Generation is based on the more common sociological label, "Millennials". Unlike other generations (e.g. Boomers, Gen X), Millennials are defined by their relationship to education. Strauss and Howe (2000, 2006) have been the most vocal and prolific writers about Millennials. They state that the term entered social science and popular lexicon to identify the students who entered the first grade in 1988 and would eventually graduate from high school in

2000, most likely at the age of 18 (Howe & Strauss, 2006, p.6). They also identify Gen X as students born from 1961 to 1981. Thus, for the purposes of this research, the Net Generation is defined as people born on or after 1982. Respondents were divided into two categories, "NetGen" and "Non-NetGen", with the latter defined as all respondents born before 1982. (The criteria for separating Gen X from Boomers did not eventually matter for this research, as there were very few respondents, four, born before 1965.)

To address the first part of this research question responses between the two groups were compared to see if NetGen students were more likely to use ICTs for interacting with peers than Non-NetGen students. All data for communication options were ordinal. Thus the Mann-Whitney test was used as it is the non-parametric equivalent of an independent t-test. SPSS does not calculate an effect size for this test, so it was calculated manually by converting the z-score into *r* using the following equation:

$$r = \frac{Z}{\sqrt{N}}$$

The Mann-Whitney test results for all communication options (see table 6) indicate there is a significant difference between NetGen and Non-NetGen students for using certain ICTs to communicate with classmates but not for other ICTs. There was no difference between groups when using institutional email or personal email. There was a difference when using Instant Messaging, Text Messaging, Facebook, MySpace and WebCT. However, there was also a difference between the groups for options not usually considered ICTs: Talking via Phone and Talking in Person. This seems to complicate the claim that NetGen are more likely to use ICTs than Non-NetGen students. The results

from significance tests do not provide a clear picture that NetGen students are more likely to use ICTs than Non-NetGen students.

Table 14: Comparison of Communication Use by Generation

Communication Option	Gen	N	Mean Rank	Sum of Ranks	Mann-Whitney *U*	Sig.	Effect Size *r*
BCIT email	NetGen	325	203.68	66197	13222	0.91	N/A
	NonNetGen	82	205.26	16831			
Personal email	NetGen	326	208.02	67815	11566	0.08	N/A
	NonNetGen	80	185.08	14806			
Instant Messaging	NetGen	326	217.49	70903	9130	0.00*	-.23
	NonNetGen	82	152.84	12533			
Text Message	NetGen	325	220.76	71748.5	7226.5	0.00*	-.32
	NonNetGen	80	130.83	10466.5			
Facebook/MySpace	NetGen	324	212.5	68851	10043	0.00*	-.17
	NonNetGen	81	164.99	13364			
Talk via phone	NetGen	326	217.26	70828	9205	0.00*	-.23
	NonNetGen	82	153.76	12608			
Talk in person	NetGen	326	211.57	68970.5	11714.5	0.01*	-.14
	NonNetGen	84	181.96	15284.5			
WebCT	NetGen	326	195.28	63661	10360	0.00*	-.15
	NonNetGen	78	232.68	18149			

*Significant at $p<.05$

What is more revealing are the effect size results. The largest effect sizes are for the difference between how the two groups use Text Messages, Instant Messaging and Talking via Phone. All three are synchronous communication options. Effect size results indicate the two groups may differ in their use of synchronous ICTs but not for all ICTs. Certainly, NetGen students used synchronous ICTs far more often than Non-NetGen students.

In order to address the second part of this research question, the amount of face-to-face communication was compared with the most commonly used ICT option for NetGen students[13]. Median scores were calculated to identify which ICTs NetGen students used most commonly (see Table 15).

Table 15: Options used to communicate with classmates about courses

OPTION	NetGen
BCIT email account	2
Personal email account (e.g. Hotmail, Telus, etc.)	4
Instant messaging (e.g. MSN, Yahoo Messenger or other applications)	3
Text message via cellphones	3
Facebook/MySpace	2
Talking via phone	3
Talking in person	4
WebCT	1

The most common ICT option used by NetGen students was personal email account. Use of Personal Email was compared with how often students Talked in Person with classmates. Table 16 shows the descriptive statistics of students' responses for communicating via Personal Email and Talking in Person.

Far more "NetGen" students would talk in person "Always" or "Often" (94.4%) with classmates about courses than use Personal Email (78.3%) "Always" or "Often" with

[13] One could make the argument that it is more fair to compare Face-to-Face communication with an aggregate of all ICT use. It is unclear, however, how one would aggregate how frequently all ICTs were used from the current data.

classmates. These results do not support the argument that NetGen students are more likely to use ICTs than face-to-face communication when interacting with classmates for course-related purposes.

Table 16: Comparison of most frequently used ICT options by "NetGen" students

	Personal email		Talk in person	
Amount	Frequency	Percent	Frequency	Percent
Never	27	6.3	3	0.7
Seldom (1 to 4 times / month)	66	15.5	21	4.9
Often (5 to 10 times / month)	101	23.7	79	18.3
Always (More than 10 times/ month)	233	54.6	328	76.1
Total	427	100	431	100

Research question 3: Do students use institutionally provided ICTs when interacting with classmates more than commonly available ICTs?

Addressing this question involved straightforwardly comparing how often students used various ICTs to communicate with classmates. Respondents were provided a list of six ICTs most commonly identified from the qualitative pilot study. Two of these were institutionally provided ICTs; BCIT email and WebCT. The other four were commonly available ICTs; Personal email, Instant Messaging, Text messaging and Facebook/MySpace. Table 17 indicates the median response for use of each ICT for communicating with classmates.

Table 17: ICTs used to communicate with classmates

ICT Option	With Classmates
BCIT email	2
Personal email	4
Instant messaging	3
Text message	3
Facebook/MySpace	2
WebCT	1

It is striking how much less institutionally provided ICTs were used than commonly available ICTs. It may be unfair to overstate the importance of the WebCT numbers, as not all students had a WebCT account. Their courses may not have had any WebCT component. However, all students did have a BCIT email account. BCIT follows the common postsecondary practice of providing all students with an institutional email account. Yet BCIT email is used far less commonly (*Mdn*=2, N=430) compared to Personal email accounts (*Mdn*=4, N=427). Indeed, BCIT email is used less than Instant messaging (*Mdn*=3, N=428) and Text Messages (*Mdn*=3, N=426) when students are communicating with classmates for course purposes.

The implications of these research findings are discussed in the next chapter.

Chapter 6: Discussion and Implications

In this chapter the primary research findings and tentative conclusions are discussed. Then, possible educational and research implications of these results are offered. Finally, limitations of this research are acknowledged.

Discussion

In the past 20 years most research on student interaction has focused on what occurs inside the classroom and online environment, or interaction at the behest of the instructor. This study has helped to map the relatively uncharted terrain of student-generated interaction outside the classroom. Some research findings in this study have been more useful than others for drawing contours of this terrain.

Attitudinal factors were identified about why students interacted with others for course purposes outside of class. Factor analysis helped uncover six latent dimensions of students' attitudes that may motivate or dissuade them from communicating with others for course purposes. These were: "usefulness of peers", "perception of instructors", "trust of peers", "sense of independence", "perception of course" and "perceived sense of threat". Some attitudinal factors were related to student-generated interaction with instructors. "Perceived threat" was a factor that was negatively associated with why students' did not talk to instructors for course and administrative purposes ($r = -.37$, $p < .01$). This effect size was not inconsistent with findings from existing research. Karabenick and Knapp (1991) found a slightly lower effect size ($r = -.28$, $p < .001$) and

Kistantis and Chow (2007) found a slightly higher effect size ($r = -.48$, $p < .001$) for the association between students' "perceived sense of threat" and their formal help-seeking behaviour. Admittedly, both sets of authors define formal help-seeking to include students' use of student tutors and university support services, as well as instructors for course content purposes. In this study, "perceived threat" was only correlated with students' behaviour of asking instructors for help. This was because other resources (e.g. communicating with the study support centre, program head, and administrative staff) did not load with "talking to instructors" in the factor analysis. Nonetheless, the findings from this study reinforce that "perceived threat" seems to be an important negative motivation (i.e. deterrent) for students' interaction behaviour.

Further still, this study yielded a model to predict how perceived threat affected students' interaction behaviour with instructors outside of class. This is a unique contribution of this study that has not been found in other research. The model included three variables that predicted students' willingness to talk to instructors; "perceived threat", "perception of instructors", and "independence". However, only "perceived threat" accounted for a moderate amount of variation ($\beta = -.29$).

It was certainly a bit surprising that "perceived threat" would be the strongest predictor, and indeed finding, from this research. Threat was only a minor theme in the qualitative pilot study. In the interviews from the pilot, students did state that their comfort with instructors affected if they would approach them. One student stated a line that seems prescient to the main research findings. When asked why MSN was being used during

class time he responded: "there's some things you don't want the teacher to hear from you" (Architecture student, on p.74). So this sense of threat was identified in the qualitative pilot study but not emphasized as a major factor. In the literature review Laiken et al. (2004) also hint at the importance of threat in their research on informal workplace learning. They advocate creating a safe culture of no-blame to foster trust in informal learning dynamics. Even in the factor analysis of the quantitative research data "perceived threat" was a factor that loaded with only two items from the survey; a relationship between a concern about looking stupid asking questions to instructors (Item 19c) and a hesitation of asking an instructor for help (Item 19f). Furthermore, "perceived threat" was the factor with the lowest eigenvalue of the six attitudinal factors that exceeded Kaiser's commonly accepted criterion of exceeding an eigenvalue of one (Field, 2005, p.633). Nonetheless, it was a consistent and significant finding.

Yet "perceived threat" is still a vague attribute of students. The items that loaded for this factor were two of several items included in the survey design to measure students' "perception of instructors". It emerged unexpectedly as a factor in the analysis. "Perceived threat" is an attribute that needs to be developed more intentionally and tested as a construct with more dimensions than it currently has. From this study, it is unclear if "perceived threat" is based on students' lack of efficacy, or their concerns about being vulnerable to the organizational power that instructors represent, or some other issue. A richer construct needs to be created to measure dimensions of students' sense of threat.

More can be learned about "perceived threat" as a construct and predictor by also developing better criterion variables. It would be useful analyze whether students sought help from peers in lieu of instructors, due to perceived threat. The qualitative pilot study did suggest that students talk to classmates partly because they were a safe, less-threatening option for addressing course and administrative issues. The main research findings reinforce that, without a doubt, classmates were definitely a very important resource for students outside of class. Indeed, no item in the 89 -point survey had a higher response rate. Turning to classmates seems to be a very important learning strategy for students. Unfortunately, this behaviour could not be used as a dependent variable because students turned to classmates for informal help-seeking so often, that there was not enough variance to conduct correlation or regression analysis. The research results yielded predictor variables but not a criterion variable for analyzing student-generated interaction with classmates. At the very least, the results of this study have provided useful attitudinal constructs to test against better-designed behavioural items in future research. Future research would benefit from more varied behavioural items about students' talking to classmates. These items would also benefit from using a wider scale in a survey (perhaps a six or seven point scale) to allow for more variability than the four-point scale used in this research.

Research findings were inconclusive about whether BCIT students fit the profile of the Net Generation. The Net Generation argument assumes a proclivity for ICTs for students born on or after 1982. This proclivity, the argument goes, is a determining variable for students' communication decisions. Research results found all NetGen aged students

communicated more in person with classmates outside of class than they did via any ICT option. Results also showed statistically significant differences between generations for use of some but not all ICTs. There was no difference in email use by generations. There was a difference in how they used all synchronous communication, whether or not these were ICT-based. NetGen students were more likely to talk to classmates in person outside of class than non-NetGen students. They were also more likely to use Instant Messaging, Facebook and talking via phone.

Even though some communication differences were statistically significant, this does not mean the generation effect is important in practical terms. Effect size results are in some ways more important than significance testing, as they help to determine if the effect is substantive. The effect size of generation was small for use of Facebook and talking in person. At best, one could argue that there seems to be a stronger difference between generations for use of synchronous communication of all kinds than there is for ICT-based communication. This may indicate that time, not ICT preference, is a more important factor that affects students' choice of communication channels. Even this claim is tenuous. The only moderate effect size of generation was for use of text message, which can be both an asynchronous and synchronous tool.

Admittedly, one cannot overstate the claims of this current research. Cohen (1988) argues that it is "quite ridiculous to try to develop theories of human behavior with *p* values... and no more than a primitive sense of effect size" (p.11). In other words, there may be statistically significant differences, but that is not enough to extrapolate a theory

of how students are behaving. Furthermore, basic non-parametric effect size results from this study are not adequate for making claims for or against the Net Generation. Relying on a single study for other institutions is not a judicious basis for making educational policy, instructional design or teaching decisions (unless, in this case, that institution is BCIT). If nothing else, these findings about generation and ICT use should give educators pause. Hopefully it will encourage them to conduct further research about how students communicate with peers and use ICTs to do so.

The NetGen research findings are uneven but certainly not consistent with the assertive and influential claims of Tapscott (1998) and Prensky (2001a) of how the NetGen behave. If anything, results seem to support the claim by Bennett et al. (2008) that there is not enough evidence to warrant the wide acceptance of the existence of the NetGen as a cohort with unique ICT behaviour in education. Certainly, the results concur with Kvavik's finding that there is a fair amount of variance within the NetGen's communication behaviour (Kvavik, 2005, p.7.17). Arguments about a NetGen in education need to be treated with caution, until there is stronger evidence.

This study does not focus on whether the NetGen may be a larger phenomenon in society. But it does ask if it is appropriate to extend what may or may not be a larger social trend into the arena of education? Education, by definition, is a social relationship with particular structural and interpersonal dynamics and constraints. An educational institution like BCIT is a formal organization where students have roles with particular expectations, form informal groups, have group processes and mores, and function in a

context of interpersonal and state-authorized power. These are important social and structural variables that need to be considered when trying to understand how students communicate with peers and instructors for course purposes. At BCIT students had structured programs that required they be on campus a lot. This curriculum design seems to have been important in shaping students' choice of communication channels. Research results suggest that it may be to easy or convenient to state that generation is a critical variable for explaining student communication behaviour. Variables of the setting may matter as much as variables of the person. The implication is that claims about the Net Gen in education may be too decontextualized. By treating an educational institution an organization with its own social dynamics one can start to distinguish between the educational and social uses of ICTs that Bennett et al. advocate (2008, p.781). However, this too needs to be studied before any strong claims are made about why students do or do not choose particular communication channels.

Finally, findings also indicate that students used commonly available ICT applications far more than they used institutionally provided applications for communicating with classmates. Of various applications available, students used personal email accounts, instant messaging and text messaging the most for communicating with classmates for course purposes. None of these were provided by BCIT. The results seem to indicate that BCIT may be practicing what can be called "supply-side ICTs". The institution is supplying ICT options on the assumption that there is a demand and use for these ICTs. Students are not necessarily using these applications, at least not with classmates. They are using applications that they use in their everyday life, beyond their role as a student.

However, students stated they were using institutionally provided email slightly more than any other ICT option for communicating with instructors (see Table 18).

Table 18: ICT options used to communicate with classmates and instructors

ICT Option	With Classmates (Mdn)	With Instructors (Mdn)
BCIT email	2	2
Personal email	4	2
Instant messaging	3	1
Text message	3	1
Facebook/MySpace	2	1
WebCT	1	1

This would seem to indicate that students use gmail/hotmail, and MSN/Yahoo Messenger far more than any other ICT option. However, they prefer institutionally provided email for institutional communication. There may not be widespread use of institutional ICT resources. But they do seem to be used for specific purposes. Institutions provide ICTs for many purposes such as course management, student to instructor communication, class announcements, peer collaboration tools and subject matter specific tools. Future analysis of ICT provisions should consider how important it is for instructors to provide particular peer communication and collaboration tools for students.

Implications

There are several implications for practitioners and researchers from this study. Foremost, is that student help-seeking outside of class seems to be an important learning strategy. Students are seeking help from formal and informal resources. The research indicates that students' "perceived threat" is deterring students from approaching

instructors for help. It is unclear why students are seeking help more from classmates than other sources, but they certainly are. Educators need to acknowledge that students are using informal help-seeking options more than formal channels. Institutions need to consider ways to help foster and support these informal channels if there is a desire to scaffold students' course-related learning outside the classroom.

For researchers, this study indicates the topic of help-seeking warrants further research. In particular, it would be useful to learn what factors affect students' decision to seek help through informal channels. It could also be useful to investigate how students are leveraging ICTs to create self-organizing informal learning groups. Further, it would be useful to investigate if formal and informal help-seeking is actually improving student achievement. There was no analysis of student achievement data in this study.

The NetGen findings of this study have fostered much curiosity. Indeed, the Open University of Catalonia (UOC) is using parts of the survey instrument from this study to create a profile of their students. They learned of this study through one of several conferences where these findings have been presented. UOC is a distance education university and it is encouraging if parts of this study can help research in the DE branch of educational technology. It will be useful to see how the results from a DE institution offering a broad range of university courses compares with the results of this study that occurred at a trades-based polytechnic institution.

Additionally, the Centre for Teaching and Learning Services at Concordia University has also expressed interest in using parts of this study to understand how their students are using ICTs. It is hoped that future implementations of this study will benefit from the limitations and missteps as well as insights of this research.

Limitations

There are a few important limitations in this study. There was a concern about survey structure bias for findings to the first research question. Bradburn et al. (2004, p.145) contend that the ordering of questions can lead to a structure bias in how subjects respond. In this study this bias may have occurred in two of the factor loadings in the analysis of what factors motivated students to communicate with outside of class. Items clustered around other items that were in the same section of the survey. However, this occurred only among attitudinal items. It did not occur for the key attitudinal factor, perceived threat, which was used to create the regression model. Also, items did not cluster around contiguous items for behavioural measures. Still, in future research it would be advisable to separate or randomize attitudinal items into different sections or intersperse them with behavioural items (Bradburn et al., 2004, p.296).

One also needs to treat factor analysis results with a bit of caution. There are critics of factor analysis (Kline, 1994; Gould, 1996) who argue that it is a technique that can yield many mathematically equal solutions. They also argue that it is difficult to replicate factor analyses. These are important caveats. However, it was encouraging that in this

study some factors were consistent between the quantitative pilot test of the survey and the final quantitative research results.

Finally, the results for the Net Gen section were based on non-inferential statistics. These findings are not generalizable. Relying on these results for other institutions may not be the most judicious basis for making educational policy, instructional design or teaching decisions.

Conclusion

The three research questions in this study shared a common theme: student-generated interaction outside of class seems to be important for students and is worth studying. What has hopefully emerged from this study is the value of exploring the larger social context and dynamics –the spaces between the spokes of the Buddhist wheel– in which course-related learning occurs and educational technologies are used. This study only begins to indicate the value of exploring factors outside of class such as students' informal dynamics, structural dynamics and the role of the organization. Much can be learned about students' course-related communication behaviour by leaving the classroom and entering the hallways.

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Appendix A: "Request to participate" email to instructors

Dear Stan,

The LTC will be conducting research on how students communicate with classmates and instructors outside of class. We are requesting instructors to invite students to participate in focus groups on this topic, which will be held at the end of May. Please find attached an information sheet (called the "Initial Contact Letter") that provides students with more details about the study.

We have also selected you for an interview on your perspective on how students communicate with classmates and you for course purposes. The interview will take no longer than 60 minutes, and will also be held at the end of May.

We will be calling you to confirm your interest and participation in this research, and thank you in advance for your cooperation.

Sincerely,

Terry Fong
Instructional Design Consultant
Learning and Teaching Centre
BCIT
604-123-4567

This research project has been approved by BCIT's Research Ethics Review Board. If you have any concerns or questions about treatment of participants, please contact BCIT Research Ethics at research_ethics@BCIT.ca.

Appendix B: Focus Group Contact Letter

BCIT LETTERHEAD

INITIAL CONTACT LETTER

Dear (name of program) student

The Learning & Teaching Centre at BCIT is **looking for students to participate in a group interview** for a study we are conducting about how students interact with peers and instructors for course purposes. The interview will take about **60 minutes** of your time. All interview participants will be entered into a draw. One participant will **win a $200 gift certificate** for the BCIT bookstore.

We want to collect information about students' approaches and experiences of communicating with BCIT classmates and instructors. We will also ask about resources available to students in their program and required in their courses. The research data will be used by staff at the Learning & Teaching Centre and by Adnan Qayyum a graduate student at Concordia University (Montreal), who is working with the Learning and Teaching Centre.

Your identity will be kept confidential and will not be disclosed by the researchers. Your name will not be used in the research report. You are welcome to contact us after the group interview if you want to clarify, change or remove any comments you made.

The interview information will be used to identify main themes and issues about how students' interact with peers and instructors, and to create a survey. The survey will be conducted with a larger number of students, later this year.

If you have are willing to participate **please contact Adnan Qayyum at** *adnan.qayyum@sympatico.ca* **or 613.233.7773.**

Contact Adnan if you have any questions about the research project or procedures

There will be no negative consequences if you do not participate or discontinue your participation at anytime. All information collected is purely for research and will not affect your class standing in any way.

If you have any concerns about your rights or treatment as research participant, please contact BCIT's Research Ethics Review Board at research_ethics@BCIT.ca or its Chair, Dr. Norman Straight at 604-123-4567.

Appendix C: Protocol for dialogue

Sample script for contact with students
in BCIT Social Learning Spaces

Hello, my name is Adnan Qayyum. I'm a PhD student at Concordia University in Montreal. I'm doing a study with the Learning & Teaching Unit here at BCIT about how BCIT students interact with classmates and instructors outside of class.

Can I take 10 minutes of your time to ask you some questions in exchange for some muffins?

If you agree, I need for you to complete this consent form. (Give them consent form).

Thanks for agreeing to participate. As it says on the consent form, feel free to withdraw your consent or discontinue from the interview at any time. There will be no negative consequences for you.

I'll just take notes as I ask you some questions.

Questions

1. Through what channels do you communicate with classmates?
2. Name four topics you communicate about?
3. Where are you when you communicate with classmates?
4. Describe what channels you use to communicate with your instructor.
5. Does the instructor require or encourage you to communicate with classmates?
6. When you have a problem or issue in your courses, what do you do?
7. What communication options would help you learn in your courses?

Thanks for your time.

Again, if you have any questions or concerns about the study, please contact me at the email address or phone number indicated on the consent form.

If you have any concerns about how you've been treated or your rights in this research, please contact BCIT's Research Ethics Review Board or the people mentioned on the consent form.

Thanks again. Have a good day.

Appendix D: Interview consent form

BCIT LETTERHEAD

CONSENT FORM TO PARTICIPATE IN INTERVIEW

Research project title: The experiences of BCIT Millennial Learners

Project description

The Learning & Teaching Unit at BCIT is undertaking research about how students communicate with classmates and instructors outside of class. We want to collect information about students' approaches and experiences of interacting with classmates and instructors. Partly, we want to explore if students' approaches and experience communicating with classmates and instructors differs with age. ("Millennial Learners" refers to students born after 1982, but we are interested in students of all ages).

We will also ask about communication resources available to students in their program and required in their courses. This will allow us to analyze students' approaches and experiences in the context of what their courses require and what resources are available to them in their program area. The research data will be used by the Learning & Teaching Unit and by Adnan Qayyum a graduate student at Concordia University, (Montreal).

Procedures

We will gather information initially by interviewing students in focus groups. Group interview data will be used to identify main themes and issues and to create a survey. The survey will be conducted with a larger number of students, later this year.

This document concerns focus group interviews. Interviews will be conducted with participants and will last between 30 to 60 minutes. Interviews will normally take place at the Learning & Teaching Centre at BCIT, but may take place in another location that is more convenient.

If you have any questions about the research project or procedures please contact the researcher, Adnan Qayyum at:

Email: *adnan.qayyum@sympatico.ca*
Phone: 613.233.7773

Compensation: chance to win

All interview participants will be entered into a draw. One participant will win a $200 gift certificate for the BCIT bookstore.

Your participation

By signing this document you acknowledge the following CONDITIONS OF PARTICIPATION:

- I understand that I am free to withdraw my consent and discontinue my participation at any time without negative consequences.
- I understand that all information collected is purely for research and will not affect my class standing in any way.
- I have been informed that the purpose of the research is to understand how students communicate with classmates and instructors.
- I understand that my participation in this study is CONFIDENTIAL. My identity will be kept confidential and will not be disclosed by the researcher.
- I understand that the data from this study may be published.

I HAVE CAREFULLY STUDIED AND UNDERSTAND THE ABOVE FORM. I FREELY CONSENT AND VOLUNTARILY AGREE TO BE INTERVIEWED FOR THIS STUDY.

Name (please print)_____

Program of study _____

Date of Birth_____

Signature_____

Today's date_____

Contact information_____

If you have any concerns about your rights or treatment as research participant, please contact BCIT's Research Ethics Review Board at research_ethics@BCIT.ca or Dr. Norman Straight at 604-123-4567.

You will be given a copy of this consent form for your own records.

Signature of person explaining and obtaining consent

Name (please print)_____

Signature_____

Date_____

Appendix E: List of students interviewed

SESSION #	NUMBER OF PEOPLE	PSEUDONYM	GENDER	AGE	PROGRAM SHORT NAME
1	2	Drew	M	--	Robotics Engineering
1	2	Arthur	M	--	Robotics Engineering
2	2	Al	M	--	Robotics Engineering
2	2	Tony	M	--	Robotics Engineering
3	2	Alex	M	--	Robotics Engineering
3	2	Sherry	F	--	Robotics Engineering
4	4	Bintao	M	23	Architecture
4	4	John	M	22	Architecture
4	4	Orest	M	25	Architecture
4	4	Miamo	M	21	Architecture
5	1	Andrew	M	20	Business
6	2	Talat	F	19	Finance
6	2	Jennifer	F	19	Finance
8	5	Gulig	F	28	Geology
8	5	Craig	M	27	Geology
8	5	Pat	M	21	Geology
8	5	Bill	M	26	Geology
8	5	Scott	M	28	Geology
10	2	Kyle	M	27	Marketing
10	2	Bruce	M	34	Marketing
11	1	Darminder	M	23	Radiology
12	3	Evan	M	19	ABET
12	3	Pedro	M	27	ABET
12	3	Newman	M	21	Mechanical Engineering
13	1	Mahlavi	F	27	Computer Engineering
14	4	Sergio	M	17	Electrical Engineering
14	4	Chin	F	22	Electrical Engineering
14	4	Glenda	F	25	Electrical Engineering
14	4	Narl	F	21	Electrical Engineering
17	2	Sunny	F	24	Nursing
17	2	Vasquez	F	26	Nursing
18	2	Andrea	F	30+	Nursing
18	2	Ferron	F	40	Nursing
19	3	Balti	F	25	Nursing -specialized
19	3	Nancy	F	27	Nursing -specialized
19	3	Alison	F	41	Nursing -specialized
20	3	Sally	F	24	Forestry
20	3	Martin	M	27	Forestry
20	3	Bob	M	27	Forestry

23	2	Ron	M	24	Mechanical Engineering
23	2	Joan	F	21	Journalism
24	2	Jorge	M	20	Synthetic manufacturing
24	2	Sanderson	M	21	Nuclear Medicine
27	1	Jordan	M	24	Synthetic manufacturing
31	7	Cary	M	19	Metal manufacturing
31	7	Landon	M	19	Metal manufacturing
31	7	Dave	M	18	Metal manufacturing
31	7	Clemon	M	19	Metal manufacturing
31	7	Adam	M	18	Metal manufacturing
31	7	Scooter	M	21	Metal manufacturing
31	7	Abby	M	24	Metal manufacturing
32	6	Ari	M	18	Metal manufacturing
32	6	Trent	M	19	Metal manufacturing
32	6	Icabod	M	19	Metal manufacturing
32	6	Donald	M	19	Metal manufacturing
32	6	Darby	M	19	Metal manufacturing
32	6	Lyndon	M	22	Metal manufacturing
33	2	Jimmy	M	19	Electronics Engineering
33	2	Kim	M	22	Electronics Engineering
34	3	Jack	M	22	Automotive Engineering
34	3	Larry	M	25	Automotive Engineering
34	3	Kal	M	21	Automotive Engineering
38	2	Naresh	M	22	Finance
38	2	Parminder	F	18	Operations Management
39	1	Haiti	F	35	Cardiology
40	1	Joanne	F	27	Cardiology
41	1	Vanessa	F	45	Cardiology
42	1	Archie	M	45	Cardiology
43	1	Priti	F	20	Cardiology

Appendix F: Sample of organized interview data

SESSION 4: ARCHITECTURE STUDENTS

Context of interview: Group interview with four architectural science students. An instructor introduced us to the students and requested they cooperate by agreeing to be interviewed. Students were interviewed in their studio on Monday morning at 10:30am. They were interviewed at semester's end as they were working on final assignments. It seemed they spent a lot of time in the studio and a couple had stayed late the night before, including eating supper there.

Field notes: During the first 4'22" interviewees are completing consent forms. First question at 4'58"
Students were aged 22 to 26 years of age.

1. Channels they use to communicate with classmates?
MSN
MSN while in class. They are allowed to and do use laptops in class when class is going on. This way they don't have to lean back to ask a classmate while the teachers up front. They're online while in class and have their MSN open when in class.
5:33 –the majority of the time, the teacher will be going around helping students at their desk. There is not official lecture portion. Because they're working on their projects at the time they communicate over MSN. Talking might raise a raucous. Or there's some things you don't want the teacher to hear from you [5:59] [Open code note: threat]

They have courses in a studio. Their class is 12 people so they have tables for each and every one of them. Have more physical resources/space than diploma students. They use their laptops all the time [6:36].
All their courses are with the same people.

Some people pass around paper. "That's old school". [7:08]

Outside of they communicate with email, "but the most efficient way is messenger" [7:15]

When they're not online, they phone each other. And tell them to get back online?? [7:27]

First MSN, then phone. Email is when you want to send something to the entire class. Or if you really have a long message and you can't just chat with them.
For one course, the instructor emailed pdf files to all.
Use email for more formal communication.

"Messenger is very informal and usually between friends." [8'55]

Are usually online when the laptop is open. That is usually the case as much of their work has to be done on the computer. [13:55]

They don't text message because of costs [16:50]

2. Topics they communicate about?
Random stuff
School–related mostly [9'20]
Certain topics about a course. Or if you need information like an assignment you forgot to write down. Or an assignment

3. Where they communicate from with classmates
Usually in the classroom (studio)
Or at home.
Are not using other spaces around campus.
Have enough space in the classroom.

4. How they communicate with instructors.
We don't really have a formal lecture. We usually have one on one with the teacher.

The prefer email for instructors they don't find it as easy to communicate with [17:45]
Other instructors who are easier to communicate with, talking to them directly is preferable for some instructors. [18:00]

We have a lot of one on one. The instructor doesn't have time to cover everyone. So it's better if you email them, because you can ask all the questions at one and still have time to think about it [18:32]. And they can email you back with the answer.

Don't MSN with teachers. "I don't know a lot of teachers that have MSN". [18:45]
Coding note: Asynchronous has an element of formality. Even if joking on email. It's still formal communication.
They'll probably learn..._____ [18:50]
Field note: Might be interesting comment about teachers & MSN.
I haven't had any experience of MSN with a teacher.
"They know how addictive it is." [19:02]
Coding note: What is the relationship between synchronous written speech and informality and need to read?

You should be doing work, but your friends are online too. 'Hey, how's it going?' [19:12]
Coding note: procrastination effects of informal dynamics
Also socializing on MSN during class. "A fair bit". "That's a common thing" [19:30]
Coding note: Linda Stone's "continuous partial attention" phenomena

"If you're really not motivated to do work at the time, it's a lot easier to say, 'hey, how's it going'". [20:15]

"Depends on the person, if you want to chat with somebody or listen to the teacher"

"I think they [the teachers] do know because you can hear keyboard sometimes. "You can say you're taking notes." Re-listen [20:45]
"That's a common excuse"
"Yeah, they know"
They know.
I'm sure they know.
"[A student is] smiling all of the sudden"

"In civil engineering, all the sudden you're smiling at your computer screen. It's pretty obvious". [21:20]

Amount of time spent on MSN during the day depends on "where you are at the term"
"It also helps to not sign in at all when you need to do work. I haven't been signed it at all in the last week and a half." [22:40]
Except to take a break, after dinner.

5. Role of communication or collaboration in their course(s).
The program is designed for communication. We have an open layout. [11:31]

6. What they do if they have problems with course content or assignments.
You usually contact each other.

It's a very _____ class [10:28]
You tend to ask a friend before you ask a teacher. [10:30]
"Rarely would you ask the teacher".
You basically canvass all your friends. Then check the book. Then ask the teacher.

Some teachers are more approachable. Its so much easier to talk to or understand that one (than another).

7. Communication options that would help them learn in their courses.
The set up here is pretty good. Have the option to get up and walk around and talk to friends.

Field note: they have a work space, not just classroom space. This effects their dynamics for help-seeking.

Code note: space matters, not just course design.

They provide their own computers because laptop allows lug it between campus and home. [14:15]

Field notes: When asked about technology options, they mentioned hardware. Software is not tech in their lingua franca.

The only thing they gave us is access to printers.

They have to buy their course software themselves. e.g. Autocad

More windows. Atmospheric. Quiet. Brighter. We're doing design. We need to get inspired by our surroundings. [28:10]

The physical environment.

They use digital technologies more because they are not given the resources for some of the other options e.g. drafting on a back-lit table is not there, so they draft on the computer.

Appendix G: Sample memo

Memo Sept 10

Ikea unbundling metaphor

How does information use relate to information need and information and communication options?

For example, the Manufacturing students have psychomotor, tactile information need for their courses. Thus, digital information is not used by them to support each others learning because the courses do not use any digital resources (even though Brian did develop an online version; look at this further).

Maybe these students are not as comfortable or conversant with ICT. No, they grew up digital natives, are net gen, etc but still don't use it for their learning. Why is this?

Appendix H: Penultimate survey instrument

Survey of Student Communication & Study Habits

Help us understand how students **interact** with classmates and instructors **outside of class**. By completing this survey you will provide valuable information, and help to improve the educational experience of future students. **All responses will remain confidential.** This information will be used for educational research that is consistent with the Concordia mandate, and the information will be used in compliance with the Quebec's *Act Respecting Access to Documents Held by Public Bodies and the Protection of Personal Information*.

Section 1: Demographic information

1. Gender __F __M

2. Date of birth: Month_____ Year_____

3. Please indicate your student status.
___Full-time student ____Part-time student
___Other. If so, please state what your student status is._____

4. What program are you in? _____

5. What year of the program are you in?
___1st year ___2nd year ___3rd year ___4th year

6. How many hours per week on average are you on campus (including class & non-class time)? _____

7. How many hours a week on average do you work at a job (whether you work for an employer or are self-employed)?_____

8. What was your average grade in the program last semester? Please choose one option.

___less than 50%	___60 to 64	___75 to 79	___90 to 94
___50 to 54	___65 to 69	___80 to 84	___95 or more
___55 to 59	___70 to 74	___85 to 89	

Section 2: Who students turn to for help with their courses?

Please use the following scale to answer the questions in this section: **1=Never and 4=Always.**

9. What do you do when you have a question about <u>course material</u> (e.g. understanding course content)?	Never 1	2	3	Always 4
a. Talk to an instructor	o	o	o	o
b. Talk to a classmate	o	o	o	o
c. Talk to others students not in the course	o	o	o	o
d. Talk to another person (e.g. family, friend etc.)	o	o	o	o
e. Go to a study support centre (e.g. math help centre)	o	o	o	o
f. Search online	o	o	o	o
g. Talk to a work colleague	o	o	o	o
h. Try to address it on my own	o	o	o	o

i. Please indicate what else you do to answer course content issues._____
_____

10. What do you do when you have an administrative question about a course or the program (e.g. assignment due dates, grades)?	Never 1	2	3	Always 4
a. Talk to an instructor	o	o	o	o
b. Talk to classmates	o	o	o	o
c. Talk to other students not in the program	o	o	o	o
d. Talk to the program head	o	o	o	o
e. Talk to administrative staff	o	o	o	o
f. Search Concordia's website	o	o	o	o
g. Try to address it on my own	o	o	o	o

i. Please state any other things you do to address course administrative issues. _____

Section 3: How and where students communicate with peers and instructors?

Please use the following scale to answer questions in this section:

Never **Often =5 to 10 times per month**

Seldom = 1 to 4 times per month **Always =More than 10 times per month**

11. How often do you use each of the following to communicate with classmates about courses?	Never 0	Seldom 1 – 4	Often 5 – 10	Always More than 10
a. Concordia email account	o	o	o	o
b. Personal email account (e.g. Hotmail, Telus, etc.)	o	o	o	o
c. Instant messaging (e.g. MSN, Yahoo Messenger or other applications)	o	o	o	o
d. Text message via cellphones	o	o	o	o
e. Facebook/MySpace	o	o	o	o
f. Talking via phone	o	o	o	o
g. Talking in person	o	o	o	o
h. Moodle	o	o	o	o

i. Please list any other applications or channels you use to communicate with classmates?

_____

12. How often do you use each of the following to communicate with instructors?	Never 0	Seldom 1 – 4	Often 5 – 10	Always More than 10
a. Concordia email account	o	o	o	o
b. Personal email account (e.g. Hotmail, Telus, etc.)	o	o	o	o
c. Instant messaging (e.g. MSN, Yahoo Messenger or other applications)	o	o	o	o
d. Text message via cellphones	o	o	o	o
e. Facebook/MySpace	o	o	o	o
f. Talking via phone	o	o	o	o
g. Talking in person	o	o	o	o
h. Moodle	o	o	o	o

i. Please list any other applications or channels you use to communicate with instructors?

_____

13. How often do you study or work on assignments in the following places outside of regular class time?

	Never	Seldom	Often	Always
	0	1 – 4	5 – 10	More than 10
a. In a classroom	o	o	o	o
b. In a lab, workshop or studio	o	o	o	o
c. In the library	o	o	o	o
d. In social spaces around campus (e.g. FRC, coffee shop)	o	o	o	o
e. At home	o	o	o	o
f. At work	o	o	o	o
g. In transit (e.g. bus, Metro)	o	o	o	o

h. Please state any other places where you study or work on assignments._____

Section 4: Students study and communication habits with classmates and instructors

In this section, please rate your level of agreement with the each of the following statements.

14. Students' study habits.

	Strongly disagree			Strongly agree
	1	2	3	4
a. I prefer to work on assignments on my own, even if I have trouble learning class material	o	o	o	o
b. I try to work with other students from my classes when completing course assignments.	o	o	o	o
c. I prefer to work in groups because it ends up being less work for me.	o	o	o	o
d. I only work with classmates if I'm stuck on an assignment.	o	o	o	o
e. I prefer to learn by exploring and trying things out for myself.	o	o	o	o
f. I prefer to get clear instructions and information before trying something new.	o	o	o	o
g. I am used to doing several different tasks at the same time.	o	o	o	o

15. When do you usually study or work on course assignments?

a. Please check all that apply.

_____During class
_____Throughout the day
_____Between class breaks
_____In the evenings

b. Please list any other times you usually study or work on course assignments.

_____

16. Students' relationship with peers.

	Strongly disagree			Strongly agree
	1	2	3	4
a. I trust other students in this program.	o	o	o	o
b. I can rely on other students in this program to help me.	o	o	o	o
c. I can rely on a classmate to respond to my course questions quickly.	o	o	o	o
d. I feel other students in the program do not help me learn.	o	o	o	o
e. I feel like I am always connected to my friends because of cell phones and other technologies.	o	o	o	o

17. I work with classmates because...

	Strongly disagree			Strongly agree
	1	2	3	4
a. it helps me understand course content better	o	o	o	o
b. I enjoy it	o	o	o	o
c. It results in better work completed	o	o	o	o
d. It is easier than working alone	o	o	o	o
e. it keeps me motivated to keep working	o	o	o	o
f. classmates provide useful feedback for my work	o	o	o	o

18. Student attitude toward the program and peers

	Strongly disagree			Strongly agree
	1	2	3	4
a. I feel connected to others in this program	o	o	o	o
b. I feel isolated in this program.	o	o	o	o
c. I would rate my educational experience in this program very highly.	o	o	o	o
d. I need a lot of help in this program.	o	o	o	o
e. This program has a manageable workload.	o	o	o	o

19. Student attitude towards instructors

	Strongly disagree			Strongly agree
	1	2	3	4
a. The instructors are available if I have any questions in a course.	o	o	o	o
b. The instructors are approachable if I have any questions in a course.	o	o	o	o
c. I don't want to look stupid, so I don't ask the instructor questions outside of class.	o	o	o	o
d. Instructors in this program are knowledgeable.	o	o	o	o
e. I would not hesitate to ask an instructor for help.	o	o	o	o

20. Personal interests

	Strongly disagree			Strongly agree
	1	2	3	4
a. I am comfortable using computers, the Internet and other information and communication technologies for a variety of purposes.	o	o	o	o
b. I enjoy meeting new people.	o	o	o	o
c. I enjoy talking about myself to people I meet	o	o	o	o
d. I have very clear goals in life.	o	o	o	o
e. I enjoy reading.	o	o	o	o
f. I get involved in projects and activities that make a difference in society	o	o	o	o

21. Please make any comments or suggestions about communication options that would help you learn in your courses?_____

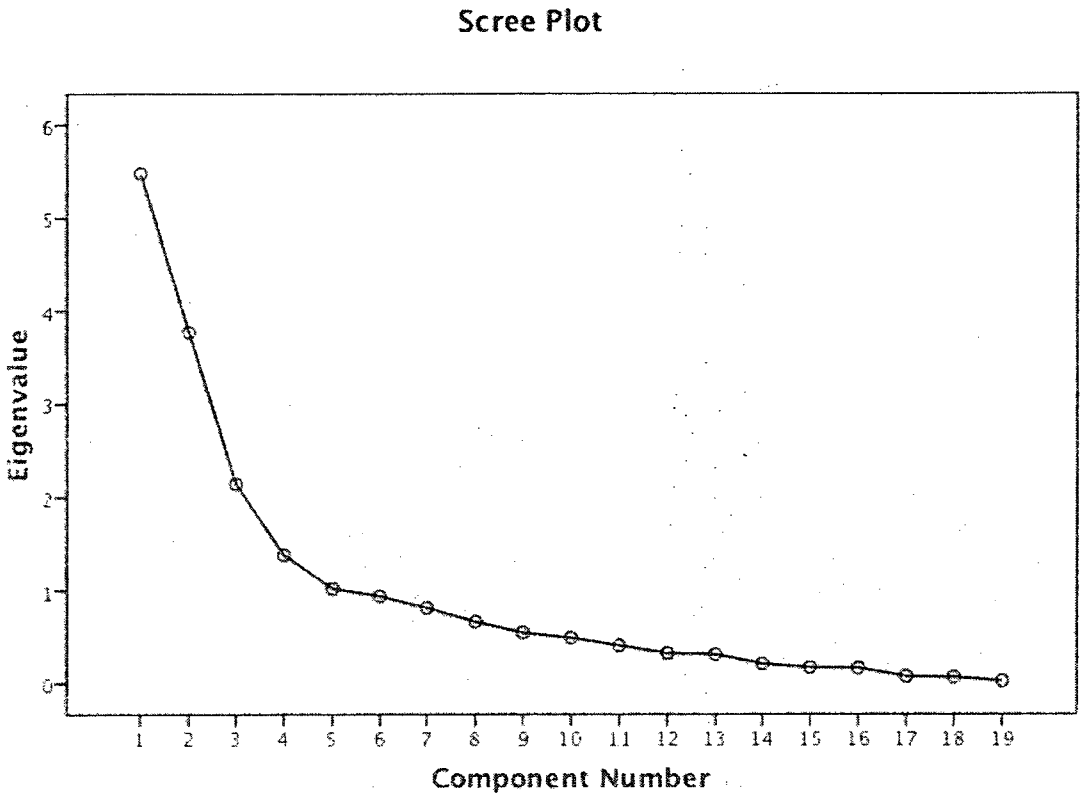
_____

_____

_____

Thank you for completing the survey

Appendix I: Scree plot for factor analysis of attitudinal items in the pilot test survey



Appendix J: Final survey instrument

BCIT Logo

Survey of Student Communication & Study Habits

Help us understand how students **interact** with classmates and instructors **outside of class**. By completing this survey you will provide BCIT with valuable information, and help to improve the educational experience of future students. **All responses will remain confidential.** This information will be used for educational research that is consistent with the BCIT mandate, and the information will be used in compliance with the BC Freedom of Information and Protection of Privacy Act S.B.C. 1992 September/03 V1.0.

Section 1: Demographic information

1. Gender __F __M 2. Date of birth: Month_____ Year_____

3. Please indicate your student status.
___Full-time student ___Part-time studies student
___Other. If so, please state what your student status is._____

4. What program are you in? _____

5. What year of the program are you in?_____

6.a. How many hours of classes do you attend per week? _____

6.b. On average, how many hours per week do you study outside of class time?_____

6.c. On average, how many hours are you on campus each week (including class & non-class time)? ___

7. On average, how many hours do you work at a job each week (whether you work for an employer or are self-employed)?_____

8. What was your average grade in the program last year? Please choose one option.

___less than 50%	___60 to 64	___75 to 79	___90 to 94
___50 to 54	___65 to 69	___80 to 84	___95 or more
___55 to 59	___70 to 74	___85 to 89	___Not applicable

Section 2: Who do you turn to for help with your courses?

Please use the following scale to answer the questions in this section: **1=Never and 4=Always.**

9. What do you do when you have a question about course content?	Never 1	2	3	Always 4
a. Talk to an instructor	o	o	o	o
b. Talk to a classmate	o	o	o	o
c. Talk to a set representative	o	o	o	o
d. Talk to others students not in the program	o	o	o	o
e. Talk to another person (e.g. family, friend etc.)	o	o	o	o
f. Go to a study support centre (e.g. math help centre)	o	o	o	o
g. Search online	o	o	o	o
h. Talk to a work colleague	o	o	o	o
i. Try to address it on my own (e.g. read the textbook)	o	o	o	o

j. Please indicate what else you do to answer course content issues._____

10. What do you do when you have an administrative question about a course or the program (e.g. assignment due dates, grades)?	Never 1	2	3	Always 4
a. Talk to an instructor	o	o	o	o
b. Talk to classmates	o	o	o	o
c. Talk to a set representative	o	o	o	o
d. Talk to other students not in the program	o	o	o	o
e. Talk to the program head	o	o	o	o
f. Talk to administrative staff	o	o	o	o
g. Search BCIT's website	o	o	o	o
h. Try to address it on my own (e.g. read the course outline)	o	o	o	o

i. Please state any other things you do to address course administrative issues. _____

Section 3: How and where do you communicate with peers and instructors?

Please use the following scale to answer questions in this section:

Never
Seldom = 1 to 4 times per month
Often =5 to 10 times per month
Always =More than 10 times per month

11. How often do you use each of the following to communicate with classmates about courses?	Never 0	Seldom 1 – 4	Often 5 – 10	Always More than 10
i. BCIT email account	o	o	o	o
j. Personal email account (e.g. Hotmail, Telus, etc.)	o	o	o	o
k. Instant messaging (e.g. MSN, Yahoo Messenger or other applications)	o	o	o	o
l. Text message via cellphones	o	o	o	o
m. Facebook / MySpace	o	o	o	o
n. Talking via phone	o	o	o	o
o. Talking in person	o	o	o	o
p. WebCT	o	o	o	o

i. Please list any other applications or channels you use to communicate with classmates?

_____

12. How often do you use each of the following to communicate with instructors?	Never 0	Seldom 1 – 4	Often 5 – 10	Always More than 10
i. BCIT email account	o	o	o	o
j. Personal email account (e.g. Hotmail, Telus, etc.)	o	o	o	o
k. Instant messaging (e.g. MSN, Yahoo Messenger or other applications)	o	o	o	o
l. Text message via cellphones	o	o	o	o
m. Facebook / MySpace	o	o	o	o
n. Talking via phone	o	o	o	o
o. Talking in person	o	o	o	o
p. WebCT	o	o	o	o

i. Please list any other applications or channels you use to communicate with instructors?

_____

13. How often do you study or work on assignments in the following places outside of regular class time?

	Never	Seldom	Often	Always
	0	1 – 4	5 – 10	More than 10
h. In a classroom	o	o	o	o
i. In a lab, workshop or studio	o	o	o	o
j. In the library	o	o	o	o
k. In social spaces around campus (e.g. Great Hall, cafeterias)	o	o	o	o
l. At home	o	o	o	o
m. At work	o	o	o	o
n. In transit (e.g. bus, Skytrain)	o	o	o	o

h. Please state any other places where you study or work on assignments._____

Section 4: Your study and communication habits with classmates and instructors

In this section, please rate your level of agreement with the each of the following statements.

14. My study habits.

	Strongly disagree			Strongly agree
	1	2	3	4
h. I prefer to work on assignments on my own when doing schoolwork.	o	o	o	o
i. I prefer to study only with friends.	o	o	o	o
j. I prefer to learn by trying things out for myself.	o	o	o	o
k. I prefer to get clear instructions before trying something new.	o	o	o	o
l. I am used to doing several different tasks at the same time.	o	o	o	o

15. a. When do you usually study or work on course assignments? Please check all that apply.

_____During class
_____Throughout the day
_____Between classes
_____In the evenings
_____On weekends

b. Please list any other times you usually study or work on course assignments.

_____

16. My relationship with peers.

	Strongly disagree			Strongly agree
	1	2	3	4
f. I trust other students in this program.	o	o	o	o
g. I can rely on classmates to help me.	o	o	o	o
h. I can rely on classmates to respond to my course questions within a few hours.	o	o	o	o
i. I enjoy discussing my ideas about course content with other students.	o	o	o	o
j. I feel like I am always connected to friends because of technologies such as cell phones and the internet.	o	o	o	o

17. I work with classmates because...

	Strongly disagree			Strongly agree	Not applicable
	1	2	3	4	5
g. it helps me understand course content better.	o	o	o	o	o
h. I enjoy it.	o	o	o	o	o
i. it results in better work completed.	o	o	o	o	o
j. it saves time.	o	o	o	o	o
k. it keeps me motivated to keep working.	o	o	o	o	o
l. classmates provide useful feedback for my work.	o	o	o	o	o

18. My experience with the program and peers

	Strongly disagree			Strongly agree
	1	2	3	4
f. I feel isolated from other students in this program.	o	o	o	o
g. I need a lot of help in this program.	o	o	o	o
h. I feel this program has a manageable workload.	o	o	o	o
i. I would recommend this program to others.	o	o	o	o

19. My experience with instructors

	Strongly disagree			Strongly agree
	1	2	3	4
f. Instructors are available when I have any questions in a course.	o	o	o	o
g. Instructors are approachable if I have any questions in a course.	o	o	o	o
h. I don't want to look stupid, so I don't ask instructors questions outside of class.	o	o	o	o
i. Instructors in this program are knowledgeable.	o	o	o	o
j. I can rely on instructors to respond to my course questions within a few hours.	o	o	o	o
k. I would not hesitate to ask an instructor for help.	o	o	o	o

20. Personal interests

	Strongly disagree			Strongly agree
	1	2	3	4
g. I am comfortable using computers, the Internet and other information and communication technologies for a variety of purposes.	o	o	o	o
h. I enjoy meeting new people.	o	o	o	o
i. I enjoy talking about myself to people I meet.	o	o	o	o
j. I have very clear goals in life.	o	o	o	o
k. I enjoy reading.	o	o	o	o
l. I get involved in projects and activities that make a difference in society.	o	o	o	o

21. Please make any comments or suggestions about communication options that would help you learn in your courses? Also, please feel free to make any suggestions or comments about this survey.

_____

_____

_____

_____

Thank you for completing the survey.

Appendix K: Instructor contact email

Dear Instructor,

The Learning and Teaching Centre is conducting research on how students use digital technologies to interact with classmates and instructors outside of class. One of your classes has been randomly selected to participate in the survey: NMED 3040, Applied Physiology offered on **Monday, October 27 at 10:30 am**.

Please let us know if you are willing to support this research project by allowing us to come into your class at this time to administer this survey. In doing so, you will help provide BCIT with invaluable information, and help improve the educational experience of future students. The survey should take students about **10 minutes to complete.**

The survey will be administered by Adnan Qayyum, a doctoral student who is working with the Learning and Teaching Centre. We would appreciate it if you could confirm by this **Thursday, October 9,** your willingness to participate.

Thank you in advance for your cooperation.

Sincerely,

BCIT Senior Manager

This research project and the survey have been reviewed and approved by BCIT's Research Ethics Review Board. If you have any concerns or questions about treatment of participants, please contact BCIT Research Ethics at research_ethics@bcit.ca

****

BCIT Senior Manager
British Columbia Institute of Technology
3700 Willingdon Ave.
Burnaby, BC, CANADA

Appendix L: Outline used to introduce survey to participants

Survey of Student Communication and Study Habits

A. Describe what Learning and Teaching Centre does

1. Introduce myself
2. Located in SE 12
3. Supports teaching
4. Provides course development, technology, instructional design support and audio-visual services

B. Describe survey goals

1. How students communicate and study, outside of class.
2. How they use softwares and applications to study
3. How BCIT can help improve and support students learning and improve the learning environment

C. Describe process for completing survey

1. Participation is voluntary.
2. State they can choose not to complete survey.
3. Mention BCIT Research Ethics approval.
4. Takes 7 to 12 minutes
5. 4 pages
6. Check marks in the multiple choice the quickest

D. Inform instructors they can see results of survey on PD day.

Appendix M: Instructor survey

BCIT Logo

Survey of Student Communication & Study Habits

Background questions for instructors

1. How many students are enrolled in this course? _____

2. Is this a required course in the program? _____

3. Do you require students in this course to use particular information and communication technologies? If so, please describe which ones? _____

4. Please estimate what percentage of assignments in this course requires group work? _____

5. Do you encourage group work in this course? If yes, please describe.

Appendix N: Description of courses surveyed

(from BCIT website and instructors' outlines)

List of courses where survey was administered

1. Introduction to Mineral Processing (Mining and Mineral Exploration)
2. Applied Physiology 2 (Nuclear Medicine)
3. Object Oriented Programming in C++ (Computer Systems)
4. Design of Steel Structures (Civil Engineering)
5. Heating, Ventilating and Air Conditioning (Building Engineering)
6. Technical Communication 2 for Electronics (Electrical and Computing Engineering)
7. ArcGIS 3: Customization and Modeling (Geographic Information Systems)
8. Business Planning Principles (Marketing Management)
9. Management Accounting Administration (Business Management)
10. Transportation Economics (International Trade and Transportation)
11. Video Production (Broadcast and Media Communications: Television)
12. Systematic Inquiry Research (Nursing)
13. Sanitation for Food Processing (Food Management)
14. 3D Computer Rendering for Interior Design (Interior Design)

Course Descriptions

1. Introduction to Mineral Processing (Chemical Sciences)
The course covers the essential operations of applied mineral processing: grinding, screening, gravity separation, cyclone classification, flotation, sedimentation, thickening, filtration. Emphasis on numerical solution of operating and design problems. Course includes laboratory work.

Upon successful completion, the student will be able to competently cover the following topics:

Introduction to Mineral Processing
* Define mineral processing and state why concentrating operations are necessary in recovering metals from ore deposits.
* Recognize and interpret typical mineral processing flowsheets.
* Describe mineral properties utilized in the separation of gangue and economic minerals.
* Derive and utilize two product formulas for calculating recovery and ratio of concentration from stream assays.

Particle Size Measurement
* Recognize that reported irregular shaped particle sizes depend upon method of measurement and definition of size.

* Describe methods of particle size measurement.
* Describe the standard Tyler and other sieve series.
* Perform solids sample size distributions by sieve analysis.
* Analyze size distribution data graphically and in tabular formats.

Crushing

* Define crushing, angle of nip and crusher classifications.
* Describe the various types of crushing mechanisms.
* Describe the types of primary crushers.
* Describe secondary, tertiary and quaternary types of crushers.
* Utilize standard crusher performance charts to determine capacities of crushers.
* Utilize standard graphical size distribution data to determine crusher product characteristics.
* Describe types of screens utilized in closed circuit crushing.
* Perform crushing and industrial screening experiments.

Comminution Theory

* Describe methods utilized to determine mineral liberation size.
* Describe rock breakage according to F.C. Bond.
* Describe how applied mechanical energy is utilized during comminution.
* State the empirical proposition between energy and size reduction of rock.
* State the comminution laws of Rittinger, Kirk and Bond.
* Define Bond's work index.
* Utilize Bond's law to determine energy required to achieve size reduction of rocks.

Grinding

* Describe the grinding mechanisms encountered in tumbling mills.
* Define critical speed during grinding in tumbling mills.
* Utilize derived formulas to calculate critical speed.
* Describe types of grinding media and mill liners.
* Describe the importance of circulating loads during grinding.
* Describe typical characteristics of rod mills, ball mills, pebble mills and SAG mills.
* Utilize standard formulas for scaling tumbling mills.
* Experimentally determine the Bond work index for ores.
* Determine rod and ball mill power draws utilizing standard formulas and tabulations.
* Apply standard efficiency factors to the Bond equation when sizing rod and ball mills.

Sedimentation Theory

* State Newton's laws of motion.
* Describe the free settling concept utilized in sedimentation theory.
* Recognize the mechanical mineral separation techniques that are based on fluid mechanics.
* Recognize the importance of the force of gravity, the buoyant force and the drag force acting on a mineral particle immersed in a fluid.
* Utilize standard charts of drag coefficient versus Reynolds' number in terminal velocity calculations.

* Utilize Stokes' law for calculating terminal velocity of particles in laminar flow.
* Experimentally determine the size distribution of a sub sieve size solids sample utilizing an Andreasen pipet.

Laboratory Exercises
* Sampling of Brocken Rock
    o Development of sampling techniques from large bulk sample
    o Screening tests and presentation of data in tabular and graphical forms.
* Screen Analysis
    o Experimental determination of differences between wet and dry screening techniques as applied to a sample containing fine material.
    o Presentation of data in tabular and graphical forms.
* Bond's Work Index
    o Estimation of Bond's Work Index by measurement of energy required to crush various ores. Screen efficiency experiment included in this section.
* Sedimentation
    o Sizing of fine particles according to Stokes' law by the use of the Andreasen sedimentation pipet.
* Heavy Media Separation
    o Separation of minerals of different specific gravities by the use of a high density pseudo-liquid.
* Calculations for rod and ball mill sizing.

2. Applied Physiology 2 (Nuclear Medicine)
Instructs in all aspects of current applied physiology including criteria, methodology, instrumentation, patient problems and approach, data collection and manipulation.

Upon successful completion, the student will be able to:
* Apply knowledge of the imaging and non-imaging physiological applications of radiopharmaceuticals to explain and perform Nuclear Medicine Technology diagnostic and therapeutic procedures in the following categories: non-imaging in vivo, inflammation and tumor imaging, gastrointestinal tract imaging, hepatobiliary imaging, liver and spleen imaging, bone imaging and bone densitometry.'
* Identify how normal anatomy & physiology as well as pathologies are made evident by a Nuclear Medicine study.
* Generate valid, optimal quality diagnostic images and data.
* Evaluate the technical validity and quality of Nuclear Medicine procedures and data.

3. Object Oriented Programming in C++ (Computer Systems)
This course covers a paradigm in programming which deals with classes and objects. A number of features of the C++ language will be covered including inheritance, polymorphism, templates, exceptions and the Standard Template Library.

By the end of this course, the student will be able to:

* Design and code basic C++ programs.
* Understand abstract data types as represented in C++ code.
* Design and code good C++ classes.
* Understand and use common algorithms expressed in C++.
* Use inheritance to capture and reuse common behavior.
* Use polymorphism to create easily extensible systems.
* Use templates to create reusable containers and iterators.
* Use multiple inheritance to model complex abstractions.
* Use exception handling to catch errors and properly release resources.
* Use simple persistence strategies for preserving objects between program invocations and/or share objects between programs.
* Use the standard C++ library.

4. Design of Steel Structures (Civil Engineering)

This course covers various topics on the behaviour and design of steel members and structures. Topics include beam-columns, fatigue, plate girders, composite design, structural stability, plastic design, connections, and seismic design considerations.

Upon successful completion of this course, the student will be able to:

* Design beam-columns according to CSA S16.
* Identify fatigue-susceptible details in structural steel.
* Identify failure mechanisms in steel plate girders.
* Design stiffened plate girders according to CSA S16.
* Describe the load-resisting mechanisms for composite concrete and steel sections.
* Design composite flexural sections according to CSA S16.
* Design lateral-force resisting elements for ductility according to CSA S16.
* Design and detail common structural steel elements such as gusset plates, base plates and bearing stiffeners.
* Design continuous beams and rigid frames using basic methods of plastic analysis.
* Prepare design development-level drawings of steel structures.

5. Heating, Ventilating and Air Conditioning (Building Engineering)

Introduces the factors and concerns influencing indoor comfort and heat transfer in buildings, properties of air and air conditioning processes. Application of these principles will be applied to preparing load estimates for a small building of a non-specialized nature. Includes review of mechanical systems with descriptions of function and operation of components.

course learning outcomes / competencies

Upon successful completion, the student will be able to:

* Define requirements for comfort.
* Analysis a given structure and calculate heat losses.
* Determine the heat gain of a given structure.

* Discusses the advantages/disadvantages of various HVAC systems in terms of specialized functions.
* Explain the role of HVAC designer within the design team.
* Interpret a HVAC systems design and discuss possible options.
* Identify various types of air handling systems.
* Specify construction materials to meet Energy Code/Bylaw.

6. Technical Communication 2 for Electronics (Electrical & Computing Engineering)
In this course, students prepare a professional career search package, practice interviewing skills, conduct a business meeting, and write routine business correspondence and non-formal technical reports, including a proposal. As well, they prepare a formal research report which presents and analyses the findings of a major project in their technology option. They also learn how to present this information and analysis in an effective oral presentation.

Upon successful completion, the student will be able to:
* Apply the writing skills learned in COMM 1143.
* Produce an effective career search package (resume and application letter).
* Present technical information and analysis in oral briefings.
* Write the basic types of business correspondence.
* Write persuasive, professional proposals.
* Write clear, informative investigation reports and progress reports.
* Use effective visuals in oral and written reports.
* Write and package a formal research report.
* Effectively prepare for, conduct, and participate effectively in a business meeting.

7. ArcGIS 3: Customization and Modeling (Geographic Information Systems)
Introduces the ArcObjects development environment using the Microsoft Component Object Model and VBA. Topics include customizing tool bars, controls and map documents, coding events, working with tables, creating Map Layouts and creating custom tools. VBA applications will be created that manipulate the MxDocument, Map, Feature and Graphic Layer and other objects. A complete VBA customization of ArcMap will be created for Crime Analysis.

Upon successful completion, the student will be able to:
* Develop GIS application interfaces using Visual Basic for Applications.
* Develop GIS application interfaces using Visual Basic.
* Design custom interfaces for ArcGIS Desktop.
* Use existing software components to create a customized application.

8. Business Planning Principles (Marketing Management)

Teaches the practical skills required to successfully launch a new venture with emphasis on how to assess new business opportunities, compose a business plan and obtain the necessary financing. Students will be able to determine whether a new business concept has sufficient potential market demand, product/service provision capacity, management skill and financial commitment to represent a successful business opportunity.

Upon successful completion, the student will be able to:

* Explain the importance of analyzing ideas before starting a business.
* Describe the major characteristics that underlie business success and failure.
* Assess whether a new venture opportunity has sufficient potential market demand, product/service provision capacity, management skills, and financial commitment to represent a valid business opportunity.
* Identify and be able to apply the distinctive research required to successfully complete a business plan suitable to raise financing.
* Discuss the importance of the sustainability of competitive edge/advantage.
* Identify and compare broad-based strategy options for the entrepreneurial venture.
* Develop the components of a business plan, in whole and in part, to describe the growth of a business opportunity from concept to operating business.
* Discuss the types of information needed to evaluate competition. Explain how competitive strategies are evaluated and analyzed.
* Describe the characteristics and value of a strong management team.
* Explain the common legal forms of organization used by businesses.
* Describe the purpose, content, and application of the Pro-Forma Income Statement, Cash Flow Statement and Balance Sheet.
* Apply the concepts of Sales and Expense Forecasting to the Pro Forma Financial Statements.
* Evaluate the choice between debt financing and equity financing.
* Define and select the most realistic form(s) of financing for a business.
* Describe the advantages and disadvantages of buying a business as well as the valuation methods used.
* Explain and give examples of franchising business concepts.

8. Management Accounting Administration (Business Management)

Covers the management accountant's role in decision-making, planning and control of company operations through budgeting, standard costing and evaluation systems. Emphasis is on alternative methods for product costing, cost allocations, performance measurement and decision-making models.

9. Transportation Economics (International Trade and Transportation)

This course provides an understanding of the major economic issues involved in the provision of transportation services. The course will analyse the factors which determine the supply and demand for these services. Both practical and theoretical aspects of transportation economics, including both the domestic and international scenes, will be

undertaken. Emphasis will be placed on applying these economic concepts to transportation problems.

At the end of this course, the student will be able to:

* Determine the significance of transportation services in the economy:
  - o Identify the economic value of goods due to transportation
  - o Recognize the impact of transport on the Canadian Economy
  - o Interpret the trends in transportation services
* Discuss the demand for freight and passenger services.
  - o Describe the measurement of freight and passenger demand.
  - o Analyze aggregate demand and demand elasticity
  - o Explain the elasticity of demand for transport
  - o Explain the characteristics of transport demand
  - o Identify problems due to non-uniform demand
* Discuss economic costs and their implications in price determination
  - o Distinguish between accounting, economic and social costs
  - o Distinguish between cost-of-service and value ?of-service pricing.
  - o Discuss pricing factors, strategies, and techniques in transportation
* Apply cost-benefit principles to choose between alternate investment proposals.
  - o Identify tangible vs. non-tangible costs
  - o Identify when to use cost benefit analysis vs. other selection techniques
* Analyze the cost/economic characteristics of transport carrier operations
* Determine cost factors for intermodal movements
  - o Describe ocean transport costs.
  - o Identify additional intermodal costs
* Describe the impact of international economic activities on transport decisions
  - o Identify the impact of government intervention
  - o Compare the impact of economic regulation vs. deregulation of transportation.

11. Video Production (Broadcast and Media Communications Television)

Upon successful completion of this course, students will be able to demonstrate their professional competency as members of a television or video production team as they rotate through all respective positions. Studio, field and post-production activities will be assigned to meet the demands of a variety of program formats. Students will assume all managerial, production and support function responsibilities.

Upon successful completion, the student will be able to:

* Plan Production Proposals.
* Organize Production Meetings.
* Assess necessary Production Requirements.
* Prepare and analyze Production Schedules.
* Facilitate discussions with Clients.
* Manage Client expectations.
* Write Meeting Reports.
* Demonstrate practical knowledge in all aspects of Production and Post Production.

* Evaluate their contribution and that of their peers to the Production process.
* Conduct Debriefing Sessions.

12. Systematic Inquiry Research (Nursing)
This course examines the components of the research process. Students will analyze methodologies in both qualitative and quantitative nursing research studies. Students will read and critique research studies for the purpose of making judgments about the applicability of research findings to nursing practice.

13. Sanitation for Food Processing (Food Management)
Stresses the good manufacturing practices, personal hygiene, and HACCP systems relating to the sanitation of food plants. Studies properties of appropriate cleaners and sanitizers together with the proper use of equipment for cleaning. Discusses sanitary and safety design of food processing plants and equipment as well as appropriate waste management.

Upon successful completion, the student will be able to:
* Assess the level of sanitation in food processing plants and recommend appropriate practices and procedures to achieve the sanitary conditions required by regulatory agencies and consumers to produce high quality food products.
* Appreciate the principles involved in producing food products under sanitary conditions.
* Demonstrate the effectiveness of cleaning agents and procedures employed in the sanitation of food processing plants by laboratory tests and case studies.
* Determine the appropriate cleaning and/or sanitizing practices to be used for selected food plant situations.
* Formulate an appropriate HACCP system and Good Manufacturing Practices for selected food processing systems.
* Select effective control methods that are environmentally-sensitive for insect, rodent and bird pests.
* Examine and prepare plant sanitation and housekeeping procedures with respect to compliance with government regulations.
* Review appropriate solutions to food processing waste situations.

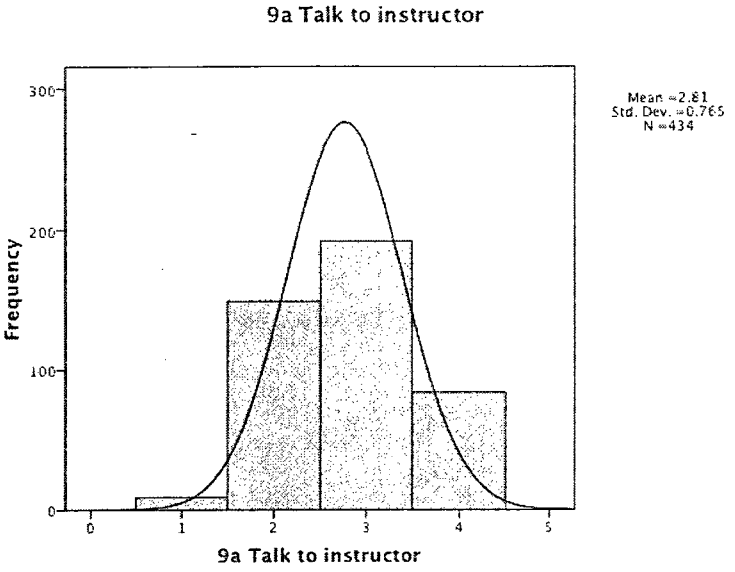
14. 3D Computer Rendering for Interior Design (Interior Design)
This course will introduce students to 3D drawing using AutoCAD, and to rendering using Accurender. With these programs, students will draw furniture, spaces in isometric and perspective views, and walk-through simulations of created spaces.

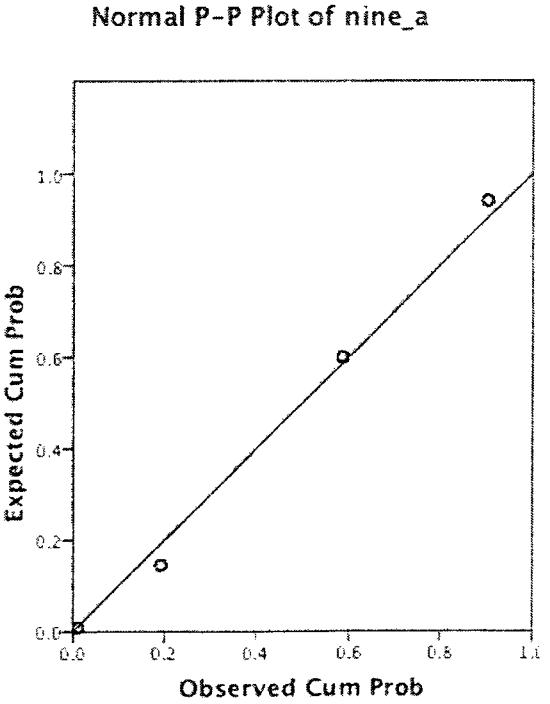
At the end of this course the student will be able to:
* Create 3D drawings using AutoCAD for interior design applications.
* Render 3D objects and spaces using Accurender software.
* Create animated 'slideshows' of an interior space using Sketch Up software.
* Plot a professional looking rendered 3D drawing.
* Convert AutoCAD drawing to a Sketch Up drawing and vice versa..

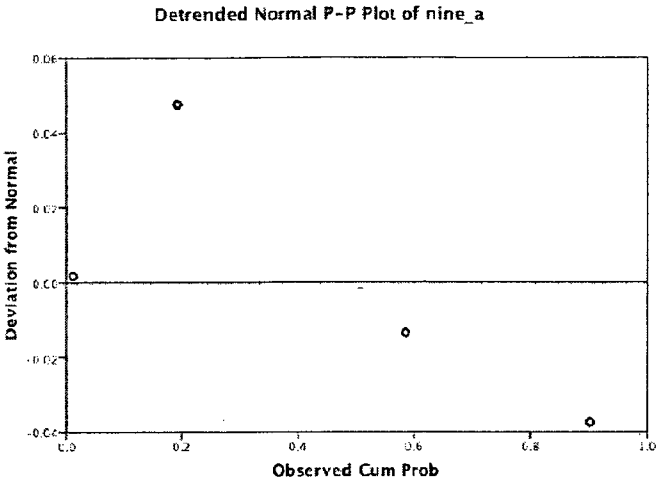
* Present projects using PowerPoint.

Appendix O: Histograms, normal probability plots and detrended probability plots for items 9a and 9b

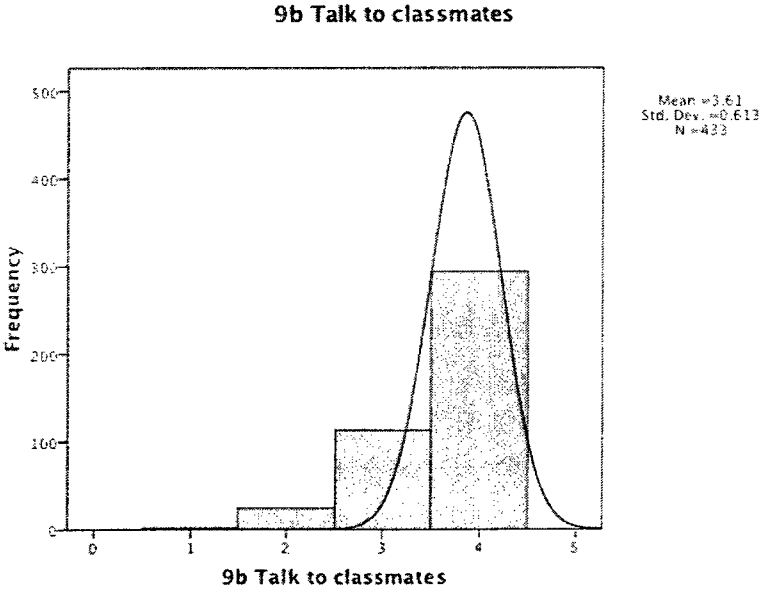
Item 9a:



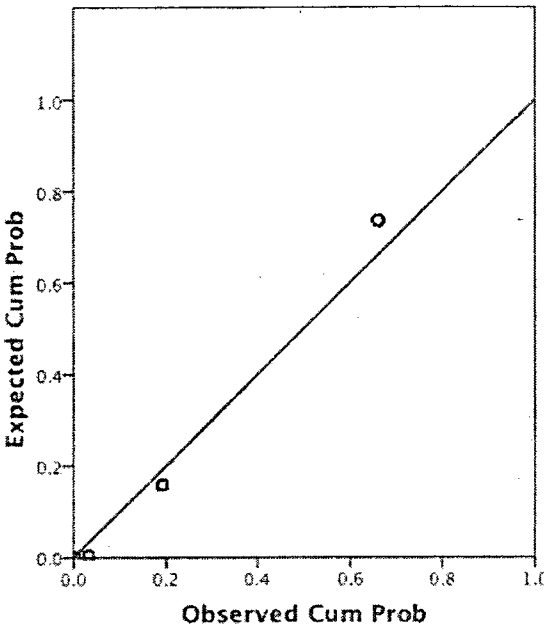



Detrended Normal P-P Plot of nine_a
Deviation from Normal
Observed Cum Prob
0.06
0.04
0.02
0.00
-0.02
-0.04
0.0
0.2
0.4
0.6
0.8
1.0

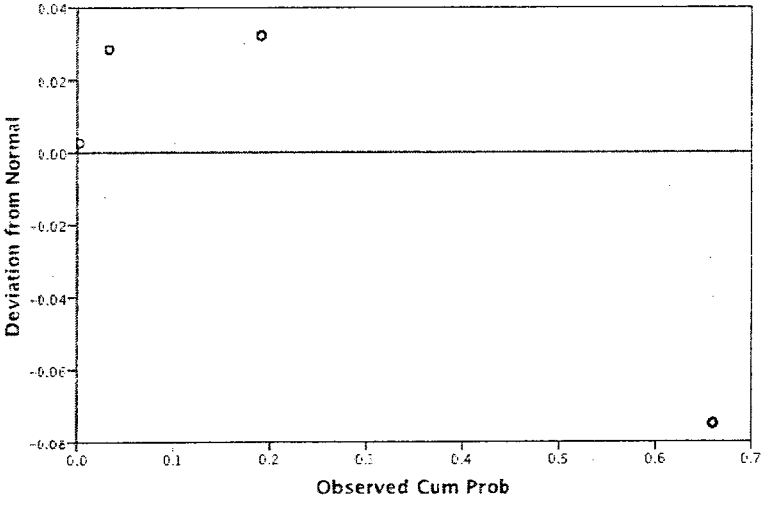
Item 9b:


9b Talk to classmates
Mean =3.61
Std. Dev. =0.613
N =433
Frequency
9b Talk to classmates
500
400
300
200
100
0
0
1
2
3
4
5

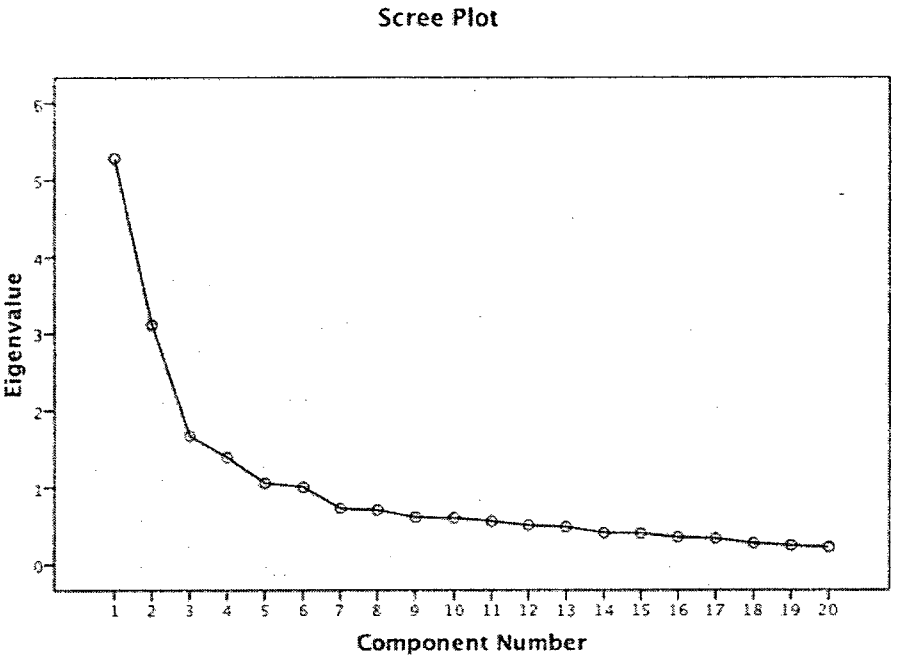
Normal P-P Plot of nine_b



Detrended Normal P-P Plot of nine_b



Appendix P: Scree plot for factor analysis of attitudinal items



Appendix Q: Structure matrix for factor analysis (oblique rotation) of attitudinal items

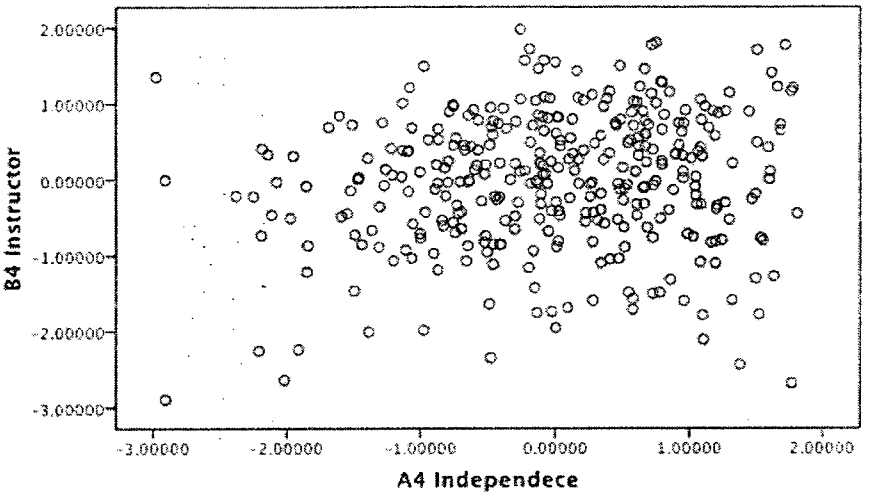
Factors	1	2	3	4	5	6
14a Prefer to do schoolwork on my own				.820		
14c Prefer to learn by trying things for myself				.844		
16a Trust other students in the program			-.814			
16b Rely on classmates to help me			-.850			
16c Rely on classmates to respond quickly to course questions			-.836			
16d Enjoy discussing my ideas about course content with other students			-.710			
17a Classmates help me understand course content better	.807					
17b Work w classmates because I enjoy it	.791					
17c Working w classmates results in better work completed	.886					
17d Working with classmates saves time	.831					
17e Working with classmates keeps me motivated to keep working.	.832					
17f. Classmates provide useful feedback for my work	.763					
18c. I feel this program has a manageable workload.					-.857	
18d. I would recommend this program to others.					-.785	
19a. Instructors are available when I have any questions.		.810				
19b. Instructors are approachable		.774				
19cR Reverseof "Don't want to look stupid"						-.866
19d Instructors in program are knowledgeable		.694				
19e I can relay on instructors to respond quickly to course questions.		.749				
19f I would not hesitate to ask an instructor for help.						-.800

Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser Normalization.

Appendix R: Partial regression plots for regression analysis

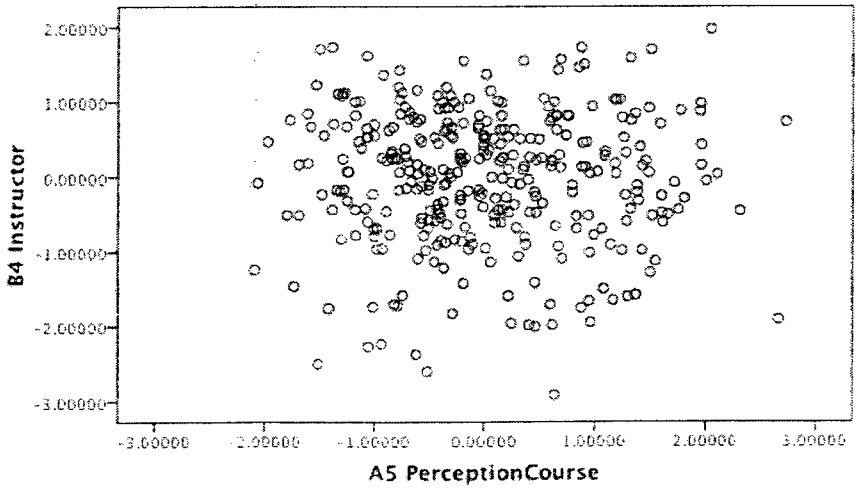
Partial Regression Plot

Dependent Variable: B4 Instructor



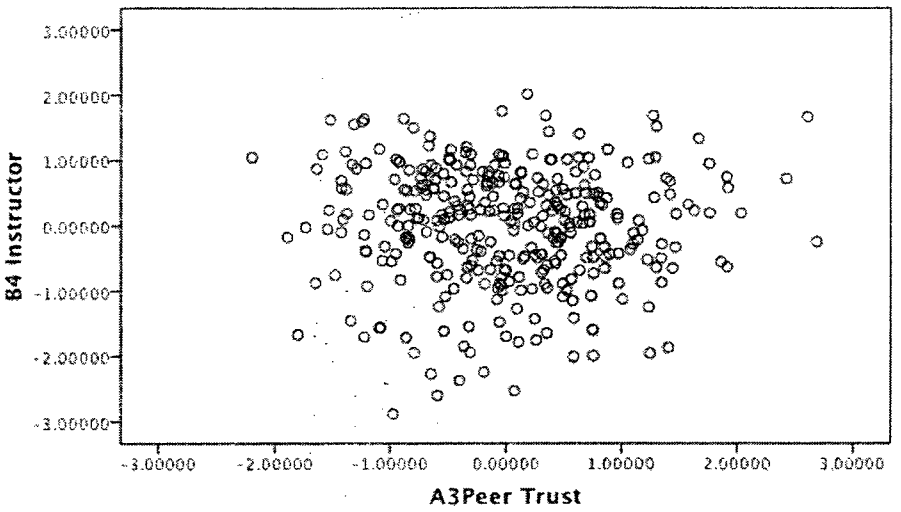
Partial Regression Plot

Dependent Variable: B4 Instructor



Partial Regression Plot

Dependent Variable: B4 Instructor



Partial Regression Plot

Dependent Variable: B4 Instructor