A Postphenomenological Exploration of Mobility in
Post-Secondary Teaching and Learning

by

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# Abstract

Increasingly, we work, learn, travel and spend our leisure time with highly portable, micro technologies and we have less direct, face-to-face contact with people and the world. Education has become "mobilized" with teachers and students regularly using smartphones, tablets, laptop computers and mobile applications. These technologies function as portals into other, virtual worlds where there are both educational opportunities and new challenges. This study moves beyond the hype of mobile technology and the discussions of "technology-as-tool" and "technology-as-future" and considers how the increased mobility of students and teachers is subtly changing education practices in postsecondary education. The study begins with the acknowledgement that things (including technologies) are inseparable from their contexts or worlds (Borgmann, 1984, p. 41) and explores students' and teachers' pre-reflective experiences while they are using mobile technologies for teaching and learning. By applying a unique, postphenomenological research lens, which combines insights from hermeneutic phenomenology and actor-network theory, the study investigates some of the human-technology interactions that occur in post-secondary classrooms, the ways in which students and teachers are influenced and changed by the use of mobile technology and what this means for twenty-first century teaching and learning.

## Preface

This dissertation is an original work by Peggy Jubien. The research for this dissertation was collected in two studies and subject to the review and approval of the University of Alberta's Research Ethics Board. The first research study, "Linking actor-network theory and mobile technology in education", No. Pro00027701, is from November 29, 2011 and the second study, "Understanding telepresence in online conferencing programs", No. Pro00038895, is from March 27, 2013.

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**Dedication**

To my husband, Nicholas.

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# Glossary of Terms

**Actor-network theory**. A theoretical understanding that identifies how objects, artifacts and people (called actors) combine together into actor-networks or assemblages and how they work together. ANT originated in the writings of many scholars, but most especially in the work of: Michael Callon, Bruno Latour and John Law.

**Mobile Learning**. For this study, I have adopted O'Malley's et al. (2005) definition of mobile learning as "Any sort of learning that happens when the learner is not at a fixed, predetermined location, or learning that happens when the learner takes advantage of the learning offered by mobile technologies." (p. 7).

**Mobile Technology**. Ally's (2004) defines mobile technology as mobile computing devices that allow users to access materials from anywhere, at any time.

**Online conferencing**. A method of real-time communication that brings remote users together through the use of the Internet and specialized software programs. Users may share text, voice and video information through the use of smartphones, desktop, laptop and tablet computers.

**Phenomenology**. A qualitative research method that studies our lived, pre-reflective experiences of a phenomena. In education, phenomenology strives to uncover our lived experience of educational phenomena and attempts to return to our pre-reflective experiences of the world, rather than depend on our theories, categories, conceptualizations or reflections (van Manen & Adams, 2010).

**Postphenomenology**. Postphenomenology is broadly defined as a reinterpretation of phenomenology that is nonsubjectivistic and interrelational (Ihde, 2009). It strives to understand subjects and their objects by focusing on the ways they co-constitute, shape, and influence one another (Verbeek, 2005). Postphenomenology integrates understandings, vocabulary and research strategies from phenomenology as well as actor-network theory (ANT).

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**Chapter 1: Introduction**

**Mobilizing Education**

In post-secondary classrooms, libraries, hallways and green spaces, mobile technologies are now a taken-for-granted, ubiquitous feature of campus life. Students use their smartphones and tablet computers to attend group meetings in Second Life, read and annotate textbooks, and access Facebook and Twitter; teachers use mobile devices to prepare lesson plans, distribute course materials, and communicate with students and colleagues. Many, including teachers, administrators and IT specialists, predict that mobile technology will improve teaching and learning. One administrator describes mobile technology as "... transforming the learning environment." (*ACU first university,* 2008, ¶ 4), Cox (2010) outlines how teachers and students see mobile learning as "... increasingly essential to higher education ..." (p. 3), and Chen (2011) contends that, "There's a clear opportunity here ... [for the iPhone] to refresh classroom learning in higher education." (p. 48). The enthusiasm generated by Apple, whose executives declared their tablet computer to be a "... magical and revolutionary device ..." (Apple, 2010, ¶ 2) has caught on in education.

Post-secondary students are some of the most fluent mobile phone owners in North America. A recent survey found that 69% of students at Ball State University owned smartphones (Rainie, 2012, p. 2), and two-thirds of all young adults between the ages of 18 and 29 years-old own smartphones (Ransford, 2012, p. 2). Beneath the increasing prevalence of mobile technologies among post-secondary students and the high expectations for how m-learning will transform higher education, there are many other important questions that educators might consider.

This chapter begins with some background information to this new study of mobility in post-secondary teaching and learning. Definitions of mobile technology and mobile learning are presented as well as a summary of some of

the early educational uses of mobile technologies. The original notions of ubiquitous computing are presented as a means of contextualizing twenty first century mobile teaching and learning. The discussion continues with a review of the mobile technology literature and an examination of the ways that technology is commonly regarded and the importance of considering an alternative viewpoint, one that addresses how teachers' and students' ways of thinking, their methods of communication and their interactions are influenced through the use of technology. The final sections discuss the research questions of the study, an overview of the methodological approach that was used and a review of the paper-based dissertation format.

## Background to the Study

When I lose my phone or leave it at home, I am unable to access my email messages, send or receive text from friends or family members, search the Internet, check the time, listen to music, make or check appointments, look up unfamiliar words in the dictionary, set alarms, find the locations of unfamiliar restaurants ... the list is endless. When I don't have my smartphone or tablet computer with me, it seems as though *I am unable to function*. Of course, this statement is absurd; not so long ago, I did not own a smartphone, and I managed just fine. But in a relatively short period of time, I have become almost completely dependent on my mobile devices to think, plan, communicate, navigate, and live my daily life. When I talk about this reliance with others, they sympathize and share similar stories. One person remarked that losing their phone is like losing their brain; they can't think without it. Another said that having their smartphone with them is like putting on clothes in the morning; they couldn't fathom heading out the door without it.

This close and personal attachment to smartphones is fostered by phone manufactures and wireless carriers who offer customers a dazzling assortment of colours, cases and accessories that reflect our unique tastes and preferences. We have the freedom to rearrange the icons of the pre-installed applications on our

phones and to purchase and install an endless supply of free, low-cost, and mid-priced applications to suit our individual needs and longings. While we must choose from a set of pre-defined options in terms of the cases, ringtones, and applications, there are so many choices available that the chances of meeting someone else with exactly the same phone as ours is very remote.

We make smartphones and tablet computers our own personal devices, meant for us alone to use. When we lose them, it is an upsetting and disturbing loss and we feel disorientated and helpless without them. Our phones and computers contain our emails, texts, photos, videos, voice memos and more and these items are deeply personal and act as a digital reminder to our lives and the people, events and places that we know. Our smartphones and mobile devices become like a prized piece of jewelry, where the emotional intensity at losing it seems out of proportion to the value of the physical object itself.

This close connection with our mobile devices is evident in education. In classrooms, hallways, libraries and cafeterias, students have their smartphones, tablet, and laptop computers nearby and routinely check their tweets, text and email messages, scan social networking sites and see whether feedback on their assignments and final grades have been posted on course websites.

**Noticing Our Technological Devices**

Albert Borgmann (1984) has written about the devices we use in daily life and noted how they become less noticeable over time while the functions they provide become more prominent. His observation is pertinent for smartphones; one of the first mobile phones, the Mobile Control Station, was a large and heavy device, weighting approximately 7 kg (Klemens, 2010), as compared to one of the latest phones, the Samsung Galaxy Note II that weighs only 180g. It is easy to overlook our compact smartphones. Oftentimes we only notice them (and the functions they provide) when we want to send a text message, browse a webpage or get directions to a nearby restaurant. Then, we reach for our phone in order to

communicate with others and seek out the information we need. When our phones or tablets are new, we may pay notice them and observe their physical qualities (e.g. thinness, lightness, screen resolution) but these features quickly fade and we focus instead on the functions of the phone.

This noticing does not occur in isolation. In fact, we notice smartphones (and other objects) in relation to what we are doing with them. For instance, when I want to set an alarm, I notice the alarm feature of the phone; when I want to send an email, I notice the email capabilities. Borgmann (1984) argues that a device is inseparable from our interactions and engagement with it and its context or world (p. 41). What this means is that devices (like smartphones. tablets and laptop computers) cannot be understood if we focus only on the thing itself. We must also look at our interactions with smartphones, consider what we are doing with them and examine the unique contexts or worlds have are created. This is a study of the some of the educational uses of smartphones in post-secondary education, an account of our interactions with these devices and a discussion of the virtual worlds that are being created.

**Interest in Mobile Technology**

Initially, my curiosity in mobile technology was sparked by an interest in the various modes of distance education and the diverse technologies that have been used in this type of learning. It began several years ago, when I was living in Alberta and had enrolled in an online master's degree program at the University of Saskatchewan. I was interested in learning about new, mobile technologies that were being introduced into post-secondary education. In one of my courses, I examined how traditional tools such as printed texts and study guides were being used in conjunction with new technologies including streaming audio and video and hand-held wireless devices.

While working towards my degree, I studied independently from my home office. I communicated asynchronously with the other students and

teachers through email and online discussion forums. Occasionally, we met in real-time using conferencing software. On one occasion we attended a virtual conference in Second Life but working on my own was the norm. While studying, I began to realize that the generally accepted distance education learning theories did not fully capture my own experience of being a online, "at a distance" student. For instance, while participating in videoconferences, I would often have the experience of being transported to another place. However, Moore's theory of transactional distance, which considers the time and space separation of students and teachers (Moore & Kearsley, 2005), seemed insufficient to explain that experience. In particular, I wondered: How was it that I entered a place of teaching and learning while I also sat in my living room, in front of the computer screen? How did I move from living room to virtual learning place(s) and back when my physical body had not moved at all? It was as if the technology had transported "me" to somewhere else — a virtual space —while my actual body was back at home. Unfortunately, Moore's theory did not address these philosophical questions and it seemed as though many of my experiential moments as a distance student did not fit with the theoretical frameworks that I was studying.

After graduation, I enrolled in the Pedagogy of Technology course at the University of Alberta where I discovered a rich, new vocabulary, along with a wide range of theoretical perspectives and new frameworks that helped me to look at technology differently. I was drawn to revisit some of my unanswered questions about my experiences as a distance student.

As I encountered the writings of Heidegger (1992), Ihde (2009), Richardson (2007) and Verbeek (2005), I began to see that technologies are more than simply tools for teaching and learning. I understood that a technology also constructs specific ways of being in the world and particular ways of knowing, understanding and interacting. I could no longer look at distance education technologies simply in terms of their advantages and disadvantages for

teaching and learning. Gaining insight into the intimate relationships that are struck between human beings and the *things* of their world enabled me to see technologies from a broader view and ultimately through the post-human framework known as postphenomenology.

**Defining Mobile Technology and Mobile Learning**

 The terms mobile technology and mobile learning have multiple definitions and there is no generally accepted definition for either term. The terms are sometimes used to denote the delivery of learning materials through devices small enough to be carried in pockets and purses (Keegan, 2006) or to refer to improved access to learning materials without the inconvenience of being connected to computers or networks (Caudill, 2007). But these definitions are misleading because other educational artifacts including pencils, notebooks and textbooks could justifiably be categorized as mobile technology too, since they are clearly also compact objects that students carry with them and use without computers or networks. Thus, for the purposes of this study, I adopt Ally's (2004) definition that mobile technology is mobile computing devices that allow users to access materials from anywhere, at anytime. In addition, I will follow O'Malley's et al. (2005) definition of mobile learning as "any sort of learning that happens when the learner is not at a fixed, predetermined location, or learning that happens when the learner takes advantage of the learning offered by mobile technologies."

Laptop, tablet computers, smartphones and cellular phones fit Ally's (2004) and O'Malley's et al. (2005) definitions and while there are many similarities between these technologies, smartphones and (the programs that are available on them) will be the primary focus of this study. Smartphones are the smallest kind of mobile technology and it makes for a more focused and manageable study by choosing one technology, rather than trying to consider two or more.

Smartphones are mini, hand-held, portable computers with phone capabilities. At a minimum, smartphones combine the calling and texting features of cellular phones, with the email, calendar, web browsing, and note-taking features of desktop computers as well as the listening capabilities of digital audio players. Although smartphones would be more accurately thought of as small, powerful computers, we do not usually think of them in this way. Although the label "smartphone" is admittedly somewhat misleading in terms of its multiple functions, the term will be used throughout this study since it is the popular name for this technology.

**Early educational uses of mobile technologies**

Some of the earliest mobile (Internet enabled) digital technologies were: personal digital assistants (PDAs), cellular phones, and portable media players. The educational application of these original mobile technologies often involved loaning or selling devices to students at subsidized prices. Educators would use the capabilities that came built-in to cellular phones and PDAs (such as the calendar, memo, to-do list and texting features) or pre-install learning materials onto to the devices for student to use in combination with intermittently available Internet resources (Brooks-Young, 2001; De Hart, Monk-Tutor, Worthington, Price & Sowell, 2004; Griffioen, Seales & Lumpp, 1997; Hackemer & Peterson, 2005; Kneebone & Brenton, 2005; Levy & Kennedy, 2005; Sharples et al. 2005).

There have been many important changes in how mobile technology is used in education since these early experiments. Some of the most significant changes are: the types of mobile devices that are available, the educational purposes they are used for and who has ownership and control of them. As the speed and capability of all computer technologies have improved, some early mobile technologies have become obsolete (such as PDAs), others have been re-developed (notably cellular phones into smartphones) and new technologies have been created (such as tablet computers). One of the most popular redesigned technologies is the smartphone. This device, which combines the communication

features of early cellular phones with many capabilities that were formerly only available on desktop computers, is very popular amongst post-secondary students. A recent survey found that 69% of students at Ball State University owned smartphones (Rainie, 2012, p. 2), and two-thirds of all young adults in America between the ages of 18 and 29 years-old own smartphones (Ransford, 2012, p. 2). In Canada, a 2011 survey of mobile phone use showed that 41% of residents own a smartphone, well above the global average of 28% (TNT Mobile Life, as cited in *Study Says Canadians*, 2011).

One of the consequences of the widespread ownership of smartphones among post-secondary students is that computer use is no longer confined to office spaces, computer labs and libraries. Students and teachers take their highly compact, portable smartphones with them as they move throughout campus spaces and beyond and they use them wherever they happen to be located. In addition, universities now have far less control over the kinds of technology that students and teachers use. The "Bring Your Own Device" (BYOD) practice that is already common in many workplaces (Rochel, 2012) is now part of education.

Besides this shift of who owns and controls mobile technology, there have also been many changes in how they are used. The smartphones that are available today are powerful, multi-purpose devices that are capable of performing a wide range of educational tasks. It is no longer necessary to pre-load learning materials onto them or be restricted to their built-in functionality. Smartphones are highly adaptable for a wide range of educational tasks and purposes. This is possible due to the accessibility of free and low-cost mini-software applications and the wide spread availability of wireless Internet connections.

One of the most popular brands of smartphone, the Apple iPhone, is estimated to be capable of performing 400 000+ functions, and one commentator described it as the "anything-anytime-anywhere device" (Chen, 2011).

Smartphones are small, highly portable, personalizable pocket computers that can quickly and easily go from being a student's alarm clock, to playing a pre-recorded podcast lecture and acting as a: classroom navigator, dictionary, periodic table of elements, research tool, and e-book reader.

**The Beginning of Mobile Technology**

Sometimes, it seems as though mobile technology is a new phenomenon that has emerged only recently, but it actually has a 25-year history. In 1988, computing scientists Mark Weiser and John Seely Brown began using the phrase "ubiquitous computing" to describe what the next important stage in computing technology. They envisioned a time when the computing capabilities of desktop computers would be integrated into our everyday objects and become a standard part of our lives and activities (Hansmann, Merk, Nicklous & Stober, 2001). Their prediction about ubiquitous computing has become reality and we now live in a post-PC era in which computers are an invisible part of many devices including: cars, microwaves, and smartphones. Today, the terms: pervasive digital media, miniaturized mobilities, wireless computing, mobile technology and mobile media are used more often than the original term ubiquitous computing (Coyne, 2010; Elliott & Urry, 2010; Farman, 2012; Mackenzie, 2010). Perhaps this shift in terminology reflects the fact that computers have been so thoroughly incorporated into our everyday objects that we tend not to think of their computer components. Indeed, the word smartphones, rather than mini, portable computers, reflect this bias.

**Pervasive or Ubiquitous Computing**

There are four components of pervasive or ubiquitous computing that should be considered in a review of the history of mobile technology. They are: decentralization, diversification, connectivity and simplicity. (Hansmann, Merk, Nicklous, & Stober, 2001). Although these concepts have been in existence for some time, they serve as a reminder that mobile technology is a gradual innovation in computing, rather than a new innovation that is without precedence

or prior experimentations. Considering these ideas also enables us to be more critical of mobile technology and to thoughtfully reflect on the significance of mobile technology in education.

**Decentralization.** The concept of decentralization was initially understood to be the gradual transformation of information processing capacity from large, centralized mainframe computers to small, individual desktop computers. In the second stage of decentralization, a wide range of small, mobile devices were envisioned.

Today, there are many aspects of decentralization in education to consider. One notable issue is the way that learning technologies have become highly personal devices. Today, it is individuals, rather than institutions, that control educational technology. With so many students regularly using laptop computers and smartphones, we forget the computer labs of the past. Gradually, as computing became more affordable, labs have become redundant and information processing has become decentralized.

Yet at the same time, there are also signs of centralization. Cloud computing tools such as Microsoft's SkyDrive, Apple's iCloud and Google's Drive, highlight how information processing is more centralized than ever. Although the original prediction about decentralization has become a reality, educators and researchers might consider the ways that their digital information is being centralized and begin to raise concerns about whether this is a positive or negative development in their teaching and research work.

**Diversification.** The term diversification was originally used to describe the development of particular devices that would meet the needs of specialized users and tasks. There are many examples of diversification in education such as students who use specialized e-book software programs with built-in dictionaries and teachers who use interactive white boards. But there is also parallel trend

towards consolidation in multi-function devices. One of the most noticeable examples of this is the smartphone. When Apple unveiled the first iPhone, they described it as a combination of a cell phone, an iPod and a handheld computer with Internet capabilities. But the iPhone is not simply a web browser, a phone, and an iPod anymore – it is an alarm clock, a dictionary, a thesaurus, a calendar, a classroom GPS navigator and an e-book for students and educators. The original prediction about diversification has become a reality. There are some devices that are highly specialized and that meet the needs of particular students but at the same time, there is a parallel trend towards making one device – our smartphones – function as single, multi-purpose devices.

**Connectivity.** Connectivity is probably the most well understood aspect of pervasive or mobile computing. Mobile connectivity is the ability to share information across wireless networks and devices. The CEO of IBM described connectivity as "Everybody's software, running on everybody's hardware, over everybody's network." (Sureshkumar & Hariharan, 2010). The extent of our connectivity and how much we depend on it is often overshadowed by other topics such as the flexibility of mobile learning and the ability to learn at any time or place (Chen, 2001; Shepherd, 2008). This is surprising since smartphones and tablet computers must have consistent access to the Internet in order for students and teachers to communicate through email and instant messaging, to search for information on the web and to access online documents and reference tools.

It would be helpful to expand our thinking about the topics of connectivity and mobility. One aspect we might consider is the suggestion by social scientists Elliott & Urry (2010) who use the term "mobility lens" to describe the new economic, social and political relationships that exist in society as a result of increased mobility among its' citizens. While some aspects of this mobility/connectivity lens may not be relevant to education, there are some aspects that are pertinent. The overlap of physical and virtual worlds is one

characteristic of connectivity that is relevant. As one writer has observed, "...locating one's self simultaneously in digital space and in material space has become an everyday action for many people." (Farman, 2012, p. 17.).

Now that students and teachers are connected through their mobile devices and have the ability to share information across wireless networks, they are experiencing time and space differently. This shift has profound implications for education. A recent study that examined some of the differences between listening to in-person lectures and mobile lectures, considered how this different types of listening impacts students' experience of space, time and others. Since mobile lectures (or podcasts) allow for only one-way, not two-way communication between students and teachers, we might call this type of listening "eavesdropping" for students are surrounded by the sounds of the podcast lecture, but they not actively engaged with it (Jubien, 2012).

**Simplicity**. The concept of simplicity is linked to diversification. As specialized devices were created for specific tasks, it was predicted that hardware and software would be seamlessly integrated and this would result in products that were simpler and easier to use. Unfortunately, the prediction about simplicity has not become a reality. Many students, teachers and administrators find the built-in functions of their smartphones and tablet computers difficult to use and they are at times overwhelmed by the intricacies and peculiarities of the numerous downloadable applications that are available.

## Implications for Teaching and Learning

The original concepts of pervasive computing are influencing twenty first century teaching and learning in profound and imperceptible ways. As the control of educational technology has become more decentralized, there has been a corresponding loss of control by university administrators and technology departments. In the past, universities took a systems approach and viewed technology as something that could be planned for, implemented and controlled.

One of the fundamental assumptions of a systems method is there is a centralized hub of control. But it is no longer effective to manage with this strategy because control has transferred from universities to students and teachers. We need to find new ways of working cooperatively *with* students and teachers on these technological issues, rather than insisting that universities set the technological goals and take responsibility for implementing them.

This issue is also related to diversification because universities have far less control over the kinds of technology that students and teachers can use on campus. Many students use their smartphones for learning on their own initiative and they do not receive any official support or approval from their universities or teachers. This is a clear instance of the Bring Your Own Device (BYOD) practice that is already common in many workplaces (Rochel, 2012).

Our high degree of connectivity and our reliance on ubiquitous wireless networks are two other factors that influence present-day teaching and learning. Too often, we conceptualize technology in education either as technology-as-tool and technology-as-future perspective and overlook other dimensions, such as connectivity and wirelessness. We must find a new perspective that accounts for the fluid, ubiquitous connections that occur between students, instructors, technologies, teaching and learning. Perhaps with these insights, we might better understand what it means to teach and learn in pervasive digital spaces.

**Mobile Technology: A Review of the Literature**

The interest in mobile technology and how it is used in education is growing. A recent review of six major educational technology journals revealed that the number of articles about mobile and ubiquitous learning increased four-fold in the period 2000-2010 (Hwang & Tsai, 2011). This mobile technology research encompasses a wide range of topics, including: the need for a theoretical framework for mobile learning (Koole, 2009; Motiwalla, 2007), the potential instructional uses of mobile technologies (Corbeil & Valdes-Corbeil, 2007;

Librero, Ramos, Ranga, Trinona & Lambert, 2007), descriptions of small-scale pilot studies (Goh & Kinshuk, 2006; Polishook, 2005), the use of mobile technology with particular groups of students (Kukulska-Hulme, 2006; Diaz-Vera, 2012), the methods of integrating web 2.0 tools with mobile technology (Brooks-Young, 2010; Richardson, 2009), and mobile technology design and usability considerations (Ally, 2004; Gorlenko & Merrick, 2003; Kadirire, 2007; Taylor & Evans, 2005). A 2012 report on higher education named mobile applications and tablet computing (both mobile technologies) as the top two technologies to watch in the next 12 months. (Johnson, Adams & Cummins, 2012, p. 6). Mobile technology and mobile learning are liable to continue to be important topics of study and research in the foreseeable future.

**Technology-as-tool.** Although this research on mobile technology has significantly increased the knowledge of mobile learning, many of the studies are often framed following a means/end pattern of thinking about technology. That is, technology is viewed as a means to attain an educational end. This viewpoint is evident in Will Richardson's (2009) book, when he describes various web 2.0 technologies like blogs, wikis and audio/video-casting as a teacher's "tool-box" (p. 9).

The limitation of the technology-as-tool perspective is that it often overlooks or ignores many other aspects of technology, such as the social, moral, political, economic, cultural and historic dimensions (Introna, 2006; Selwyn, 2010). In order to gain a more complete understanding of technology in education and society, we need to consider how technology shapes and changes our everyday practices (Dreyfus, 2009; Introna, 2006; Postman, 1993; Winner, 2009). By gaining some insights into how technology does this, we may discover the ways that technology is influencing and changing education.

**Technology-as-future.** Besides the technology-as-tool perspective, there is also the technology-as-future point of view. This perspective views technology

as a force that has profoundly changed how young people think and learn. Proponents of this point of view suggest that teachers must modify their outdated teaching styles and find innovative ways of using digital technology in the classroom that suit the thinking and learning patterns of today's digital students (Brown, 2002; Brooks-Young, 2010; Richardson, 2009). Author Mark Prensky (2001) is one of the most well-known spokespersons for this perspective. He writes, "Our students have changed radically. Today's students are no longer the people our educational system was designed to teach." (p. 1) In the technology-as-future point of view, young people are portrayed as confident users and multi-taskers of digital technology who prefer to access visual and auditory information, rather than just read text. One of the limitations of this perspective is that portraying students as a single, homogeneous group is a stereotype. According to Morgan & Bullen (2011), there are no meaningful differences between the net generation and non-net generation students in terms of their use of technology, behavioral characteristics or learning preferences. Kennedy, Judd, Dalgarno and Waycott (2010) found that students born after 1980 were not a homogeneous group in terms of their familiarity with digital technologies and they urge us to move beyond the debates about "digital natives" and "digital immigrants" to find more sophisticated understandings of how students' use of technology influences teaching and learning in higher education.

**Technology-as-hype.** One of the risks of assuming all students are technically savvy and perceiving technology as the way of giving students a twenty-first century education, is that we may think less critically about technology in education and get caught up in the technology-as-hype phenomena. The field of mobile technology is characterized by frequent changes, numerous technical developments and fierce competition among companies. This situation was similar for earlier technologies such as the desktop computer and the Internet. The first smartphone was introduced less than ten years ago, but already there have been many changes to this device, including: a proliferation of custom applications (many of which are used for

education), increased popularity of cloud computing tools such as Microsoft's SkyDrive, Apple's iCloud and Google's Drive, and the widespread adoption of touch-screen interfaces. All of these changes have important pedagogical dimensions for educators to consider. For instance, what does it mean for writing skills when students are tapping more than typing at their computers? Who ultimately has control and ownership of the documents that students and teachers save in cloud storage? What are the commercial barriers to integrating third-party applications in teaching and learning? Compared to mobile devices, educators and administrators had more control over the use of desktop computers in education. But they have less control with mobile technologies because students are the ones who own these devices. The integration of mobile technology is moving quickly and it can be very hard to separate the hype from the reality or to investigate the pedagogical and lived dimensions of mobile technologies for teaching and learning.

The technology-as-hype viewpoint is evident in many descriptions of mobile technology. For instance, one post-secondary administrator describes mobile technology as "... transforming the learning environment." (*ACU first university,* 2008, ¶ 4), Cox (2010) writes how teachers and students see mobile learning as "... increasingly essential to higher education ..." (p. 3), and, Chen (2011) argues that, "There's a clear opportunity here ... [for the iPhone] to refresh classroom learning in higher education." (p. 48). The enthusiasm generated by for-profit companies such as Apple, whose executives declared their tablet computer to be a "... magical and revolutionary device ..." (Apple, 2010, ¶ 2) has created so much interest about mobile technology in education that it sometimes seems as though critical examination and debate are being overlooked. Sherry Turkle (1984) points out that technology changes not only what we do but how we think and this highlights how important it is to consider technology as more than just a tool, or the means of improving teaching and learning in post secondary classrooms.

**Technology-as-revealing.** In his essay, *The Question Concerning Technology*, Martin Heidegger (1977) proposed that we could understand technology in a multi-dimensional way. He suggested that if we thought about technologies as more than tools, we could see other dimensions of them but if we focused on the tool, then other dimensions may be hidden or obscured from our view. Since Heidegger wrote about this, others scholars have taken his ideas and expanded on them. For instance, Ihde (2009) points out how a magnifying glass opens up the world of one thing for closer examination while it simultaneously reduces our view of the rest of the world. He calls this the amplification/reduction tendency to signal how technology can amplify one dimension (such as a close up view in a microscope), while it also reduces our understanding of how the smaller parts fit into a larger picture.

Later on in life, Heidegger became concerned that technology might so completely captivate our attention that it could become our only way of thinking about the natural world (2006, p. 95). Dreyfus & Spinosa (2003) argue that what Heidegger saw as technology's greatest danger was "...a new totalizing style of practices that would restrict our openness to people and things by driving out all other styles of practice that enable us to be receptive to reality." (p. 341). They caution that when technology becomes our only (or our preferred way of knowing the world), then other ways of knowing or understanding may disappear. This observation differs from Heidegger's earlier one when he warned that other perspectives were merely hidden or obscured from our view. Now, other ways of knowing may disappear completely if we focus only on the technological one. To understand what this means in practice, is it helpful to return to Ihde's example of the microscope. If we focus on a small part of the world that is visible through a microscope, we may no longer be able to know how it fits in with other parts of the world.

**Human-Technology Relations**

One valuable way of studying technology is to use Don Ihde's (2009) human–technology relationships. In the development of his model, Ihde (1983) discusses the concept of communication and argues that all interaction between two individuals who are not face-to-face, are moderated through a medium. He proposes that the use of media (technologies) transforms the communication situation. This interest in communication and how it is changed by technologies lead Ihde to develop the human-technology concepts of embodiment, hermeneutic, alterity and background relations.

      **Embodiment relations.** Ihde (2009) described embodiment relations as "…relations that incorporate material technologies or artifacts that we experience as taken into our very bodily experience." (p. 42). Embodied technologies extend and expand our body's capability in some way. Using technologies such as reading glasses and computer mice are two examples of embodiment relations; they act as extensions of our eyes and hands and once we become accustomed to them, go unnoticed while we pay attention to other things. Smartphones are small enough to fit in one hand and we use our thumbs to tap or swipe and our fingers to make multi-touch gestures. Our embodiment relationship with them is evident in how we regularly carry them in our hands or pockets wherever we go. Smartphones are incorporated into our bodily experience and they extend our sensory capacities (e.g., hearing and vision). This embodiment relation is so intense that many people feel as though they are missing a body part if their smartphone is not close by, either in their hand or pocket.

      When we have an embodiment relation with a technology, we are unaware of how automatically and routinely we use it in our daily lives and we find it hard to describe this experience to others. Ihde's notion of embodiment is similar to Heidegger's (1953) observation of how we have a ready-to-hand relationship with technology. When we are using a tool and it is working property, it disappears or withdraws from our attention and we focus on what we

trying to accomplish (Dreyfus, 1991). We are not aware of the smartphone in our hands while we are using it to text our classmates or to search for unfamiliar words in the dictionary; we are focused on what we are trying to achieve at that moment and the phone fades or disappears from our attention. But if the phone were to do something unexpected, break down or stop working, we would suddenly notice it again and no longer have a ready-to-hand relationship with it. There are overlaps between Heidegger's ready-to-hand understanding and Ihde's notion of embodiment. Both concepts illustrate how we overlook technologies (including smartphones) while we are using them.

      **Hermeneutic relations.** In describing the notion of hermeneutic relations, Ihde (2009) explains that this experience with technology engages our reading or interpretive capacities, rather than our bodily experience. In education, students are frequently required to read and interpret various technological devices. For instance, I use an e-book reader to borrow and read books from the public library. To do this, I must use a software program called OverDrive, which uses specific terminology and phrases such as: e-book account, add to cart and checkout. I must interpret and understand these phrases correctly in order to search the catalogue for titles and put them on hold. More than once, I have forgotten to add a book to my cart, which means that I cannot download or read it. Part of the reason for this mistake is that the order of steps is confusing and different than those I follow when borrowing books in person. At the library, I select books first and then check them out. In OverDrive, I find a title, check it out and then borrow and download it. Occasionally, I forget that I am using OverDrive and think I am ordering a book through Amazon's website, because Amazon also uses terms like "add to cart" and "checkout". But I must read and understand these terms for what they mean in OverDrive, not Amazon, if I am to be successful at borrowing and reading books.

      **Alterity relations.** The third human-technology relation is alterity and it is a familiar experience to many of us. In this situation, we interact with

technological devices (Verbeek, 2008). As students and educators, we engage and interact with many technologies throughout our workday. Consider for a moment the teacher who hurriedly checks Google maps on their smartphone to find a new classroom or the student who uses the self-check-out machine at the library to take out books. In the alterity relation, Ihde (2009) argues that we engage with technologies as though they are quasi-objects, even quasi-others. When our interactions with a technology go smoothly, we do not think of them has having a quasi-object or quasi–other quality. But they can become quasi-objects to us when they are not working as we expect them to.

**Background relations.** The last component of Ihde's model is the background relation. This experience is so familiar to us that it is often taken overlooked. The technologies are not experienced directly in this case, but instead create a context for our perceptions (Verbeek, 2009). An example that comes immediately to mind is attending a class lecture. In this case, we sit in chairs and tables, facing the front of the room where we trust that the teacher will write down important points on the board. Here, the technologies (table, chairs and whiteboard) have created a unique context that influences our experiences of the lecture.

## Verbeek's Immersion Relation

Since Ihde developed his framework of human-technological relations, other researchers have taken up his ideas and extended them. Verbeek (2009) notes how the latest man-machine relationships, which are made possible through nanotechnology and biotechnology, cannot be fully explained by Ihde's framework of human-technological relations for these emphasize how humans use technology, rather than how humans are closely knit together or combined with technologies. Verbeek (2009) proposes that we consider an immersion or merged relationship, where we are either deeply immersed with or fused together with our technologies. This type of merged relationship is apparent in education, where many students and teachers are closely knit together, reliant on and

merged together with digital technologies such as smartphones, tablet and laptop computers.

**Research Question**

Beneath the increasing prevalence of mobile technologies among post-secondary students and the high expectations for how it will transform higher education, there are many important questions that educators should consider: What is the experience of using smartphones for teaching and learning? How do such mobile technologies influence teachers' and students' ways of thinking, their methods of communication and their interactions? What are the pedagogical significances of mobile technology? My research explores these issues by examining the everyday use of smartphones among students and teachers in post-secondary settings. Using a post-phenomenological approach to frame my study, I ask: In which ways are mobile technologies (specifically smartphones) reshaping our learning patterns and teaching practices in post-secondary education?

In order to investigate the new learning and teaching spaces co-configured with smartphones, I follow Ingrid Richardson's (2007) post-phenomenological insight that mobile technologies are *experienced* as "pocket techno spaces". That is, while they are using smartphones, students' and teachers' lived worlds are significantly re-constructed via the virtual and mobile spaces opened by the smartphone. The specific objectives of this study are:

1. To explore how post-secondary students and teachers experience the lived dimensions of spatiality, temporality, embodiment and relationality while they are using smartphones,
2. To consider how the virtual, "micro worlds" afforded by smartphones serve to scaffold and co-create students' and teachers' thinking, learning and teaching practices.

**Approach**

This study uses multiple methodologies, including hermeneutic phenomenology and actor-network, in a hybrid approach called postphenomenology. Postphenomenology is broadly defined as a reinterpretation of phenomenology that is nonsubjectivistic and interrelational (Ihde, 2009). It strives to understand subjects and their objects by focusing on the ways they co-constitute, shape, and influence one another (Verbeek, 2005). Postphenomenology integrates understandings, vocabulary and research strategies from phenomenology as well as actor-network theory (ANT).

In order to understand how this hybrid approach was used in this exploration of mobile technology in post-secondary education, I provide a brief introduction to phenomenology and actor-network theory in the next sections.

**Phenomenology**

Phenomenology is a qualitative research tradition that makes basic human experiences the starting point for analysis and study (Ihde, 2009, p. 42). Phenomenological research always begins in the lifeworld of individuals (van Manen, 1997), where they are interacting with and experiencing their unique worlds. Merleau-Ponty (2002) has noted that, "We are caught up in the world and we do not succeed in extricating ourselves from it in order to achieve consciousness of the world" (p. 5). This calls attention to the interrelations between human beings and their surroundings and how our knowledge of the world comes from our experiences in it. From this perspective, there is no strict division between subjects and objects; both are connected and give meaning to one other. As Max van Manen has written, "...the world is given to us and actively constituted by us..." (1997, p. xi).

In post-phenomenological studies, human-technology relations are recognized as "... being each other's reciprocal and ongoing condition or possibility for being what they are" (Introna, 2005, p. 3). In other words, human

beings' understanding of their world is always rooted in their interactions and engagement with the world and the objects they find there, including the technological ones. When phenomenology is used in education, it strives to uncover our lived experience of educational phenomena including teaching and learning and attempts to return to our pre-reflective experiences of the world, rather than depend on our theories, categories, conceptualizations or reflections (van Manen & Adams, 2010).

Undertaking a qualitative research study via van Manen's (1997) "phenomenology of practice" involves six research phases or methods. These are: turning to a phenomena, investigating experience as we live it (not as we conceptualize it), reflecting on the essential themes of the phenomenon, describing the phenomenon through a process of writing and rewriting, maintaining a pedagogical orientation to the phenomenon and reflecting on both parts and the whole of the phenomenon (van Manen, 1997). Phenomenological research aims to produce more than just descriptions of lived experiences; it also endeavours to interpret the experiences and understand their meanings as we live in them (Creswell, 2007). The activities of gathering lived experience descriptions, reflecting on them and writing about the phenomenon are not sharply defined or delineated; rather, these steps are closely connected and interrelated.

**Data collection and analysis.** There are a number of steps in the process of collecting and analyzing data during a phenomenological study. The primary method of collecting data is through open-ended interviews and writing samples. At the beginning of each interview session, students and teachers are invited to "recall a time when you used podcast lectures (or another program or application on smartphones) for teaching or learning and describe the experience in as much detail as you can". At the recommendation of van Manen (1997), individuals are cautioned to "...describe the experience as you live(d) through it. Avoid as much as possible causal explanations, generalizations, or abstract interpretations" (p.

64). In some instances, students and teachers were also invited to write about their experiences and submit them to the researcher later. This method of data collection was particularly helpful if students and teachers thought of other memorable experiences they had had in the past, at the end of the interviews.

After collecting the writing samples and transcribing the interview materials, the data analysis process may begin. There are three goals at this stage: to review the data that has been collected carefully, to identify and reflect on the essential themes of the phenomena and to begin the process of writing about them. Van Manen (1997) explains that, "The purpose of phenomenological reflection is to try to grasp the essential meaning of something" and this "... involves a process of reflectively appropriating, of clarifying, and of making explicit the structure of meaning of the lived experience." (p. 77). During this stage, researchers are cautioned to bracket (or suspend) their own assumptions or beliefs about a phenomenon and to identify the essence of an experience through the use of themes (van Manen, 2014). Highlighting prominent words, phrases and sentences in the interviews may facilitate the work of identifying and clarifying themes. It is also helpful to condense and rewrite some sections of the interviews and writing samples into shorter descriptions (called anecdotes or stories) and to seek feedback on these from study participants for validation. By this stage, researchers may have already begun the process of sensitively and reflectively writing about the study. According to van Manen, "...to do justice to the fullness and ambiguity of the experience of the lifeworld, writing may turn into a complex process of rewriting (re-thinking, re-flecting, re-cognizing)" (1997, p. 131). This reminder emphasizes the interconnections between the data analysis, reflection and writing phases.

**Actor-network theory**

Actor-network theory originated in the work of many scholars, including the science-technology-society (STS) researchers Michel Callon (1986) and Bruno Latour (1992) and the sociologist John Law (1987). ANT identifies how objects,

artifacts and people (called actors) combine together into actor-networks or assemblages and how they work together. The formation of an actor-network is not predictable nor stable; actors can, at any moment redefine their relationships to one another in new ways and enrol (or bring) new actors into the network (Callon, 1987). The actor-networks overlap and intersect; some parts work co-operatively and provide stability, while others conflict with one another, causing network strains and breakages. In early ANT studies, the word actant was sometimes used instead of the word actor. Harman (2007) has observed that, "An actant is nothing without networks; with networks, it is all" (p. 43). Although the notions of actors and actants are thought provoking, ANT is more focused on the assemblages of actors into networks and the work that is performed within and through these networks of relations (Law, 1999).

One of the challenges of using actor-network theory is making sense of the vast number of ANT terms. Some of these terms include: mediators, intermediaries, translation, immutable mobile, fluid objects, fire objects and black boxes. Sometimes these terms and the many variations and interpretations of them can make ANT seem overly complicated. Take for instance, the seemingly straightforward term object. According to the Canadian Oxford Dictionary, an object is a "material thing that can be seen and touched". But in ANT, the term object is used more broadly. In one classic ANT study, researchers de Lat and Mol (2000) examined the Zimbabwe bush pump (an object that can be seen and touched) but in other instances, including Law and Singleton's (2005) study of alcoholic liver disease and Mol's (2002) analysis of atherosclerosis, this standard definition is not suitable. While it would be simpler if there were fewer terms to comprehend, they are a valuable means of describing the messy, disordered and constantly changing situations that are created when multiple actors connect and circulate in fluid and dynamic networks. One of the strategies for coping and making sense of them is to identify which terms are liable to be important in a study beforehand and to review previous ANT studies that focus on those terms carefully.

**Data collection and analysis.** There are a number of research steps that are typically part of an ANT study. These are: identifying and narrowing a topic of research, developing interview questions, recruiting, interviewing and observing participants (both human and non-human), reflecting on the data and careful writing. There are a number of methods for collecting and analyzing data in ANT studies including: interviews, demonstrations and observations. In this study, all three data collections methods were used. During the interviews, students and teachers described how they used smartphones and demonstrated what they did while the researcher observed and took notes. After the meetings, more detailed notes were made about what the participants had demonstrated and later, the interviews were transcribed and analyzed.

During the process of data analysis, it was valuable to keep in mind the observations and suggestions from other ANT researchers. In particular, Leander & Lovvorn's suggestion (2006) to focus on the *relations* among actors (rather than to code individual actors and focus on them in isolation) and Aanestad's (2003) reminder that, "...agency is an *emergent* and not an essential or inherent property of the actors" (p. 7, emphasis in original) were particularly helpful. Besides noting the relations among actors and the assemblages that form (and reform) within actor-networks, ANT researchers must also take note of the important incidents and accidents that are described and demonstrated by participants during the interviews because these often become the focus of the analysis and writing phases.

Regarding the writing of ANT studies, Latour (2005) encourages researchers to produce an account that "...traces *a network*" and is "...a narrative or a description or a proposition where all the actors *do something*..." (p. 128, emphasis in original) while Law (2009) argues that ANT an account "... tells stories about 'how' relations assemble or don't". (p. 141).

**Postphenomenology**

The decision to use a postphenomenological approach, rather than only phenomenology or actor-network theory (ANT), resulted from a thorough and lengthy research process. My first step was to conduct an in-depth study of phenomenology and ANT separately. Following this, I initiated two university-approved studies, one using each methodology. After developing suitable interview questions, I collected data during semi-structured interviews, demonstrations and writing exercises. I then examined the interview transcripts, field notes and the participants' writing and wrote a discussion of this analysis.

This process led to two papers; one paper studied the phenomenological experience of listening to podcast lectures on mobile devices and the second examined the use of smartphones in post-secondary education using vocabulary and concepts from ANT. At the conclusion of these writing projects, I reflected on the strengths and weaknesses of each approach and determined that blending phenomenology and actor-network theory had the potential to uncover more about educational mobile technology than using just one method. In the next section, I provide a brief overview of the strengths of each method and how I propose to blend them in a hybrid approach in the final paper.

In my previous work, I found phenomenology to be a beneficial approach to use when I wanted to reveal the experiential or lived experience *of something* – whether that was listening to a podcast lecture or interacting with others through online conferencing systems. Phenomenology can also lead to insights about devices and the ways in which unique contexts or worlds may open up to us while we are routinely engaged with our smartphones and mobile devices. Meanwhile, actor-network theory provides a rich vocabulary for describing objects and an innovative method for detailing how objects and humans join together, stabilize, work together and break apart and the pedagogical practices that are created (and changed) within these assemblages. Having meaningful terms and concepts for objects and the pedagogical work that was occurring

enabled me to see how some routine educational practices, such as researching, reading and communicating, were being influenced and changed by the use of smartphones.

**Data collection and analysis.** The decision to use a blended or hybrid methodological approach created a number of decision points. Perhaps the most puzzling part of this process was determining which data collection and data analysis methods to use and deciding upon what to focus on during the writing stage. While there are some similarities between phenomenology and ANT (both methods use interviews as a data collection tool), there are also important differences, most notably during the data analysis and writing stages. In the data analysis of a phenomenological study, researchers strive to distil and interpret the meanings contained within pre-reflective human experiences, while in ANT researchers focus on writing detailed descriptions of the relations among actors and the work or pedagogy that is performed within them. To use a blended approach like postphenomenology effectively, it is important to be aware of the different methods of data analysis and writing used in phenomenology and ANT while also noticing if there were any overlaps or common insights uncovered by these two different methods.

The version of postphenomenology that was developed in the final study is a new and evolving research approach. Despite the ambiguity and uncertainty that come with the use of an emergent method, there are also a number of strengths to consider. One of the benefits of using this approach is in the opportunity it provides to describe objects *and* study the virtual micro-worlds or "pocket techno spaces" (Richardson, 2007) opened up by digital technologies. I examined the virtual worlds created by smartphones and learned more about how teachers and students experience the lived dimensions of space, time, embodiment and relationality and considered how this influenced thinking and learning patterns and teaching practices. By using complementary strategies from phenomenology and ANT, I could also reflect on the pedagogical

significance of these human-technology entanglements in post-secondary education. While there is no doubt that using a single research method would be simpler and easier, there was greater potential for discovering new insights and understandings about smartphones in education by combining different approaches.

**The Paper-Based Dissertation**

Students at the University of Alberta may prepare their dissertations in one of three ways (traditional, paper-based or mixed-format), but in practice, there are actually only two choices, the traditional and paper-based dissertation (University of Alberta, Graduate Studies and Research, 2011). The mixed-format and paper-based dissertations are very similar; the only difference between them is in the formatting of the body, footnotes and appendices sections.

Generally, the paper-based dissertation is a collection of four or five publishable papers; it is common in the technical and mathematical social sciences fields (Dunleavy, 2003). Each paper constitutes a chapter and usually has its own reference section. There are introductory and concluding chapters in the dissertation that tie the papers together and create a coherent argument.

For this project, I selected a paper-based dissertation, rather than the traditional format because it offered a number of important advantages. First, this type of dissertation provides the flexibility to explore a topic using more than one research method and the opportunity to reach different scholarly communities of readers. Second, publishing in scholarly journals is an important way to share ideas and participate in the scholarship and conversations of the academic community (Huff, 1999). Third, a paper-based dissertation gives doctoral students the opportunity to have their work read by a group of experienced academic peers and receives feedback while they are still working on their dissertation, rather than waiting until after they have graduated. This

feedback can be used in strengthening arguments, refining ideas and inspiring new areas to investigate.

Going through the process of preparing and submitting papers for publication is good practice for doctoral students who will, after graduation, need to write papers, submit them for review, receive feedback and persist through the extended periods of writing and rewriting that will follow in their careers as academics and researchers (Johnson, 2011). Finally, publishing doctoral work is a key way for new scholars to introduce their ideas into the academic community and to avoid their work from becoming "shelf-bending research", or work that collects dust and is ignored on university shelves. (Dunleavy, 2003, p. 227).

There are also many practical reasons to do a paper-based dissertation. At times, writing a dissertation can be an unstructured, lonely and frustrating period of life (Clark, 2007). During their programs, doctoral students must keep up their interest in their research topics, effectively manage their time, overcome procrastination and deal with writer's block (Zerubavel, 1999). In a paper-based dissertation, students have frequent deadlines to meet because they usually have one or more papers under review by academic journals at any given time. These deadlines provide strong incentives to persist with the task of writing and rewriting. In addition, students learn how to incorporate reviewers' suggestions into their revised manuscripts and how to handle critical feedback from journal editors. Paper-based dissertations also provide a way of reaching a wider scholarly community of readers. For interdisciplinary fields such as mobile technology, which has ties to education, communications, computer science, and business, a paper-based dissertation allows the flexibility to publish papers in a variety of journals that serve different academic communities.

Mobile technology is a rapidly expanding, constantly changing and diverse field of study. Only ten years ago, Agnes Kukulska-Hulme and John

Traxler (2005) published a landmark book about mobile learning but since then, there have been many changes in how we think about and use mobile technology in education. Personal digital assistants, cellular phones and portable media players have become obsolete or outdated and smartphones, tablet computers, mobile applications and wireless networks have become commonplace. Where researchers once studied how to harness the built-in features of PDAs and cellular phones for learning, they now focus on flipped classrooms, MOOCs and wearable computers (*NMC Horizon Project*, 2012). In just 10 years, mobile technology and how it is used in education has evolved significantly. The paper-based dissertation is adaptable and suits the changing nature of both mobile technology and mobile learning. Over the course of research in a dissertation, each paper can focus on a timely and relevant topic in the field of mobile technology and learning.

Although the paper-based dissertation is less common than the other types, other students in the Faculty of Education at the University of Alberta have chosen this format in the past (Adams, 2008; Conrad, 2004; Thompson, 2010; Watson, 2008).

The number of literature reviews and research method sections that are included in paper-based vs. traditional dissertations is one of the most noticeable differences between these two formats. In traditional dissertations, there is usually just one literature review and one research method section. In paper-based formats, there is often a literature review and research method section included in every paper or chapter. While multiple literature reviews and research method sections can sometimes make the paper-based dissertation seem repetitive, this inclusion is necessary because each chapter is written so that it may be read and examined on its own, often published as an independent, peer-reviewed article in a journal.

**Overview of the Papers**

This dissertation is divided between four papers.

Paper 1 – "Postphenomenology, smartphones, and learning: Students and teachers in higher education" was published in SAGE's *Online Research Methods Cases* (2014). It reflects on understandings from phenomenology and actor-network and describes how these two methods may be blended into a unique, postphenomenological approach to study of mobile teaching and learning in higher education.

Paper 2 – "A phenomenology of the podcast lecture." This paper was published in the pedagogical section of the Media Ecology Association's journal, *Explorations in Media Ecology* in 2012. It uses Max van Manen's (1997) four existentials of lived space, time, relationship with others and body as a guide to uncover some of the overlooked and less explored dimensions of the phenomena of listening to podcast lectures. The paper begins with a discussion of the differences between attending in-person and listening to podcast lectures and examines the existential experience of listening to podcast lectures.

Paper 3 – "Shape shifting smartphones: Riding the waves in post-secondary education." This paper was published in the *Canadian Journal of Learning and Technology* in 2013. It is a study of smartphones and post-secondary students and an account of the numerous ways that these actors are caught up in overlapping assemblages or actor-networks in post-secondary education. The paper probes important concepts from actor-network theory, including the notion of black boxes, fluid objects, and fire objects and introduces the notion of smartphones as protean objects.

Paper 4 – "Telepresence and online conferencing" investigates what it is like to attend classes, group meetings and virtual conferences and communicate with others through the use of online conferencing systems like Microsoft Skype

and Apple FaceTime. The discussion blends van Manen's (1997) approach to the lived existentials with Ihde's (1979) amplification-reduction framework to uncover some of the hidden pedagogical implications of online conferencing.

**Conclusion**

Education has arrived at an important crossroads with mobile technology. Projects that use mobile technology in classrooms and lecture halls have been implemented and researchers from various disciplines including education, communication, and the social sciences have noted how mobile technology is profoundly changing the ways we live, work, learn, and, communicate. There are still many research topics that could be considered, such as how we are knitted together with our smartphones and how these close relationships are influencing our thinking habits, learning patterns and teaching practices. Albert Borgmann (1984) distinguishes between devices and things and contends that *devices* provide commodities or goods and services to us, while *things* are inseparable from their contexts or worlds (p. 41). This study starts with this understanding of *things* (or technologies) as inseparable from their worlds to explore the ways that smartphones open up new virtual worlds in education and the pedagogical implications for teaching and learning.

## Chapter 2: Paper 1 –Postphenomenology, Smartphones, and Learning: Students and Teachers in Higher Education [1]

**Introduction**

Today, our lives are increasingly mediated by technology. As the human-technology scholar Don Ihde (1990) has noted, our lives are "technologically textured" in numerous and subtle ways. In the area of post-secondary education, many of teachers' and students' interpersonal interactions and communications are mediated by computer technologies, including email, learning management systems, social networking sites, virtual learning spaces and online conferencing systems. The rapid integration of mobile technology in education has increased the type and frequency of human-computer interactions. With the use of smartphones, tablets, and laptop computers, teachers and students who are not in physical proximity can connect and communicate with one another.

Smartphones are small, hand-held, portable computers with cellular phone capabilities and they are now one of the most ubiquitous technologies in use by students and teachers in higher education. According to a report, sixty-six percent of young adults between the ages of 18-29 years old in America own them (Rainie, 2012, p. 2). Smartphones combine the calling and texting features of cellular phones, with the email, calendar, web browsing, and note-taking features of desktop computers and the listening capabilities of digital audio players. When users install free and low-cost software programs called "apps", smartphones have an even wider range of features. Some examples include: making online conferencing calls and accessing academic databases and reference sources such as a dictionary and thesaurus. Although smartphones would be more accurately thought of as small, powerful computers, we do not usually think of them as such. Although the label "smartphone" is admittedly

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[1] A version of this chapter has been published: Jubien, P. (2014). *SAGE Research Methods Cases,* doi: http://dx.doi.org/10.4135/9781446273050513512947.

lacking in terms of signaling its multiple functions, the term will be used throughout this study due to its general acceptance.

While we may often notice students using their smartphones, it is not always obvious whether this is for educational or non-educational purposes. In order to discover more about how students use their smartphones for learning, I initiated a study as part of my doctoral work at the University of Alberta. My original plan was to explore phenomenology and actor-network theory (ANT) in separate side-by-side studies in order to become familiar with these research methods and then select one for the remainder of my doctoral research. But at the conclusion of the work, I reflected on the strengths and weaknesses of each method and determined that blending insights from phenomenology and ANT had the potential to uncover more about mobile technology in education. Using this blended approach, called postphenomenology, created a unique opportunity to describe objects *and* study the virtual micro-worlds opened up by mobile technologies.

**Understanding the Methods**

      **Phenomenology.** Phenomenology is a qualitative research approach that focuses on everyday human experiences. According to phenomenologist Max van Manen (1997), this approach always begins in the lifeworld of individuals where they are interacting with and experiencing their unique worlds. Merleau-Ponty has noted that, "We are caught up in the world and we do not succeed in extricating ourselves from it in order to achieve consciousness of the world." (2012, p. 5). This observation calls attention to the interrelations between human beings and their surroundings and how our knowledge of the world comes from our experiences in it. From this perspective, there is no strict division between subjects and objects of knowledge; both are connected and give meaning to each other. Scholars Max van Manen and Catherine Adams (2010) point out that when phenomenology is used in education, it strives to uncover our lived experience of educational phenomena including teaching and learning and

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attempts to describe and reflect on our pre-reflective experiences of the world, rather than depend on our theories, categories, conceptualizations or reflections.

**Actor-network theory.** Actor-network theory (ANT) emerged from the work of many researchers in the 1980s and 1990s including the sociologist John Law and science-technology studies scholars Michael Callon and Bruno Latour. ANT investigates the ways in which objects, artifacts and people combine into actor-networks, or assemblages, and the work that is performed within them.

Some characteristics of ANT can be challenging for the beginning researcher. For example, there exists an ongoing debate about whether it is correct to call ANT a *theory*. Tara Fenwick and Richard Edwards point out that it may be more accurate to think of ANT as a sensibility or virtual "cloud" for explanation. This illustrates that, while ANT may not have a universally accepted definition, one of its key components is *description*.

Most ANT studies are highly descriptive, detailed accounts of the work that is being performed within the numerous assemblages in the context of the study and the means by which they are cooperating, stabilizing, breaking apart and reforming into new assemblages. To write these highly detailed descriptions, ANT researchers use a complex vocabulary with terms such as: actors/actants, symmetry, assemblages, mediators, intermediators, black boxes, fluid objects, fire objects, translation and immutable mobiles. For the beginning ANT researcher, the terminology may seem overwhelming so it is valuable to prioritize the most important terms, including actors/actants, assemblages and symmetry. The terms actor and actant can be used interchangeably and designate any entity, whether it is human or non-human (e.g., a smartphone) that is contained within an assemblage. The term assemblage is often used interchangeably with actor-network and it describes the joining of two (or more) actors together. Finally, symmetry identifies the way in which human and non-

human actors should be treated equally in ANT; humans should not be given preference over non-humans.

**Postphenomenology.** As with ANT, there is no universally accepted definition or precise meaning of the word *postphenomenology*. The word itself combines the prefix "post" with the word "phenomenology". Postphenomenology designates the era after phenomenology, which adds to the potential confusion because phenomenology is still in use today. Upon deeper reflection, it appears that postphenomenology describes an evolution of phenomenology that specifically addresses the current age when humans and computer technologies are increasingly interconnected.

Presently, there are numerous philosophical descriptions of postphenomenology as a conceptual framework, but less information available about how to actually *do* postphenomenological research. The American philosopher Don Ihde initially coined the term postphenomenology and has described it as a modified, hybrid form of phenomenology (2009). Peter-Paul Verbeek (2005) describes postphenomenology as a way of understanding subjects and their objects by focusing on the ways they co-constitute, shape, and influence one another. Although these insights provide a conceptual basis for postphenomenology, they do not provide researchers with any concrete suggestions or strategies for how it can be employed for research purposes.

In addition, it is sometimes challenging to decipher postphenomenology writing without having a rudimentary understanding of phenomenology and actor-network theory. Before it was developed into a research method, phenomenology was formed as a philosophical tradition in the 19th century. Some of the early philosophers of phenomenology included Edmund Husserl, Martin Heidegger and Maurice Merleau-Ponty. The writings of Husserl, Heidegger and others are often highly abstract and conceptual but are important

for the phenomenologist to study as they form the fundamental philosophical foundation of the research method.

While it may appear to be easy to make human experiences the focus of inquiry in a research project, it is actually very difficult to accomplish in practice. We are more familiar with using theories and models to understand our experiences, rather than closely studying our pre-reflective experiences and interpreting them. It takes time and perseverance to acquire a phenomenological (or postphenomenological) sensitivity and reading the work of early phenomenologists can be the first step in this process.

Another challenge for beginner researchers is the assumption that this method is purely phenomenological. While it can be applied in this fashion, it is also possible to combine phenomenology with other methods and still have a postphenomenological approach. That was the case in this study of smartphones.

**Triangulating the Methods**

In my research studies, I found that phenomenology and ANT approaches complemented each other in some respects. Phenomenological philosopher Martin Heidegger made two important observations that are related to ANT concepts.

In his study of humans and technology, Heidegger noticed how humans understand mundane objects of use, such as hammers and pens in reference to other things. He wrote, "In accordance with their character of utility, useful things always are *in terms of* their belonging to other useful things: writing utensils, pen, ink, paper, desk blotter, table, lamp, furniture..." (1953, p. 68, emphasis in original). If his observation were rewritten for the twenty-first century context, we might say that useful objects like smartphones and tablet computers are always in reference to (and in relationship with) other humans and objects including: students, teachers, wireless network connections, web

browsers, learning management systems, online conferencing and social networking services. This observation is similar to a key understanding from ANT that describes how human and non-human actors join and stabilize in actor-networks or assemblages. Phenomenology and ANT both share an interest in how people and objects connect and influence one another. Phenomenologists consider how humans and things belong together, while actor-network theorists describe how humans and nonhumans form into actor-networks. There are many human-technology (cyborg) groupings or assemblages in higher education but these do not exist in isolation. Rather, the assemblages are situated in reference to one another and should be studied together within this context.

Heidegger was also fascinated by the way in which we take up an object to accomplish a task and how it "disappears" from our field of attention. He suggested that when we use a hammer to nail something, it quickly fades from our conscious attention and we focus on what we are making with it instead. This reflection is relevant for the present day for it illustrates that when students and teachers use smartphones for teaching and learning, this tool often "disappears" from our conscious awareness. Of course in reality objects do not disappear and they are always present. But what Heidegger observed was the manner in which objects can quickly fade from our awareness into the background of our attention. In ANT, researchers have also noticed the disappearance of objects. As Bruno Latour says in his discussion of objects, "That is why specific tricks have to be invented to *make them talk*, that is, to offer descriptions of themselves, to produce *scripts* of what they are making others – humans or non-humans – do." (2005, p. 79, emphasis in original). In both phenomenology and ANT, there is a shared recognition that objects fade into the background of our attention.

**Study Overview**

My first study used a phenomenological approach to explore how the experience of listening to pre-recorded lectures (or podcasts) on mobile devices is different

than the experience of listening to in-person lectures, and the second study used understandings from ANT to examine the educational uses of smartphones. Both studies were formally reviewed and approved by the University of Alberta's ethics review committee.

**Recruitment of Participants for the Phenomenology and ANT studies**

The task of recruiting suitable participants for both studies was relatively straightforward because of the high smartphone adoption rates among Canadian university students. Both undergraduate and graduate students participated. The only criterion used to select students was they had to own and self-report to regularly use a smartphone for learning tasks. In total, twelve students participated. They were divided into two groups, six in each study. As with most qualitative studies, the sample size was relatively small to allow the researcher ample time to conduct rich, in-depth interviews with all participants.

Research data was collected during semi-structured interview sessions and writing exercises that lasted approximately 1 – 1.5 hours. Many of the interview questions were formulated before the sessions but some spontaneous questions were asked during the meetings to clarify a point or learn more about what a participant was discussing. One of the challenges of using two methods simultaneously was ensuring that the questions asked were suitable. It would have been inappropriate and confusing to ask a phenomenological question during the actor-network theory stage of the project and vice versa. It was helpful to prepare the questions beforehand in order to avoid this pitfall. The interviews in each study were conducted only once. A common strategy of in phenomenological research is to ask participants to talk about the experience of a phenomenon and to describe it is as much details as they can remember. In the ANT study, I asked participants about how they used their smartphones for learning tasks, such as completing coursework and assignments. What follows is a sample of the interview questions that were used during the studies.

**Sample Interview Questions**

Phenomenology study of pre-recorded lectures*:*

1. Recall a time when you listened to a podcast lecture.
2. Describe the experience in as much detail as you can remember. Imagine that you are in the experience right now and describe it from beginning to end. You might begin by describing where you were when you listened to the podcast.

Actor-network theory study of smartphones*:*

1. How do you use your smartphone to do coursework and assignments?
2. What is surprising or frustrating about using this technology for school?

**Data Analysis**

The process of data analysis was lengthy and extensive. The data in the phenomenological study was analyzed according to Max van Manen's four existential, or themes. The existentials are: spatiality (lived space), temporality (lived time), relationality (lived relationships with others) and corporeality (lived body). van Manen has written that these existentials "… may be seen to belong to the existential ground by way of which all human beings experience the world…" (1997, p. 102). These themes were a very helpful way of considering the many aspects of students' listening experiences.

The process of analyzing data gathered in the ANT study was more complicated. While there are general statements about how to view data with an ANT sensibility, there are fewer guidelines about how to implement this in practice. For instance, Mike Michael (2004) argues that humans should resist the temptation to speak "about, for and of" objects and recommends that we search for ways to speak "with, by and through" them instead. Although this observation is a good reminder about how important it is to resist speaking for objects, it did not provide enough of a concrete or detailed "how-to" guide for a beginner researcher. In the end, I concluded that such a guide is probably in conflict with ANT's philosophical viewpoint that we must respect the

unpredictable and constantly changing assembly of actors and assemblages. Nevertheless, I needed some framework or suggestions to follow so I implemented Bruno Latour's (2005) suggestion to "follow the actors". In ANT, the term "actor" denotes any object, human or non-human in a study. I was especially interested in the mediators, or the actors that created tensions and produced changes in the human-object assemblages that were forming and dissolving in this study.

**Reflections on the Methods Used**

Many students brought their smartphones to the interview meetings and this offered a tangible way for them to demonstrate how they used their smartphones for learning (this was especially true in the ANT study). One surprising comment made by a few students was that it was a pleasant change to be asked about how they used their smartphones for learning, as others often assumed that they were using their devices exclusively for non-educational tasks.

The largest surprise in the research project came after the pilot studies were completed. At this stage, I reflected on the strengths and drawbacks of both methods and wondered if it might be possible to combine them in order to take advantage of their complimentary understandings and learn more than would be possible if I used just one or the other on its own. I found phenomenology to be a beneficial approach to use in order to reveal the experiential or lived experience *of something* – in this case, the experience of listening to a podcast lecture. Meanwhile, ANT provides a rich vocabulary for describing objects and an innovative method for detailing how objects and humans join together, stabilize, work together and break apart. Having meaningful terms and concepts for objects and their interactions enabled me to see how some routine educational practices, such as researching, reading and communicating, were being influenced and changed by the use of smartphones.

During the course of two research studies, I also identified some limitations of phenomenology and ANT. The complex vocabulary in ANT and use of terms including mediators, intermediators, black boxes and immutable mobiles can be overwhelming and unnecessarily complicated. ANT's emphasis on symmetry, or the equal importance of human and nonhuman actors, is challenging. By de-centering the human participants, I began to lose sense of the study's meaning and significance. As Rosalyn Diprose (2009) eloquently puts it, "...it is up to human elements of assemblages to keep the world open for ethics." (p. 9). Human actors have the capacity to ascribe meaning in a context while nonhuman actors lack this capacity. Insisting on the equal importance of humans and nonhumans had the effect of de-centering meaning in the ANT study. While I could trace the formation of complex actor-network assemblages and describe them with ANT-specific terminology, their significance to post-secondary education was often hidden.

Meanwhile with phenomenology, I struggled with Heidegger's conceptual understanding of tools. Recall that Heidegger said that when we take up objects to perform an action, they often "disappear" from our field of attention. While tools do not physically disappear, they shift in and out of our conscious attention while we are using them. For instance, when we first pick up a hammer to drive in a nail, we may notice the weight and particular shape of the hammer in our hands, but gradually, our attention shifts and we focus on the goal we wish to accomplish instead. If we use Heidegger's concept to describe modern tools like smartphones, we could say that when students first pick up their devices they might briefly notice the weight in their hands and the physical location of buttons in relation to their fingers, but their attention then shifts to what they what to accomplish with it. During the interviews, students described how they would use a database application, switch to the note-taking feature and then launch the dictionary application on their phones, all within a few minutes. They frequently and seamlessly shifted between noticing the tool and focusing on what they are trying to accomplish with it. This disappearance and

reemergence from their conscious awareness adds a new dimension to Heidegger's original model of tools. Smartphones and other mobile technologies are multi-function tools, not single-function tools like hammers. As students interact with their devices and use different applications, the tool momentarily reemerges in their awareness but then they lose track of it and focus on their goal. In order to capture students' unique experience of using modern tools like smartphones, we need to extend Heidegger's original conceptual model to include this notion of how digital tools fade and reemerge in our awareness as we are interacting with them.

In becoming more familiar with the postphenomenological literature, it became apparent that it would be beneficial to combine phenomenology and ANT in my next study. Peter-Paul Verbeek's (2005) list of postphenomenological vocabulary, which blends terms from phenomenology, ANT, and the human-technology scholar, Don Ihde is an important source of postphenomenological material. After discovering this, I still had to determine how to apply it and what specific research strategies that I could employ in a new research project. While I am still in the process of discovering how to meet these challenges, I can share some of the central insights and lessons that I have learned thus far, in hopes that they may be helpful to others who are interested in embarking on a postphenomenological research project.

One of the postphenomenological insights that provided a clue about how I could proceed came from Ingrid Richardson (2007), who observed that mobile technologies are *experienced* as "pocket techno spaces". That is, *while* they are using smartphones, students' and instructors' lived worlds are significantly re-constructed via the virtual and mobile spaces opened by the smartphone. This insight about the construction (and reconstruction) of new virtual worlds while using mobile technology resonates with Max van Manen's strategy of the four lived existentials. When I used van Manen's existentials in the study of podcast lectures, they were a helpful way of describing students' experiences. I hope that

they will also be a good strategy to use in a new, postphenomenological study that investigates the virtual worlds configured by smartphones.

**Postphenomenology: Lessons Learned**

During the course of the pilot studies, many new lessons and insights emerged that may be valuable to other researchers who are considering using this style of postphenomenology. Since this style blends research methods, data collection, and analysis strategies from two other methods, it is important to have some familiarity with phenomenology and ANT. There are some regions where these methods overlap and other areas where they are separate and distinct. With this understanding, a new researcher may better select the strategies from phenomenology and ANT that will be most suitable for their own research project.

Another challenge of using postphenomenology is becoming familiar enough with the literature of phenomenology and ANT that a researcher feels capable of combining these methods in a research project. The writing of some authors in phenomenology and ANT is more accessible than others. Unfortunately, Heidegger is more ambiguous and difficult to understand than most. Postphenomenology (as it was used in this particular study) may seem like an easy method to use since it aims to learn more about our everyday experiences using smartphones, but this was not the case. During the investigation, important philosophical questions were raised. When we consider the ways in which students' lived experiences of time, space and others is altered through the use of mobile technology and consider that unique, virtual worlds are being formed we have begun to delve into philosophical questions that do not have any quick or easy answers. While our end goal as postphenomenological researchers may not be to find conclusive answers, we must nevertheless seek out thoughtful and sensitive ways of describing students' experiences and reflect on the significance of these as educators. It is possible to gain a deeper appreciation of our experiences of using technology by reading the works of

select phenomenologists, actor-network theorists and human-technology scholars.

**Conclusion**

Blending phenomenology and ANT creates a unique opportunity to describe objects *and* study the virtual micro-worlds or "pocket techno spaces" created by digital technologies. While there is no doubt that using a single research method would be more straightforward, there is greater potential for discovering new insights and understandings about smartphones in higher education by using a postphenomenological research approach.

With a better appreciation of the synergies of phenomenology and ANT, and some experience with using these methods in real research projects, I am now in the process of identifying the specific research strategies to use in my next postphenomenological study. Catherine Adams and Terrie Lynn Thompson (2011) have compiled a set of eight heuristics for interviewing educational technologies, which blends strategies from phenomenology, ANT and human-technology scholars. Some of the heuristics are: Marshall McLuhan's Four Laws of Media, Don Ihde's human-technology framework, and the ANT tactics of following the actors and studying accidents and breakdowns. Although I was familiar with some of these strategies from before, I plan to use some of the ones I am less familiar with in the next research project. Specifically, I am curious to see whether using Ihde's human-technology framework in the preliminary stage will open up new lines of investigation that might be followed during the interview and analysis stages.

**Chapter 3: Paper 2 – A Phenomenology of the Podcast[2]**

**Introduction**

Listening to recorded lectures outside the classroom is more common now than it was in the past, thanks to the widespread availability of recorded lectures and the affordability of mobile technologies. Many people, both professionals and amateurs, can easily record, publish and distribute lectures on the Internet. Today, there are podcast lectures available on an overwhelming range of topics, from airlines and gerontology to medicine and zoology. These podcasts can be quickly accessed and downloaded from the Internet, transferred to a mobile device and listened to at any time. In the past, listening to recorded lectures was an uncommon experience. Students who took correspondence courses and those who made tapes of lectures they heard on the radio were among the few listeners who were familiar with mobile lectures. But now that recorded lectures (or podcasts) are so common, it is important that we study the experience of listening to them in order to uncover how this is a different experience than listening in a classroom or lecture hall. One of the most pressing questions we can ask is: can the experience of listening in classrooms be duplicated on mobile devices like digital audio players and smartphones?

Grasping the differences between listening to 'real time' vs recorded lectures is difficult since it requires us to notice what unfolds as we listen to lectures delivered in classrooms and contrast this to our experience of listening to mobile lectures. Many people have never examined or considered what it is really like to listen to a lecture in a classroom. We simply take this experience for granted.

Another hurdle that may prevent us from carefully considering in-person and mobile lectures is the temptation to assume that one type of lecture is

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[2] A version of this chapter has been published: Jubien, P. (2012). *Explorations in Media Ecology Journal*, 11(1), 73 – 85.

inherently better than the other. In this era of technology integration in so many areas of life, some people claim that recorded lectures will improve and enhance education or vice versa. People who are suspicious of the effects of the new technologies are loath to admit that recorded lectures may offer advantages. Before we leap to any conclusions, it is helpful to look carefully at both types of lectures and consider some of the similarities and differences between them. By doing this, it may be possible to discover what it is like to listen to mobile lectures and consider some of the aspects that make this experience unique.

**Background**

The topic of podcast lectures is closely linked to mobile technology and learning. When mobile technology was first used in education, there were many articles written about small-scale, pilot projects (Kadirire 2007; Librero et al. 2007; Polishook 2005; Shihn and Mills 2007; Weber et al. 2005). Since then, there has been a substantial increase in mobile technology publications (Hwang and Tsai 2011). This research covers a wide variety of topics. Some studies have focused on the need to develop a theoretical framework for mobile learning (Koole 2009; Motiwalla 2007; Sharples et al. 2007; Traxler 2007), others have investigated how mobile technology can be utilized in specialized educational settings (Abubakar et al. 2005; Diaz-Vera 2012; Levy and Kennedy 2005; Torre and Wright 2003), and some have examined how to integrate Web 2.0 tools with mobile technology (Brooks-Young 2010; Staudt 2005). There have also been many articles published about specific mobile technologies, including podcast lectures. Two of the common questions in the podcast literature are: how can we use podcasts most effectively in education, and will students prefer to listen to pre-recorded lectures instead of attending classroom lectures (Couture 2007; King 2010; Koo and Sandars 2008; Williams and McMinn 2008; Windham 2007)?

As a result of this increased interest in mobile technology, there has been an increase in our understanding of mobile learning. Yet, there are many

research areas that have not been explored and there are many gaps in our understanding. For instance, while many researchers have looked at mobile technology, few have considered the similarities and differences between new technologies and older ones. How does listening to podcast lectures compare to classroom lectures? Another research question that has been considered less often is: what is it like to listen to a mobile lecture? Although the answer to this question may seem obvious, it actually proved to be difficult to answer because it required students to recall what they experienced as they were listening. Nevertheless, it was a worthwhile exercise to seek out responses to these questions because the answers shed new light about how mobile lectures are influencing teaching and learning.

**The Importance of Media**

In the field of media ecology, there are many scholars who have looked at new technologies and considered how they are different from older ones. For instance, Marshall McLuhan prompted us to examine a technology and ask the following four questions: what human trait or experience does it enhance, what older technology does it obsolesce, what previous technology does the new one retrieve and what can it reverse into when it is over utilized? (McLuhan and McLuhan 1988). When I used McLuhan's framework to study mobile lectures, I realized that the podcasting literature could answer the first two questions but it had less to say about the last two questions. Besides McLuhan, Neil Postman is another scholar who has looked at new media or technology. In his book *Technopoly* (1992), Postman outlines how our interactions with computers have changed our thinking and the language that we use. His observations prompted me to wonder whether we may soon speak of 'pausing' and 'rewinding' lectures, whether they are mobile or not. Although I did not use either Postman's or McLuhan's work in this study, they served as examples of how important it is to think critically about new technology such as mobile lectures.

**Methodology**

To record and create a podcast lecture is to introduce a new technology into the communication between instructors and students. Since I wanted to learn more about what students experienced as they listened to mobile lectures, I used phenomenology as the research method. Phenomenology is a philosophical research tradition that explores the meaning of our pre-reflective, lived experience. When used in education, phenomenology strives to uncover our pre-reflective, lived experience of educational phenomena including teaching and learning (van Manen and Adams 2010). For this study, six college students,[3] who regularly listen to podcast lectures on mobile devices, were interviewed. Additional data were collected through writing exercises. The information was gathered into groups and analysed thematically using Max van Manen's (1997) four existentials or themes. The existentials are: spatiality (space), temporality (time), relationality (relationships with others) and corporeality (body). These themes were a helpful way of examining the many dimensions of students' listening experiences. As Maurice Merleau-Ponty (2002) points out, human beings have always been tied to the world, and that in order to think critically about the world we must first be in the world. His observation highlights our intimate connection to our surroundings and how they can be a source for self-reflection and understanding. Throughout our daily activities, we have numerous experiences of our bodies, space, time and relationships with others, but we are often unaware of them. When we do notice them, it can become clear that we do not experience them equally. For instance, if we are late and running for a bus, we may be keenly aware of the passage of time or an ache in our leg but we may ignore the people nearby and the space we are moving through. It is worth considering each dimension, though, because they can hint at how students experience mobile lectures and provide insight into the ways that mobile technology is influencing communication.

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[3] [3] The six college students interviewed were assigned pseudonyms.

In the following sections, I examine each of the four existentials and share highlights from the interviews with the students. I begin by discussing students' sense of space and then turn and look at their lived sense of others, time and body as they listen to mobile lectures.

**Shifting Space**

Considering the notion of space, or where students are when they listen to lectures, was a good beginning for this study because space and the fact that students can listen from a variety of places is frequently mentioned in the podcast literature (King 2010; Koo and Sandars 2008; Quinn 2000; Staudt 2005; Windham 2007). Space was also a part of students' descriptions. For instance, one student, Natasha, said in an interview, 'To my surprise, I began enjoying my long commutes because that meant that I could listen to the podcast'. This observation prompted me to wonder exactly *where* students are when they listen. Are they in the lecture or sitting in traffic? Of course, the same question may be relevant to in-person lectures; as we listen, are we in the room with the instructor and the other students or are we looking out the window or even lost in our thoughts? While it may not be possible to know whether students are ever truly present in their physical location when listening to either type of lecture, it seems that listening to recorded lectures can intensify the experience of being in two spaces at once.

This sense of shifting places and the experience of giving one activity only our partial attention while we focus more on recorded lectures could be described as a type of multitasking, because we are attending to two (or more) activities at once. While it may appear that we are attending to driving and listening equally, it may be that we are really focused on only one task at a time and imperceptibly switching back and forth between them. When an activity is difficult or unfamiliar, we may be more aware of how we are switching back and forth between tasks. For instance, one student said, 'Sometimes I stop what I'm

doing and then realize that I am listening to the podcast in French, which is not in my first language'. This story hints at the way that we are attentive or inattentive to activities, depending on how familiar we are with them. When something becomes easier, we may give it our inattentive attention without realizing that we have invisibly switched from focused to inattentive attention. This subtle switching of attention seems to be part of the experience of shifting places when students listen to recorded lectures.

This shifting of places is also a part of the experience of listening to lectures on mobile devices. It is possible to attend to life as it is unfolding in the present time while we simultaneously travel to other places with the speaker. But how does this experience occur? How do we shift so effortlessly between the places we are in and the places suggested by the lecture? Do we shift only once between these places or do we drift back and forth between them while we listen and attend to other things?

It seems that students' sense of place is not static, but instead is a constantly changing experience. Students do not simply enter the space of the lecture and then settle comfortably into it. Instead, their attention moves back and forth between the lecture and their surroundings. One student, Natasha, describes her sense of place like this:

> The [train] platform is packed with chatting students getting home after class. Next to me are two young girls discussing failed relationships. They are blissfully unaware of my presence on the crowded platform. I pull out my MP3 player and look for a lecture that will take me away from being right here, right now.

In this case, she intentionally shifts her attention away from the place of her surroundings towards the place of the lecture. Through the words of the speaker and the images they suggest, she can imagine being elsewhere from the place she

physically embodies for a time. Listening to lectures allows her to temporarily escape from her surroundings when she wants to leave them behind and go, in a virtual sense to another place.

This sense of shifting place also appears in other descriptions. As Conrad puts it,

> I push the ear buds into my ears as I leave the house on my run. I head down the street, towards the park where I like to go. Pretty soon, my surroundings are a blur; I am focused on what the speaker is saying and try to keep my pace up.

Another student, Connie, says,

> I collapse into a seat on the bus after work. I pull my iPod out of my pocket and scroll through the files looking for the lecture that I need to listen to for class this week. I turn up the volume so I can hear my instructor over the person who is sitting in front of me. I hate it when someone else's music is so loud because then I can't hear what my professor is saying.

In this example, the listener also intentionally tries to move into the world of the lecture and away from where she is during her commute. But she has difficulty doing this and finds that she is temporarily pulled back into her surroundings because of the noise from a person sitting nearby. It seems that listening to recorded lectures allows listeners to shake free from the constraints of their physical locations and travel somewhere else, which (temporarily) can seem to be just as real to them as the places they left behind.

Many people who listen to recorded lectures are also moving physically through space at the same time – walking, jogging, riding the bus, driving. The

simultaneous mobility and movement of listeners seems to be a unique feature of experiencing mobile lectures. Although students could access lecture recordings from their laptop computers and stereos before mobile devices were invented, the number of settings they could listen from was limited. With the widespread increase and affordability of mobile devices, it is now easier than ever for students to take a lecture with them while they go for a run or commute to work. Mobile devices are small and portable and they allow students to listen to recorded lectures in more places than before.

**Sense of Others**

In addition to considering the sense of space in recorded lectures, we can also consider the sense of others. We may wonder what makes the experience of attending in-person lectures different from listening to recorded ones, and whether it is necessary for students and instructors to be physically present with one another, in the same space and time, to call the experience a real lecture. When students and instructors share the same physical space and time, there is the potential to experience an atmosphere of mutual presence. We can see the instructor and the other students and they can see us. We can observe their facial expressions and their postures and they can do the same. If we attend a series of lectures over a semester with the same instructor and students, we may begin to notice predictable patterns of behaviour, such as whether the instructor seems rushed or calm, whether he or she prefers to answer questions during or after their lectures, and which students dominate the discussions and which ones are usually quiet. Although these elements are not a core part of the content of the lecture, they are predictable features of in-person lectures that set them apart from pre-recorded ones. These features contribute to the sense of mutual presence that can occur during live, in-person lectures.

Of course, this sense of mutuality is not always present. As Rhonda puts it, 'I was in a class of several hundred. The instructor stood at the front of the room and talked. Very few students were brave enough to ask questions. I am

certain the prof had no idea who I was'. Although in-person lectures have the potential to create mutual presence, they do not always do so.

But what happens to this sense of presence in recorded lectures? Is it reduced? Or does it disappear completely? By looking at students' accounts of listening to mobile lectures, we can gain insight into this question. One student says,

> At the beginning, the professor's nasal-sounding voice was distracting, but now I'm used to it. I know that he will begin talking about one topic but then he will go off on a side topic and then he won't remember what he was originally talking about. I'm used to him now.

In another study, a student noted how he followed recorded lectures closely and 'hung' on every word the instructor said (Quinn 2007). From these examples, we discover that students have a sense of the instructor's presence and that this part of the experience has been preserved in mobile lectures.

What about the instructor's sense of students? It seems to be missing in these two students' stories. That is because recorded lectures allow for one-way communication only, not two-way communication. Students can hear their instructors but the instructors cannot hear them. In this case, there is a sense of one-sided knowing, rather than mutual presence. Could we describe this one-sided knowing as 'eavesdropping'? According to the dictionary, one of the definitions of eavesdropping is to 'listen secretly'. Is this what students are experiencing when they listen to recorded lectures? In some respects, this seems true, especially if students listen with headphones that allow them to be the only ones who hear the lecture. They are in a secret world, surrounded by the sounds of the lecture but not actively participating in it.

Of course, students who attend in-person lectures can also dip in and out of the lecture at any time; they have the freedom to surf the web and send text messages while the instructor is talking. But in classrooms, there are some minimal social norms in place when students and instructors are together that shape their mutual sense of presence. Many students occasionally look at their instructors, some may make eye contact and a few will nod their heads in understanding or acknowledgement. This brief or subtle interaction can create a sense of shared presence and experience.

The sense of others in mobile lectures is different because it can include more than just the instructor and other students. It is also possible to have a sense of the people around us as we listen. As one student remarked,

> I am sitting in my comfy chair by the window searching for the lecture on my iPod. I put in my ear buds so as not to disturb my son working on his homework at a nearby table. This is the third or fourth time I've sat down to try to finish listening to this. Listening to the lecture, I find myself quietly watching my son bent over his books. I am slowly catching the drift of the lecture. My son catches my eye and smiles at me. I smile back and suddenly realize I lost the last snippet of what was said. I scroll back a little and continue once again.

In this example, there is a sense of another person because the listener briefly interacted with her son. But this interaction is different than the experience of catching another person's eye across the room during an in-person lecture. In the second example, the listener interacts with someone who they know from a public space, the school. But in the first example, the listener interacts with someone from her private life, her family. Our sense of others in recorded lectures can include people who are outside the lecture, and this is different than live lectures when those in attendance interact.

The presence of others can also be negative while we listen to mobile lectures. Take, for example, one student who explained,

> This strange woman on the bus kept talking to me, even though I didn't know her. At first, I nodded to be polite but then she got too annoying. To escape, I turned up the volume on the lecture I was listening to. I stared ahead and tried to ignore her.

This interaction, however brief, shows that while we can have a sense of others while we listen to recorded lectures, it is not always mutually agreeable.

Of course, this experience may also occur during in-person lectures, but with some variations. Although we may occasionally whisper to the student next to us or nod to acknowledge something the instructor says, we rarely use the lecture itself as a means to escape from our exasperating neighbours. We expect to sit quietly together and refrain from talking to each other during the lecture. We politely give the lecturer our attention (or at least the appearance of our attention). But in recorded lectures there are no such social conventions; we listen from a wide variety of locations, including public places such as bus stops, subways and coffee shops, and we sometimes use the lecture as a means to escape from our neighbours. When we do this, we intentionally avoid interacting with those who are nearby.

It seems that when we listen to recorded lectures our sense of others is complex and varied. We can have positive and negative experiences of others, we can include people who are outside the lecture entirely and we can make the lecture our means of escaping from unwelcome contact with others. All these variations make it impossible to provide one single definitive description of the way we experience others in lectures. Despite this complexity and variation, however, there is something that all recorded lectures have in common, the instructor's voice. As Gardner Campbell puts it, 'There is magic in the human

voice, the magic of shared awareness. Consciousness is most persuasively and intimately communicated via voice' (2005: 40).

Perhaps it is through instructors' voices that we gain a sense of others while listening to recorded lectures. Indeed, students mention their instructors' voices when they talk about listening to mobile lectures. In one case, a student talked about their professor's nasal-sounding voice. For this student, it is the instructor's voice that gives them a sense of others while they listen to mobile lectures.

**Pausing, Rewinding and Replaying Time**

Another way to think about mobile lectures is to consider our sense of time and how we experience it. Recorded lectures have the potential to change our relationship with time because they allow us to pause, rewind and re-listen to the lecture as many times as we want. When lectures are recorded, they become episodes or events that can be repeated and re-experienced by students infinite times. It is simply impossible to 'pause' an in-person lecture, even though we may sometimes wish to do so. This ability to pause, repeat and rewind is an important distinction between recorded and in-person lectures. Recorded lectures can be repeated again and again but live lectures occur only once.

With mobile lectures, students can also control their rate of listening. As one student puts it, 'I skipped a large percentage of the podcast I listened to today because it was boring and simply not in my area of interest. I can't imagine listening to a talk show on the radio anymore. I'm too impatient and would want to fast-forward through most of it!' Another person describes how he often speeds up the rate of his podcasts by 50 per cent on his MP3 player so that he can get through a 45-minute podcast in 30 minutes or less. He explains, 'When I listen to it at regular speed, it feels unbelievably relaxed, like the speaker is talking in slow motion'. This focus on time and the desire to control it, manage it rewind it and distort it is a defining feature of mobile lectures.

Although we may not be aware of it, our relationship with time changes when we replay lectures because we can experience the past and the present at the same time. Students can listen to a lecture recorded in the past while they are experiencing the present time. This happens so often that it is easily overlooked. Of course, before the popularity of mobile lectures, many of us experienced the past and the present by watching ten-second replays of sporting events on television. But what is significant about mobile lectures is the way that they make the past and the present time a part of education. Before podcasts lectures, students had no means of replaying a lecture. Either they listened to it in-person or they missed it. Now, with mobile lectures, students can listen to lectures they have already attended in-person, or they can listen to lectures that they will never experience live. Before mobile lectures, students' sense of the present was closely tied to lectures, but now this link is looser and students can experience the past and the present simultaneously as they listen.

Besides changing our relationship with time, students may also manipulate the time of the lecture itself. For instance, they may listen to the first part of a lecture while waiting in line; then listen to another bit over lunch and catch the last part as they are driving home from work. In the past, some students in distance education courses would be given pre-recorded learning materials on tapes or CDs and this allowed them to control the time of their listening, but not with the same level of precision as today. Navigating through a recording on tape or CD is cumbersome, and it was difficult to find a specific section in the middle of a recording. But today, most digital audio players keep track of where listeners are when they stop listening and automatically begin playing from this point when they return. When students can manipulate the time of a lecture in this way, their control of it also increases. Students are no longer required to listen to every word an instructor utters; they are free to skip over sections, repeat sections and listen in any order they want. This freedom gives students the ability to customize and personalize their learning.

The sense of the past is another noteworthy feature of mobile lectures. When students look at a lecture file on their computers, they can see that it is time and date 'stamped'. What this information does is to briefly bind a lecture to the past. If a student finds a lecture engaging and interesting, he or she may soon forget that it is from an earlier time: for the student, it is being experienced in the now. But if the lecturer mentions a current event, the student may be suddenly reminded that the lecture is old and out of date. The significance of this for education is that instructors should not plan to use the same lectures indefinitely. Mobile lectures are tied to the past and it is necessary to update them fairly often so they are may be more seamlessly experienced as fresh and concurrent with the student's present.

It may also be helpful to study Harold Innis' concepts of time and space in order to discover the similarities and differences between how these two dimensions are experienced phenomenologically. Innis (1991) looked at different forms of media and their physical characteristics and how they were connected to space and time. He proposed that some media were more suited to disseminate knowledge over space and others were more suited to disseminate knowledge over time. For instance, he argued that if a media were heavy and difficult to transport, it was more likely to disseminate knowledge over time rather than space. Since Innis lived in an era before podcasts, he did not study this technology. By using his framework, we might say that since a podcast lecture is such a highly transportable digital file, it would be most suited to disseminating knowledge over space rather than time. Interestingly, this emphasis on space is often mentioned in the podcast literature, and it emerged frequently in the students' interviews. But it would be unfair to ignore the importance of time. Although podcasts will probably not survive as long as the media that Innis studied (stone monuments and clay tablets), time is still an important element of this technology. Time and space should have equal emphasis in the discussion of podcast lectures.

**Sense of Body**

The last existential, our sense of corporeality, is perhaps the most elusive element of the experience of listening to recorded lectures. On the one hand, our bodily sense is taken for granted as part of the three other existentials. We use our legs and feet to walk or jog through space, our hands to adjust the start, stop and volume buttons, and our eyes and body language to signal to others nearby that we either welcome or reject their presence in our semi-private world. We may smile across the room at someone and invite them into our space, or we may turn our backs and close ourselves off from them. On the other hand, in normal everyday situations we tend to meet other people first through our body language. Yet, for the most part, we tend to 'forget' our bodies as we go about our everyday lives. This is hardly different for the experience of listening to a podcast lecture. Or is it?

While we attend a live lecture, we may notice the temperature in the room, the smells of food odours or perfumes and we may observe the clothing that other people are wearing. Here, our sense of body seems more complex than mobile lectures because there are so many ways we can experience the lecture and our surroundings. Strictly speaking, in recorded lectures, our ears and bodies receive sound waves, and the only things we need to receive and process them are our ears and minds. But it would be too simplistic to conclude from this that our ears are the only parts of our bodies that experience recorded lectures.

In some of the anecdotes described earlier in this study, there are glimpses of the body. Students tell us that they 'pull out their MP3 players' and 'push their ear buds in' and 'catch their son's eye'. Each of these experiences is possible only through our bodies. As Rainer Schönhammer reminds us, 'The familiar environment in which one lives and moves takes on a strange character when one is separated from the acoustic part of it' (1989: 134). Perhaps this can also happen when we listen to recorded lectures. Our bodies may take on a

strange or unfamiliar quality when they are separated from the embodied experience of attending live lectures. Campbell notes that '[…] a voice that creates a theater of the mind – radio's time-honored heritage – can connect with the listener on a profound level. The theater of the mind can be both compelling and transformative, often far more than anything witnessed visually' (2005: 42). This sense of connection also involves our bodies but in ways that we may not be aware of. It seems that in our sense of corporeality there is much that we are not aware of or understand. Indeed, it seems that listening to a podcast may intensify our body 'forgetfulness'. Even though we are walking, jogging, riding a bus or driving a car, when we are engaged in the mobile lecture our body is released to the world it has been habituated to – the neighbourhood sidewalks, the gym track, the local bus route, the car and the drive home – and in that moment, it is completely forgotten.

## Conclusion

By examining the experience of listening to podcast lectures using van Manen's (1997) four existential themes of lived space (spatiality), lived time (temporality), lived human relation (relationality) and lived body (corporeality), it is possible to see beyond the promise of mobile technology. Although pre-recorded lectures can deliver information to students anywhere, anytime, there are many other aspects that educators and administrators should consider before they move lectures out of classrooms and make them available only on mobile devices. As the work of McLuhan and Postman demonstrates, it is important to think critically about a new technology and discover how it influences and changes our interactions and communication.

When students access podcast lectures, they have the freedom to listen from any space they choose, but their sense of place is not a constant experience but a fluid and dynamic one. They drift back and forth imperceptibly between the space of the lecture and the space of their physical surroundings as they listen. Students' sense of others also changes when they experience mobile

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lectures. They can communicate with people who are outside the lecture or they can use the lecture as a means of avoiding contact with others. Since podcast lectures allow for only one-way communication between instructors and students, the mutual sense of presence that can be created during in-person lectures is lost. Students' sense of time is also experienced differently when they listen to mobile lectures. Having the ability to pause, rewind and re-listen releases lectures from the constraints of the present time and enables students to personalize and customize their learning in ways that instructors could not have imagined or predicted. Finally, it is unclear how listening to mobile lectures affects students' sense of lived body. Although there were some hints of this existential in the interviews, it was not a prominent part of any student's description. It may be that when a student is immersed in a mobile lecture the phenomenal body disappears almost entirely.

**Chapter 4: Paper 3 – Shape Shifting Smartphones: Riding the Waves in Post-Secondary[4]**

## Introduction

Contemporary educational practice is intimately intertwined with its material objects. Classrooms are equipped with tables, chairs and interactive white boards; libraries are filled with computers and books; and science laboratories and workrooms have specialized equipment and supplies. Teachers and students habitually overlook these objects and take them for granted, but as Fenwick and Edwards (2010) note, "Pedagogy centres around, and is constantly mediated by, material things. Pedagogical encounters change radically when its things change..." (p. 5). This observation suggests that some of the newest objects in education, smartphones and tablet computers, may be profoundly shaping and influencing educational practice, whether we are aware of it or not.

A distinctly 21st century invention, the smartphone is one of the newest technical objects to appear on the post-secondary education scene. Now nearly ubiquitous, a recent survey claimed 63% of post-secondary students in Canada own smartphones, well above the Canadian average rate of 54% (Newad survey about Canadian, 2012). Smartphones can be used for a variety of educational and non-educational purposes, including reading, research and communicating with peers and instructors, texting and browsing the Internet. Often, the fact that students use smartphones for learning is not obvious to instructors or administrators. Perhaps this is because they are such small, and distinctly personal devices. Instructors see students using their phones but they often do not know for what purpose. In order to learn more about the educational use of smartphones, I initiated a study, grounded in principles from actor-network theory (ANT), to learn more about students who regularly use smartphones for learning in post-secondary education. Based on observations of and interviews

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[4] A version of this chapter has been published: Jubien, P. (2013). *Canadian Journal of Learning and Technology,* 39(2), 56-72.

with six university students, this study attempts an ANT-informed account of the multiple ways that the smartphone is tangled up with students and instructors in overlapping networks or assemblages.

## Overview of the Article

The discussion begins with an overview of the mobile technology literature and an explanation of the choice of ANT for this study. The next section provides an introduction to ANT and discussion of some key terms and concepts including "symmetry," "black boxes," as well as "fire" and "fluid" objects. Following is a description of the study's research design and the methods employed. The balance of the article is a description of the study itself, organized around several key participant anecdotes. I propose that while smartphones are indeed "fluid" and "fire"-like, the descriptor "protean" captures more accurately the highly mutable and unpredictable nature of this "shape-shifting" object. The discussion concludes with a description of how the student-smartphone assemblage is influencing and changing pedagogical practices and the significance of this for education.

## Overview of the Mobile Technology Literature

Interest and research in mobile technology and mobile learning is growing. Many topics have been explored in the literature including the educational application of mobile technologies (Caudill, 2007; Pinkwart, Hoppe, Milrad & Perez, 2003; Torre, 2003), the need to develop a theory of mobile learning (Koole, 2009; Sharples, Taylor & Vavoula, 2005; Sharples, Taylor & Vavoula, 2007), applications of mobile learning (Diaz-Vera, 2012; Kukulska-Hulme, 2006; Motiwalla, 2007; Polishook, 2005; Trinder, Magill & Roy, 2005), and usability factors and guidelines for m-learning projects (Ally 2005; Vavoula, Lefrere, O'Malley, Sharples & Taylor, 2004).

**Actor-network theory and mobile technology.** Fewer studies have used actor-network theory to examine mobile technology and learning. Wright and

Parchoma conducted two ANT studies with mobile technology. In the first one, they considered the different types of discourses that exist in the mobile technology literature (2011) and, in the second they traced how one brand of smartphone formed into actor-networks in informal learning (2012). ANT was a suitable approach for this study because it provided a way of studying humans and objects together rather than separating them or considering ways that humans use objects in education (Sørensen, 2009). It also offered an opportunity to transport objects such as smartphones out of the background of our everyday world and make them important participants of the study (Adams & Thompson, 2011). Waltz (2004) notes that humans and objects interact and co-create educational environments together, and this observation highlights how the material and relational are interrelated in education and the importance of studying them together.

Another advantage of using ANT was the opportunity it offered to examine and reflect on different pedagogical practices. In ANT, the term practice is used broadly to refer to a multitude of activities. In this study, some of the practices that emerged were: accessing and gathering information, receiving feedback from instructors and collaborating with other students. ANT's focus on practice is valuable for it reminds us that practices emerge from the interactions of humans and technology, rather than existing independently before humans and objects form into overlapping actor-networks.

**An Introduction to Actor-Network Theory**

ANT originated in the work of many scholars, including the science-technology-society (STS) researchers Michel Callon (1986) and Bruno Latour (1992) and the sociologist John Law (1987). ANT identifies how objects, artifacts and people (called actors) combine together into actor-networks or assemblages and how they work together. The formation of actor-network is not predictable or stable; actors can, at any moment redefine their relationships to one another in new ways and enroll (or bring) new actors into the network (Callon, 1987). The

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actor-networks overlap and intersect; some parts work co-operatively and provide stability, while others conflict with one another, causing network strains and breakages. In early ANT studies, the word actant was sometimes used instead of the word actor. Harman (2007) has observed that "An actant is nothing without networks; with networks, it is all." (p. 43). Although the notions of actors and actants are thought provoking, ANT is more focused on the assemblages of actors into networks and the work that is performed within and through these networks of relations (Law, 1999).

## ANT as a Sensibility

There are many different opinions about the suitability of the term "actor network theory" for this method of study. Callon (1986) has used the phrase "sociology of translation" while Law (2009) has argued that the term "material semiotics" is a more suitable way to describe this approach. Instead of calling ANT a theory, Fenwick (2010) suggests that we think of it as a sensibility and a way of investigating how the socio-material enacts reality. Meanwhile, Law (2009) argues that actor-network is not a theory because it does not provide explanations, but instead focuses on descriptions and telling stories about how actor-networks assemble together and Fox (2005) explains that the goal of ANT is "...to illuminate the processes, rather than explain end results..." (p. 102). The different opinions about the suitability of the name actor-network theory and the debate regarding whether it is really a theory or not, can make it challenging to say anything definitive about ANT. One of the main characteristics of ANT studies is that they are highly descriptive accounts of the many actor-networks that form and stabilize and they usually describe the work (or pedagogy) that is occurring within them. Other than these general characteristics, each ANT study focuses on just a few terms, concepts or sensibilities within a given subject area. This variation of ANT studies is further compounded by a shift in research topics over its history from translation (Callon, 1986; Law, 1992) to objects (de Lat & Mol, 2000; Mol 2002; Law & Singleton, 2005).

**Symmetry.** One of the central tenets of ANT is that humans and nonhuman objects are equally important; one should not be privileged over the other. It is a characteristic of our humanist, anthropocentric era to imagine ourselves in the centre of networks and relegate the non-humans to the periphery. However, it is important to resist this tendency and to take a broader viewpoint in order to learn how humans and non-human technological actors assemble, circulate, and disassemble in fluid and unstable networks. This symmetrical outlook gives ANT researchers the opportunity to identify, study, and unravel the complex web of human-technological networks that co-constitute every human-technology interaction.

In addition to the notion of symmetry and the terms actors, actor-networks, and assemblages, there are numerous other concepts employed in ANT including: mediators, intermediaries, translation, immutable mobile, fluid objects, fire objects and black boxes. At times, the sheer number of terms and the many variations and interpretations of them can make ANT seem complicated and needlessly complex. While this is a fair criticism of ANT, the diversity of terms also reflects the disorderly, shifting, messy, "in the wild" situations that ANT studies. When people, objects, and artifacts combine together, these form into unstable, dynamic assemblages that may not be fully described or understood in simple terms. When there is flow and movement, interruptions, breakdowns and contradictions to account for, it is helpful to have a rich vocabulary at hand. Yet, not all terms in ANT are equally significant in all studies. In this particular investigation of smartphone use among post-secondary students, the notions of black boxes, mediators, fluid objects, and fire objects were most important. The next section provides brief definitions of these terms before the details and findings of the smartphone study are presented.

**Black boxes.** The term black box is used in ANT to describe the way that we focus on what an object produces (or does) and overlook what goes on internally that makes this possible (Latour, 1999). The term black box can be

misleading if we focus too much attention on objects alone and overlook the ways that humans and objects are entangled together into actor-networks. Latour (1999) writes, "Open the black boxes; examine the assemblies inside. Each of the parts inside the black box is itself a black box full of parts. If any part were to break, how many humans would immediately materialize around each?" (p. 185). One of the advantages of using ANT in this study is the opportunity it provides to open up the black box of smartphones and examine the many actor-networks or assemblages within.

**Mediators and intermediaries**. In ANT studies, it is important to follow those actors, or mediators, that change and produce tensions and upheavals in the assemblages in which they are entangled. According to Latour (2005), "Mediators transform, translate, distort, and modify the meaning or the elements they are supposed to carry." (p. 39). Mediators may lead in many directions and they are usually complex and contradictory (Latour, 2005). Intermediaries are actors that "...transport meaning or force without transformation..." (p. 39) or change and they are not as interesting to follow as mediators (Latour, 2005). Any actor, whether they are human or object may act as a mediator or intermediary and their status is not fixed or permanent; mediators can become intermediaries and intermediaries can become into mediators. The fluid and changing nature of intermediaries and mediators can make them difficult to follow.

Fluid objects. Fluid and fire objects are two of the most confusing concepts in ANT. The first difficultly begins with the word "object" itself. Object can be understood in terms of the expected, dictionary definition of "material things that can be seen and touched" (Canadian Oxford Dictionary, 1998). However, this definition does not apply to all ANT studies. For instance, de Lat and Mol's (2000) study of the Zimbabwe bush pump is an object that can be seen and touched but Law and Singleton's (2005) study of alcoholic liver disease and Mol's (2002) analysis of atherosclerosis does not fit this definition. Unfortunately, the difficulty is further complicated by the ANT definition of

fluid objects as something that "...flows and gently changes shape, bit by bit." (Law & Singleton, 2005, p. 338). This definition is misleading for it also suggests that objects in ANT are like other objects; they are things that can be seen and touched. But Latour (2005) offers advice for how to think differently about objects and to see them as more than just material things. He explains, "...when faced with an object, attend first to the associations out of which it's made..." (p. 233). This suggestion highlights how important it is to consider objects in terms of networks or assemblages in which they are entangled. It also prompts us to think about how an object can change when influenced by changes in other parts of the network.

**Fire objects.** The term fire object is another term in ANT. Law and Singleton (2005) used this term to describe the discontinuous patterns of absence and presence that they noticed in the treatment of alcoholic liver disease. They suggest that "fire object" captures how the absence of one thing depends on the presence of others and vice versa. They explain, "An object is a presence. It is present, here and now. But, whatever the form of its presence, this also implies a set of absences. The present object implies realities that are necessarily absent, that cannot be brought to presence..." (p. 343). They called this a fire object because they noted the way that fires have patterns of presence and absence. They distinguished between fire and fluid objects by noting that the transformation in fluid objects is slower and gentler, while the transformations in fire objects are more abrupt and disjointed. These notions of fluid and fire objects (which overlap and share similarities) captured some of the messy and unpredictable qualities of smartphones in post-secondary education.

## Overview of the Study

One undergraduate and five graduate students participated in this study; they were recruited by referrals and recommendations from other students over a two-month period. This study received formal review and approval from the University of Alberta's ethics review board. The only criterion to participate was

that students had to own and use a smartphone. Their particular use of smartphones was on their own initiative. Students did not have any formal approval or support from their instructors or universities to use this technology. The purpose of the study was to examine students' everyday use of smartphones, particularly as they related to educational tasks. Of course, during the interviews students described non-educational uses of their phones but this use was not the focus of the study. As Wright and Parchoma (2011) have noted, examining students' informal use of mobile technologies is a chance to gain insights into students' situated learning practices.

Data for this study was collected during semi-formal interviews that lasted for approximately one hour. Most of the participants brought their smartphones to the interviews and they both described and demonstrated how they used their phones during the meetings. At one session, a participant forgot to bring her phone and this made it hard for her to describe in detail how she used it. At the other meetings, the participants already had their smartphones at hand and they demonstrated what they were describing as they went along. It seemed that the smartphone had to be physically present and in use during the interviews, in order for students to talk in detail about how they used their phones.

The study asked the following three research questions: What actors and assemblages emerge when smartphones are used in post-secondary education? What pedagogical practices are created within these assemblages? How are these pedagogical practices different from the ones that were already occurring in post-secondary education?

In the next sections, I probe the concepts of fluid and fire objects from actor-network theory and propose that it is more helpful to think of smartphones as protean objects instead. In addition, I share some of the anecdotes from the

interviews and reflect on the ways that smartphones are influencing and shaping teaching and learning practices.

**The Physical Characteristics of Objects**

This study began by considering the physical characteristics of smartphones. This strategy is one that was used by De Laet and Mol (2000) when they studied the Zimbabwe Bush Pump. They described the bush pump as having: a pump head, lever, base and underground parts. At first glance, smartphones seem like objects that can be similarly described. We might say of them that they are: small devices made of metal, glass and plastic, with five buttons and they fit comfortably in one hand. But there are many issues with this description. To begin with, what object do we mean when we use the term smartphone? Are we referring to Apple's iPhone, Research in Motion's BlackBerry, or devices running Microsoft Windows Phone or Google Android? Differentiating among these brands is important because not all smartphones have five buttons, nor do they have the same physical dimensions. De Laet and Mol (2000) studied a single bush pump, the Zimbabwe bush pump "B", which made it easier to confidently describe that object. This study looked at smartphones as a group and did not focus on one particular brand or model, so it is only a starting place to consider the phones' physical characteristics. For the purpose of this study, a smartphone is defined as an computing device with a screen, one that is small enough to be held in one hand, that supports cellular and Wi-Fi connectivity and telephone calling and that has the ability to download, install and run applications.

One of the risks of focusing on the physical characteristics of smartphones is that we may conclude they are intermediaries (objects that do not change) and we overlook the interesting and exciting changes and modifications that occur. Succinctly put, smartphones and bush pumps are very different kinds of objects. Smartphones are designed to be modified on the inside, in numerous,

subtle and easily overlooked ways while modifications to the bush pump, especially those on the outside, are easier to observe.

Instead of focusing on smartphones' physical characteristics, a more effective approach is to examine the ways that smartphones may be internally and externally transformed. Unlike bush pumps, smartphones can only be nominally modified on the outside. We may use cords to attach them to electrical outlets and computers and we can use protective anti-glare film to temporarily mend a broken screen or tape to hold a broken button in place, but we cannot permanently replace these parts with locally available items, as was the case with the Zimbabwe bush pump. But we can substantially change our phones on the inside by downloading and installing a wide range of free and low-cost software applications. As Chen (2010) has noted, "Such is the undeniable appeal of a device whose minimal hardware disappears and, in the form of an app, becomes anything its owner wants." (p. 10). Within seconds, smartphones can shift between their many built-in applications such as email, text messaging, GPS navigation, web browsing and calling, to function as a dictionary, thesaurus, e-book reader, second-language translator and periodic tables of elements. These applications are just a few of the many educational ones that are available.

**Opening Up the Black Box of Smartphones**

When we look at the smartphones and consider the internal transformations that are possible, it becomes clear that these devices are entangled with numerous other actor-networks. Using the iPhone as an example, students and teachers have to use at a minimum: iTunes, wireless Internet connections and the App Store to get new applications. Behind each of these actors are many other actor-networks. As students skim through the apps, they might suppose that Apple has created them, but what they are actually seeing is the work of numerous independent software creators and the other actor-networks with which they are assembled. Depending on what application a student installs, other humans and objects will be added to this assemblage. Although this is not a complete account

of all the actor-networks that are possible on iPhones, it brings to light some of the many actor-networks that exist within them and how these are more noticeable when we open up the black box.

**Understanding Anecdotes**

In order to examine some of the actor-networks discovered in this study, anecdotal descriptions or remembered moments were collected from the participant interviews. A few of these anecdotes are presented below. Anecdotes allow researchers to start with a specific incident and explore its complex associations (Michael, 2012). The intention of using them is to gain a firsthand, admittedly "human," glimpse of the numerous connections that exist between actors—both human and non-human—as well as the work done within these assemblages. ANT researchers commonly use anecdotes as a key methodological heuristic, most famously Latour's seatbelts, doorstops and sleeping policemen (1992), and also Leander and Lovvorn (2006), Singleton (2005), and Verran (1999). Although such anecdotal accounts reconstructed from participant interviews necessarily present the "human" point-of-view, once subjected to ANT analysis, they may serve to show how humans and non-humans share agency in the immediacy of the everyday (Introna, 2007).

     **First anecdote: pictures at the library.** Adam is looking for books for his research project at the library. When he finds some that look interesting, he takes pictures of the call numbers on the computer screen with his phone's camera. He heads upstairs to find some books on the shelves. While doing this, his phone rings. He answers the phone but no one speaks, there is just a buzzing sound. He realizes that someone wants him to open the main door of his apartment building. Adam presses the number one on his phone, which makes the apartment door (located 20 blocks away) open. Adam and his roommates do not have a home telephone, so it is his smartphone that rings when someone is waiting in the lobby. When they call, he lets them in, whether he is there to greet them or not.

This anecdote illustrates the ways that a smartphone can be considered a fluid object. At the beginning of the anecdote, the smartphone is used for researching and information gathering. The phone's camera capabilities have replaced pencil and paper as the means of recording the call numbers of library books. Then suddenly, the phone shifts its function and acts as a remote entry system. Thinking about smartphones as fluid objects allows us to see that there has been an important shifting of purpose in this instance, despite the fact that the phone has not physically changed shape.

**Smartphones as Protean Objects**

While it is helpful to think about smartphones as fluid objects, the concept does not fully capture the complex mediating activity of the object in this anecdote. Sometimes, the smartphone gradually changes shape, but at other moments, the shape shifting is sudden and abrupt. For instance, when the phone rings and Adams presses one, the phone suddenly switches from being a research tool to being a gatekeeper and remote entry system. There is no gradual changing here; it is interruptive and nearly instantaneous. Using the notion of mediators and intermediaries in this case is also unsatisfactory. On the one hand, the phone acted as intermediary for it did not transform or modify the meaning of what it was supposed to carry. Adam set it up to act as a notification system and it functioned perfectly in this role. But in another respect, the phone-entry system behaved like a mediator. The security system alone was originally designed to be a means of restricting access in the building but when it is assembled together with a smartphone, it becomes a way of enabling access at a distance. While we might say that this illustrates how actors can quickly switch from being mediators to intermediaries, there is another feature of this anecdote that is not accounted for: the sudden and unexpected shape-changing that occurred. Instead of conceptualizing smartphones as mediators and fluid objects, it would more fully capture their behaviour if we thought of them as protean objects. According to the Canadian Oxford Dictionary, the word protean is used to

describe a person or thing that is variable and assumes many forms. The word comes from the Greek sea-god Proteus who had the power of prophecy but who preferred to assume different shapes rather than answer questions about the future (Canadian Oxford Dictionary, 1998).

Using mythological and historical figures as a means of describing human-technology relations is evident in the writing of others. For instance, Postman (1992) incorporates the anecdote of the Judgement of Thamus into his book about technology and culture, Latour (1999) used the notion of Pandora's box in his collection of essays about science and technology, and Arnold (2003) discussed the "Janus-Faced" nature of mobile phones in his writing. Sometimes, using mythological figures can help us capture an important trait or aspect of technology that we notice. Conceptualizing a smartphone as a protean object emphasizes the phone's continuous shifting quality. Like the sea-god Proteus, the shape shifting in phones comes in waves; sometimes, the waves move gradually and the shape shifting is gentle but at other moments, the waves are powerful and the change is sudden and unexpected.

**Fire Objects**

In ANT, the notion of fire objects has some overlap with protean objects. Law and Singleton (2005) use the term fire objects to describe objects that have patterns of discontinuity in their absence and presence. They write, "...fires are energetic and transformative, and depend on difference – for instance between (absent) fuel or cinders and (present) flame." (p. 344). This argument is relevant to smartphones because there are obvious patterns of absence and presence with these devices. The smartphone permits Adam to manipulate his presence and absence; at one moment, he is present in the library and absent from his apartment, and in the next, he is virtually present in his apartment building and physically present in the library. Protean objects and fire objects also share a sense of randomness; both are unpredictable and dynamic (Law & Singleton, 2005).

It is when we consider the concepts of place and time that we begin to see important differences between fire objects and protean objects. In their study, Law and Singleton, traced one object, alcoholic liver disease, and examined three versions of it in three differences: a hospital, a community-based psychiatry office and a GP's surgery. Although different, these versions of alcoholic liver disease were also related to one another because they were contained within a single health care system (p. 347).

In the anecdote of Adam, the two different versions of the smartphone existed in the same location: at the library. We did not have to physically move, as Law and Singleton did, in order to see two different versions of the smartphone. In addition, the smartphone versions were unrelated (searching for library books has nothing to do with acting as a gatekeeper and a doorbell to an apartment). The concepts of time and place have different meanings in protean objects and fire objects. Time moves faster for protean objects and virtual and actual places can momentarily fuse together. Unlike alcoholic liver disease, protean objects can present different versions of themselves at the same moment, within the same assemblage.

The next anecdote, from an interview with a student, illustrates this collapsed sense of time and place.

**Second anecdote: morning commute.** It's 9:30 am on Wednesday and Karen is travelling to school on the train. She takes out her phone, checks her calendar, launches a database application and begins searching for articles for a paper that's due on Friday. As she waits for the search results, her phone vibrates twice. She knows there are new email and text messages. There are three new text messages: her mom asks for the name of a hotel in Vancouver, a classmate wants to know whether they can meet at 11:30 am to discuss an upcoming group project, and a good friend, who knows her exact location thanks to a surveillance

application they both use, asks to borrow her chemistry textbook. Karen checks her email messages next. One is from the library about a book on hold, one is from a clothing company advertising this week's sales, and the last one is from her English instructor reminding her that today's class has been moved to a different room. She responds to the important messages and then switches back to the database application and skims through the seven pages of results. She flags the articles that look most promising for review later. Next, she logs on to the university's learning management system to see the feedback on an assignment from her chemistry professor. Suddenly, her phone vibrates; it's a reminder that her first class begins in ten minutes. Karen slips her phone back into her knapsack and prepares to get off at the next stop.

**Shape Shifting**

All the events of this anecdote occurred within ten minutes. During that time, Karen searched for learning resources, communicated with others, and received feedback from an instructor. Besides noticing these learning practices, there were also many interesting examples of shape shifting occurring. Some of them, like shifting from a calendar to a database-searching device, went smoothly while others, such as being interrupted by new text messages and reminder alarms, happened unexpectedly. Establishing Karen's sense of actual place in this anecdote is difficult, since she was travelling between locations and in perpetual motion. It is easier to identify the virtual places that she temporarily occupied. At a minimum, she was in the virtual places of the university's learning management system and the database. When she read the text message from her English instructor, she may also have briefly recalled the place of classroom where their meetings are normally held. In order to see these many different versions of the smartphone, it was not necessary to physically move between actual locations; the phone showed us these versions all within condensed time and space dimensions.

**Relevance for Education**

Another interesting aspect of this anecdote is the way that the student's personal and professional lives intermingle and overlap. There is no clear distinction or separation between school and personal life assemblages on Karen's phone. There has been a gradual, barely noticeable and ongoing translation of object here: from personal device to education tool, then back to personal device. In ANT, the term translation has been interpreted in many different ways (Callon 1986; Clark, 2002; Singleton, 2005). In this instance, the translation of the smartphone is closest to Singleton's interpretation, for there was a gradual transformation that occurred, from personal device to education tool and back to personal device. One of the interesting educational dimensions in this anecdote is the challenge that it poses for educators and administrators. If universities do not own smartphones, then they have less influence and control about how they will be used in education. Among the students who took part in this study, all had control over what tasks they would complete; they did not receive official support or endorsement from their university to use their phones. The Bring Your Own Device (BYOD) practice that is occurring in many workplaces is also now a part of education and a common occurrence among students (Alberta Education, 2012; Rockel, 2012).

Another interesting educational issue that was exposed in this study is how a seemingly simple practice, such as reading, is actually more complex that it first appears. Law (1999) notes that ANT can be a way to think about and appreciate complexity, especially as it relates to objects and this observation is particularly relevant to the practice of reading on smartphones.

**Third anecdote: losing the word.** Donna is reading an article for school on her phone. There are many unfamiliar words so she has trouble understanding what the author is saying. She switches out of the reading program, launches the dictionary application and begins typing one of the unfamiliar words. She can't remember how the word is spelled, so she goes back to the reading program, but

the screen on the phone is small and she can't find the word. She shifts the phone from vertical to horizontal position, hoping this will make the screen appear larger. The image on the phone freezes — it is momentarily caught between the vertical and horizontal alignment. In frustration, she pulls out her tablet computer, opens up another reading program that has built-in links to an online dictionary, as well as for Google and Wikipedia. Now she can read and look up words simultaneously. Of course, now she has to figure out how to get the article from her phone onto her tablet computer.

Besides the challenge of focusing on one task (will it be reading the article or looking up unfamiliar words in the dictionary?), this anecdote also shows us how complicated reading can be. Students with smartphones and tablet computers do not just simply read content but, they also look up the meaning of words and phrases. But what does this tell us about reading? Perhaps we might say that the practice of reading is becoming fragmented because students are less likely to extrapolate what a word means from the context and more apt to seek out a definition from the dictionary. The anecdote also reminds us that while students have more options in terms of how they will read (will it be from a printed copy, on a smartphone, an e-reader, or from a tablet computer?), there is more complexity in the human-technology assemblages. When there are accidents or breakdowns in the network, such as when the screen display is caught between vertical and horizontal alignments or the student cannot find an unfamiliar word, he or she may abandon one human-computer assemblage for another. There is no guarantee that the next student-tablet computer assemblage will work any more smoothly because there are still problems in this network, such as how to transfer an article from phone to tablet.

Some parts of the learning networks that assemble together are hidden and they only become noticeable when there are accidents or breakdowns in the network. The next anecdote makes one commonly concealed actor briefly visible, which allows us to examine it more closely.

**Fourth anecdote: studying in the cloud.** Three graduate students are working on a group project; two of them have full-time jobs and rarely have time to come to campus. They meet once a week at night class but the rest of the week, they communicate through text messaging and email. Near the end of the semester, they begin writing a document together and they all share access to it through a free, online document-sharing service. One day, one of them notices that the other person is making edits to the document that he does not agree with. He logs in and begins correcting the other person's work. Then the first student sends him text messages asking: "what's going on?" Eventually, after sending many text messages back and forth, they agree on how they will format this group project.

The hidden part of this learning assemblage is the online document-sharing service that they are using. No one has ever actually seen this part of the learning network. Of course, they see their document on the screen, but they are not aware of the many other actors-networks that are connected to it. And yet, all parts of the networks are critical to the operation and success of their work. If these parts work cooperatively, the network functions smoothly and does not experience any accidents or breakdowns. But if there are problems, the network may momentarily fail or permanently break down. There are many other hidden actors in the learning assemblages that these students encounter including: search engines, learning management systems, virtual learning communities and wireless Internet connections.

## Conclusion

By considering one object, the smartphone, and the ways that it is assembled together with other human and non-human actors in post-secondary, it is possible to learn more about how the socio-material is influencing educational practices. Studying smartphones' use shows us that there is no clear separation between students' personal and school lives and that the threads or actor-networks in

these assemblages overlap, intersect and entangle with one another. It is also possible to observe the ways that smartphones are influencing and changing learning practices. We can learn about how accessing and gathering information, receiving feedback from instructors and collaborating with other students changes when students use smartphones and we momentarily notice some of the concealed actors that assemble together in the networks. We can also reflect on the ways that smartphones act as a fluid and fire objects and consider how they can be described as protean objects. Using this new terminology calls attention to how smartphones are continually going through a process of shape shifting and how time seems to speed up and the ways that virtual and physical spaces can be briefly be fused together. These understandings raise important questions for educators and administrators that need to be further explored and reflected on, as smartphones and tablet computers are integrated into all levels of education.

**Chapter 5: Paper 4 – Telepresence and Online Conferencing**

*"Life is always and already full; it is a total fabric. It may contain empty spaces for inconsequential additions. But if anything is added to life that takes time, the web of life is torn and rewoven; a hole is made by the new device."* (Borgmann, 1992, p. 112).

**Introduction**

Many post-secondary students and teachers use online conferencing software such as Microsoft Skype and Apple FaceTime to attend classes, group project meetings and virtual conferences, thus expanding the established practice of students and teachers gathering together in-person in classrooms. The use of online conferencing is increasing: Skype users logged approximately 55 billion minutes of calls worldwide in 2013, as compared with 45 billion minutes in 2012 (Gara, 2014). According to the proponents of online conferencing, convenience and flexibility allow students and teachers to meet multiple responsibilities, including working full time, connecting to weekly classes and meeting family obligations. The use of online conferencing technologies raises many important questions for educators. For instance, we might ask: is the experience of meeting remotely sufficient for learning? Can it replace in-person collaboration? How do students and teachers experience each other's presence in such mobile space/time configurations? This study examines the topic of mobility, specifically the mobility of teachers and students and reflects on how this influences students' and teachers' sense of body, space and others. In addition, Ihde's (1979) concept of "selectivity" or how online conferencing draws students and teachers towards some possibilities while simultaneously ignoring others is also studied.

**Overview**

This paper begins with a definition of online conferencing software and provides an overview of the research that has already been completed. The next section

examines Moore's theory of transactional distance and how it has influenced many research studies. Then a rationale for considering the use of online conferencing from a different perspective is presented, as well as a brief introduction to postphenomenology. Some anecdotes from a new study of students and teachers who regularly use online conferencing in their work are presented. Finally, the discussion concludes by considering some of the pedagogical advantages and disadvantages of online conferencing for teaching and learning in post-secondary education.

**Definition of Terms**

In this study online conferencing is defined as a method of synchronous communication that brings physically remote participants together through the use of the Internet and specialized software. Online conferencing enables users to share text, voice and video information channels and usually permits users to share files and folders stored locally on their computing devices. Desktop and laptop computers can be used for online conferencing, as well as smartphones and tablet computers. Online conferencing services such as Microsoft Skype, Oovoo and Google Hangouts are free; others, including Adobe Connect, charge a fee for their services. Some online conferencing platforms, such as Moodle Big Blue Button, are freely available and intended specifically for use in post-secondary education while others, like Apple FaceTime, are available only if all attendees use Apple devices.

**Background**

Studying the use of online conferencing in education has been of interest to many educators, particular those working in the field of distance education. Online conferencing is one of the latest developments in a series of two-way synchronous communication technologies that have been used extensively in distance education courses and programmes (Moore & Kearsley, 2005). Older technologies, including audio and video conferencing, share many similarities

with online conferencing, including the capability of hearing and seeing one another synchronously.

Online conferencing has three advantages over older technologies such as audio and video conferencing. It is less expensive and more widely available than video conferencing. As long as students and teachers own (or have access to) personal, desktop, or handheld (tablet or smartphone) computers and have reliable Internet connections, they can use online conferencing software. In a 2013 poll, 83.8% of American households reported that they owned a desktop, laptop or handheld computer and 74.4% said they had high-speed Internet connections (US Department of Commerce, 2014). Unlike video conferencing, which requires the installation of expensive and proprietary computer equipment available only in designed conferencing spaces, online conferencing is widely available to anyone, located anywhere, who has installed the free online conferencing software on his or her computers and has access to the Internet.

In addition, online conferencing can combine real-time interaction with the convenience of instantly sharing files, documents or one's computer desktop. Before the introduction of online conferencing technologies, students and teachers would often use multiple synchronous and asynchronous tools to communicate. They could share documents through class websites and emails and communicate through audio and video conferencing.

**Review of the Online Conferencing Research**

Online conferencing has been used in many disciplines, including business, computing science, education, information technology, languages, nursing and mathematics (Bower, 2011; Casal, 2012; Cunningham, 2014; Ellingson & Notbohm, 2012; Hart, 2014; Ng, 2007; Reushle & Lock, 2008; Skylar, 2009). Some of the first studies regarding the use of online conferencing in education were published approximately five years after the release of early versions of online conferencing software such as Skype and Oovoo.

**Early research.** The online conferencing literature can be considered in two distinct periods or phases. In the early phase, researchers presented trial studies using online conferencing software that is now obsolete (or significantly enhanced) or they discussed the features of online conferencing they thought might be useful for educators. For example, a study published by Ng (2007) documented the use of Interwise (a now obsolete technology) in an information technology class at the Open University of Hong Kong. Ng (2007) noted that the tutors used it primarily for lecturing and he considered tutors' and students' views on it. He identified two main concerns: the limitations of a one-way, teacher-controlled communications design and the tutors' increased workload (or the additional time spent preparing for and teaching online vs. teaching in person). Tutors using Interwise had sole control of the system for sharing visual aids such as teaching notes and webpages and they also controlled the audio feature. Students could only communicate with their tutors via private text messages or through an audio link (provided they had the tutor's permission to speak).

In the conclusion of his article, Ng (2007) notes that, "An important issue in online delivery is whether it can provide an interactive learning environment for the participants" (p. 11). To account for tutors' and students' concerns about the limited opportunities for interaction within Interwise, Ng (2007) cites Anderson's (2003) concept of "equivalency of interaction". According to Anderson & Garrison (1998), there are three forms of interaction from the student's perspective: student-teacher, student-student and student-content. For those learning situations that do not have three forms of interaction present, Anderson (2003) developed an "equivalency of interaction" theorem. He explains,

> Deep and meaningful formal learning is supported as long as one of the
> three forms of interaction (student-teacher; student-student; and student-
> content) is at a high level. The other two may be offered at minimal

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levels, or even eliminated, without degrading the educational experience. (2003, p. 4.)

With this "equivalency of interaction" framework, Ng (2007) concludes that Interwise supported student-teacher and student-content interactions, but only minimally supported student-student interactions. It seems however that student-content interactions were present but that both student-teacher and student-student interactions were limited in this study.

In contrast, an article by Hashemi & Azizinezhad (2011) outlines the features of Skype and Oovoo that the authors felt would be beneficial for language learning including: a personal presentation screen, enhanced focus and multiple and parallel communication channels. In their study, the authors compare many of the features of online conferencing to in-person meetings. For instance, they say that it is possible to see and hear everyone at a meeting held via online conferencing with equally good audio quality and that it is as though "everyone is sitting on the chair next to yours" (Hashemi & Azizinezhad (2011, p. 52) This article it is an optimistic and concise summary of the advantages of online conferencing for students and teachers interested in language education.

**Current research.** There is many research topics in the second category of research including: convenience, interaction, increased faculty workload, the importance of collaborative competencies, the challenges of creating social presence and managing cognitive overload (Bower, 2011; Ellingson & Notbohm, 2012; Kear, Chetwynd, Williams & Donelan, 2012; Reuschle & Loch 2008). The online conferencing systems discussed in the second phase are more familiar and most studies are based on research projects. Researchers initiated studies of newer (or upgraded) online conferencing systems during this phase since older technologies, including Interwise, were no longer available.

A study by Ellingson & Notbohm (2012) documents how an accounting course, initially offered by distance delivery via interactive video network technology, is now being delivered through online conferencing. Ellingson & Notbohm (2012) explained that online conferencing provides a number of benefits for students including: increased motivation, course preparation, participation, collaboration, community building and convenience and some drawbacks such as: faculty investment, technological limitations and problems.

In another study, Kear et al. (2012) briefly discussed Moore's (1993) pedagogical separation of teachers and students and whether synchronous online communication like chat rooms, instant messaging tools and desktop video-conferencing systems can enhance participants' sense of social presence and belonging. In this study, Kear et al. (2012) focus on the tutor's (or teacher's) perspective in a course offered at the UK's Open University. Most of the tutors preferred to limit their use to only the audio feature of the system (rather than the video feature) and the authors note that many of the tutors' comments are related to the differences in social presence between face-to-face and online environments. The authors conclude by providing a brief summary of the strategies for teaching in a web conferencing environment and what is needed to support teachers effectively.

**A Bias in Our Understanding**

A review of the literature makes it possible to uncover biases or influences in previous studies. Michael Moore's (1993) theory of transactional distance is a central theme that is often cited (or at the core of newer theoretical frameworks) in the existing online conferencing research. Moore (1993) argues that distance education is more than just a geographical separation of students and teachers: it is a pedagogical concept. By examining teachers and learners who are separated by space and/or time, it is possible, according to Moore (1993), to identify teacher-learner relationships that "... can be ordered into a typology that is shaped around the most elementary constructs of the field – namely, the structure

of instructional programmes, the interaction between learners and teachers, and the nature and degree of self-directedness of the learner" (p. 22). Furthermore, educators may also consider "... the *effect* that this geographic distance has on teaching and learning, communication and interaction, curriculum and course design, and the organization and management of the educational programme (p. 223, Moore & Kearsley, 2005, emphasis in original).

According to Moore, the transaction (or interactions) in distance education can be understood in terms of three variables: instructional dialogue, structure and learner autonomy. Instructional dialogue describes the interactions between students and teachers. Structure refers to "...elements in the course design or the ways in which the teaching programme is structured so that it can be delivered through the various communications media" (1993, p. 26). The final variable, learner autonomy, describes learners in terms of a continuum and whether they prefer highly structured learning situations or those that are more open-ended and self-directed. Since the development of the theory of transactional distance in the early 1970s, Moore's framework has been widely cited, becoming a foundational component of distance education theory (Keegan, 1993).

With the introduction of highly interactive telecommunications media and the widespread availability of computer networks that are capable of sharing audio, graphical and video information, Moore revised his framework and added a new form of dialogue called inter-learner dialogue. Inter-learner dialogues are the conversations and interactions between learners with (and without) the presence of teachers. Online discussion boards and online conferencing software are two examples of inter-learner dialogues; both these technologies permit students to communicate with other students and their teachers.

While Moore's influence is not always explicit in research questions, a careful reader will recognize it. Studies that consider how a teacher's role has

changed with the introduction of online conferencing or the ways in which online conferencing fosters a sense of community among learners and promotes student participation are all influenced by Moore's theory and his notions of instructional dialogue and structure. Many earlier research studies focused on the physical and geographical separation of learners and how this new technology can be used to bridge the communications gap between students and teachers (Moore, 1993).

While Moore's theory is helpful for understanding some aspects of online conferencing, it does not describe the experiential dimensions of what it is like to use this technology. Moore's theory has identified the different types of interactions that occur when teachers and students are geographically separated but it does not give us insights into what it is like qualitatively to use, to experience, and to communicate through computer-mediated technologies. Understanding our daily, lived experiences of technology is important to provides insights into how our technologies are influencing and changing our communication, whether we are consciously aware of this change or not. By becoming more aware of the influence that online technology has on our communication behaviour, we can begin to consider the notion of telepresence, that is, what it is like to communicate with and experience others through computer technologies (Dreyfus, 2009).

**Methodology**

Postphenomenology, a modified, hybrid form of phenomenology is one method that we can apply to gain insights into our experience of telepresence. The goal of postphenomenology is to understand how subjects and objects co-constitute, shape and influence one another (Verbeek, 2005). Adams (2007) explains, "... the 'post' of post-phenomenology does not so much refer to a place *beyond* phenomenology, but to new questions that emerge from previously unrecognized trends and latent contents in phenomenological currents that subsequently transform the ground of the phenomenological endeavor itself" (p. 4, emphasis

in the original). Use of the term "postphenomenology" in the study is deliberate; it signifies the way humans and computer technologies are increasingly interconnected and inseparable in the present time (Jubien, 2014). Phenomenology has been used in at least two previous studies of online conferencing (Conceição, 2006; Cornelius, 2014), which focus on faculty members' experiences of online conferencing. This new study considers both students' and teachers' experiences.

**Data collection.** In this present study, van Manen's (2014) intention "... to explore directly the originary or preflective dimensions of human existence: life as we live it" (p. 39) are the means of studying our experiences of using online conferencing. Five university students and teachers participated in the study through interviews and writing exercises. The individuals shared their experiences from the perspective of begin a teacher or a student (or both) who used online conferencing for education. The number of individuals in the study was small and participants had plenty of time to speak and write (Dukes, 1984). During the interviews, the intention was to collect a series of lived experience descriptions from others, in order to that the researcher could gain more understanding of the phenomena (van Manen, 1997, p. 62).

The interviews were open-ended and began with the prompt to "recall a time when you use online conferencing to meet a teacher or student and describe it in as much detail as you can". During the meetings, most individuals talked about 1-3 memorable times when they used online conferencing and described those in-depth. Following the suggestion of van Manen (1997), study participants were cautioned to "...describe the experience as you live(d) through it. Avoid as much as possible causal explanations, generalizations, or abstract interpretations" (p. 64).

In addition to the interviews, some study participants wrote about a particular time when they used online conferencing for teaching or learning. The

decision to write was made at the end of an interview when an individual remembered another experience of using online conferencing that they had not thought of before.

**Data analysis.** Once the writing exercises and interviews were complete, the next step was to review and analyze the experiences shared by students and teachers and to uncover the meanings within them. Van Manen (2014) notes that Husserl's "...twin methods of the epoché and the reduction are the way to gain access to the meaning structures of a phenomenon." (p. 216).

The epoché or act of bracketing is a direction to put aside our own assumptions or beliefs "... that might stand in the way from opening up access to the originary or the living meaning of a phenomenon." (van Manen, 2014, p. 215). Once a researcher has temporarily suspended or "bracketed" his or her own opinions, beliefs and preconceived notions (in so far as is possible), he or she may begin the process of carefully reading and reflecting on each lived experience description. This stage is called the reduction. By examining the lived experiences closely and highlighting any words, phrases and sentences that seem to stand out, a researcher may uncover and interpret some of the possible meanings within a text. van Manen (1997) has noted that the process of interpreting the meanings within a text is a "...a process of insightful invention, discovery or disclosure – grasping and formulating a thematic understanding is not a rule-bound process but a free act of 'seeing' meaning." (p. 79).

The process of discovering the meanings in a phenomenological text is reminiscent of the way that a careful observer of a play or movie can grasp the meaning or significance of a particular scene in the story even when it is beyond his or her own personal experiences. Seeking the meaning of an experience is, according to van Manen (1997, p. 79), a part of being human.

The result of a review of the lived experiences was that it became apparent that many of the meanings (or themes) in the materials were related to van Manen's (2014) five existentials or themes. The themes are: spatiality (space), relationality (self and others), temporality (time), corporeality (body) and materiality (things). These existentials are familiar aspects of everyday life. When people are asked the question, "how was your day?" they may mention the existentials, such as the space (or place) where they were, the person or people they talked to and how fast (or slowly) the time seemed to pass by. Often, the existentials are linked together and experienced together rather than independently. By organizing the interview material into these five existentials or themes, it was possible to gain a better appreciation of some aspects of using online conferencing and to understand better how this was different from the experience of meeting face to face. This discussion focuses on three themes in particular: the senses of space, others and the body.

At this stage of the research project, sections of the interviews and written exercises were extracted and reconstructed as anecdotes or brief stories. According to van Manen (2014), "Anecdotes bring things into nearness by contributing to the vividness and presence of an experience" (p. 251). In creating the anecdotes, extraneous details from the lived experience descriptions were removed in order to focus on particular and compelling aspects of online conferencing.

## Sense of Space and Other People

In education our sense of place and our sense of others are closely connected. Consider for a moment this scene: we see a former student in an unfamiliar place, such as a grocery store and we recognize his or her face but we cannot remember his or her name. We chat with the student for a few moments and then leave the store and we try again (without success) to remember the name. While there may be many reasons for our temporary lapse of memory, it is likely that simply seeing students away from the classroom and the university buildings

where we normally interact with them is enough to make us temporarily forget their names. Our sense of others is often closely linked to our shared places (or contexts). When we see them outside familiar places, it is sometimes challenging to recall names.

When students and teachers meet together in-person for regular classes, they often experience a sense of others in the room. Along with this sense of others is a shared sense of space, which is established through a series of mundane activities familiar to most faculty and students in post-secondary settings. The process often begins when the students and teacher enter the classroom. Teachers usually go to the front of the room, turn on the computer and overhead projector and unpack their lecture notes. Meanwhile, students sit in their usual seats, say hello to their neighbours and get out their computers and books. As everyone takes his or her place, the atmosphere in the classroom begins to change. A few minutes earlier this space was an unremarkable room; gradually it is transformed to a place that is unique, distinct and meaningful to all those present. This gathering together of students and teacher creates a shared sense of space and signals to all who are present that this room is reserved for this class.

It is helpful to consider our sense of others and how this is related to our sense of space in classrooms, for it prompts us to ask: what happens to these dimensions when we meet online? Is it possible to develop a mutual sense of a virtual space and those we meet there? In this study, the students' sense of shared space was reduced and their sense of others often incomplete.

The degree to which students developed a shared sense of space and others varied depending on whether they were attending a blended course format combining online and face-to-face meetings or whether they met exclusively online. One teacher who used online conferencing to teach a fully distance

course would share slides and hear students ask questions but she could not see any faces. She recalled her first day of giving a lecture online:

> My PowerPoint is loaded and now I am just waiting to see who will show up. The first participant icons start to populate the left hand side of the screen – I'm not alone! I still feel alone as I look around my cubical and into the adjacent hallway. There is no one left on my floor. The lights are off and the sun is starting to disappear. It's time to get started. I ask the students if they can hear me and see the screen okay. A bunch of smiling face icons blink on the left hand side of the screen, otherwise nothing has changed.

In this case, the teacher seems to be in two spaces at once: in the virtual classroom with her students and on the deserted floor of a university building. She is aware of being alone and being with others at the same time. While it is possible to experience simultaneously a sense of being alone and with others while meeting in-person, the use of online technology seems to intensify this experience. A more insightful way to describe what is occurring in this situation comes from Turkle (2011) who notes how we are "alone together". Yet even Turkle's description is inadequate for this scenario. For Turkle, "alone together" means that we use computer technology to withdraw from those who are nearby to dwell in our own private, virtual worlds. In this teacher's lived experience account, we see the reverse of Turkle's "alone together" phenomenon. The teacher is not physically with the students; instead, she is all by herself on a deserted floor of a building and with her students in the online, virtual world of video conferencing.

In another interview, a student talked about how her weekly study group that normally met in-person sometimes used online conferencing. In this case, the group members knew each other from previous in-person classes but used

online conferencing to meet when members were sick or out of town. A student recalled one particular online meeting and how it began:

> We start to talk about our work but something happened and Natalie (one of the group members) goes offline. I try to bring her back in but as I flip back to my contact screen, I don't even see her. I'm not sure what is happening. Then someone else says that they will end the conversation and then invite us back in. We end the call.

On the surface, this anecdote appears to be about technical glitches and how we often have to restart computer systems when problems arise. Deeper consideration uncovers how we sometimes experience a fleeting sense of others while using online conferencing; here, the sense of others is brief and interrupted.

One way to reflect on this experience comes from Friesen (2014) who notes that during conference calls and online conferencing meetings,"...the possibility of communication with others tends towards a sharp 'all or nothing' distinction. Others are simply 'there' or they are not" (p. 21). Friesen (2014) points out that there is a sharp division between presence and absence in online conferencing that would be impossible in face-to-face situations because of the incidental interactions that occurs in elevators, hallways and stairways before meetings. These interactions begin the process of establishing a sense of others. Of course, this sense is not always constant in face-to-face situations; group members may be preoccupied with other concerns or daydreaming and not actually paying attention to surrounding people. But generally, our sense of others is more stable in-person than it is while online.

**Meeting online vs. in-person.** In the next anecdote, a teacher recounts the experience of meeting a student face-to-face whom she had known previously through online conferencing and learning management systems. This

account illustrates how closely our senses of space, and other people are connected. The teacher said:

> I was heading to the library with a colleague when I suddenly heard someone calling my name. As I turned around to see who was calling me in, I noticed a young woman heading towards me. As I desperately tried to recall this stranger's name, I whispered to my colleague, "Do you know her?" Unfortunately, my colleague did not recognize her either. I smiled and said hello to the stranger. My brain was working in fast gears wondering, where did I meet her? But my facial expression gave away my secret and the stranger said, 'Remember me? I was in your online course this spring. I am Louise from Red Deer. It is so nice to see a familiar face on campus. I knew it was you because I recognized your voice and face from our course. I feel like I know you very well.

In this situation, there is a one-sided sense of knowing the other; the student knew the teacher but the teacher did not know the student. Perhaps this one-sided knowing is because the student heard and saw the teacher more often than the teacher saw and heard the students who were taking the course. But perhaps there is also is another dimension to consider in this situation: the sense of space.

By not sharing a physical space together, it seems as though the teacher and student did not develop a strong or lasting mutual sense of one another. While the student did name a space, the online course, this is a virtual place, not a physical space. From this interview, we may conclude that the senses of body, space and the others are intertwined and that meeting in online classroom spaces is a very different experience from meeting face to face in classrooms.

**Sense of Body**

Our ability to sense others, whether in-person or online, is possible because of our body's capacity to see, hear, sense and communicate. Yet, while our bodies

are the means of experiencing and interpreting the world, they are also often hidden from our conscious attention. For many people, our everyday lived experience of body is unconscious, automatic and routine. We take our bodies for granted as we go about our daily activities and only stop to notice them briefly when we experience sudden changes, such as a cold blast of air or when we trip over something while we are walking. Since we are so often unconscious of our body, this existential is often hidden within the other existentials, thus making it difficult to identify in this study. It was also difficult to identify the lived sense of body in an earlier study that considered the multi-dimensional experience of listening to podcast lectures (Jubien, 2012).

While the lived existential of the body was present but hard to isolate in both studies, it is still worth examining because it illustrates how our sense of space, others and body are often interconnected. By returning to the first anecdote, we catch a glimpse of the online body when the teacher says: "...The first participant icons start to populate the left hand side of the screen – I'm not alone! ... A bunch of smiling face icons blink on the left hand side of the screen". Here, the icons on the screen stand in for the students' physical bodies. The teacher glances at her computer screen and "sees" her students just as she might look out over a large lecture theatre and see students' bodies sitting, facing her. While the issue of whether students are sensed as icons or physical bodies may not seem important, it can make a difference, particularly in situations where face-to-face and online students work together.

In this study, there were some students who used online conferencing to attend classes and group meetings that other students were attending in person. One distance student who regularly joined a weekly class via online conferencing recalls, "... I hear other voices but I can't see any faces. Then I see the teacher on my screen. He turns his computer around to face the class but I can only see half faces". The student is unable to see and hear everyone in the room; she can only see half faces and hear voices; she is unable to find what

Merleau-Ponty (2002) calls our "optimal grip" (or position) on the world. According to Dreyfus (2009), this optimal grip for Merleau-Ponty is "...a basic need that we can never banish as long as we have bodies" (p. 54). To take an optimal grip on a situation means that we will automatically try to take in the whole and the individual parts at once. Reflecting on this notion of "optimal grip" raises an important question: what happens to this optimal grip when we use online conferencing in education? Is it still present or does it disappear completely? From this account, we can see that the student still tried to find an optimal grip in the classroom from which she could see and hear what was going on, even though she did not have a physical presence in the room. The lived sense of body shows itself in this account by the way in which the student tried to orientate her body (via the online conferencing software) in the virtual classroom.

The way that the student had to rely on someone who was present to orientate him or herself and find an optimal grip on the classroom is also a part of a recent study by Cunningham (2014), in which on-campus students sat together with off-campus students (each represented by a separate tablet computer) at a seminar table. On-campus students were asked to turn the tablet computers to face the room so that off-campus students could hear and see a presentation and to take the tablets along with them when they moved to other areas of the room for group work. Cunningham (2014) notes that on-campus students often expected off-campus students to conform to the same social norms and behaviours as those who were physically present. The author (2014) concludes that, "it was not easy to afford online students the same right to speak as campus students" (p. 33). This study highlights the interconnection between our sense of space, body and others and how our expectations of others in the classroom remain constant, even when some students are online and without physical bodies to turn towards a presenter or to move and join a small-group discussion.

**Comparing online conferencing and video conferencing.** To learn more about the interplay between space, body and others within the context of education, it is helpful to consider briefly the use of another technology, video conferencing, and to compare it to online conferencing. Online and video conferencing are similar in many ways: they are synchronous communication systems that bring remote participants together through the use of specialized computer technology and they connect a teacher and students in one location to one (or more) students in another place or places. The type of camera, the degree to which it can be manipulated in online and video conferencing and the degree of mobility are three major differences between these types of conferencing systems. The cameras in video conferencing allow students and teachers independently to zoom in and out and scan from side to side in the room (assuming they had been given control of the camera). In contrast, most online conferencing systems use the built-in cameras of tablets and laptops or the camera in computer monitors. These cameras typically used fixed lenses. Students using online conferencing must ask someone to adjust the camera angle for them if they wish to scan the room and see everyone who is present; if the same students were to use video conferencing, they could adjust the angle and position of the camera independently to achieve a wider field of view. In online conferencing, students have to depend on others to help them find the most optimal grip on the remote classroom while in in video conferencing students may have more opportunity to find this for themselves.

The degree of mobility is another key difference between online and video conferencing. While they are travelling or away from home, students and teachers can use online conferencing systems to communicate as long as they have smartphones, tablet or laptop computers and reliable Internet connections. In comparison, video conferencing is not as flexible because it is set up in permanent classrooms to which students and teachers must travel in order to connect with others.

## Selectivity of a Technology

Besides van Manen's themes of space, body and others, it is also possible to use Ihde's (1979) amplification-reduction framework to study online conferencing. Ihde (1979) argues that our experiences are either amplified (intensified) or reduced with the use of computer technologies and notes that "... this amplification-reduction forms the peculiar 'selectivity' of the technology". (p. 57). This "selectivity" according to Ihde (1979), is the way that a technology inclines or draws us towards some possibilities while simultaneously relinquishing or ignoring others. In this study, it is noticeable how online conferencing often amplified the presence of others who were located elsewhere; a teacher had the sense of being with students while she sat alone in a university building while a distance student had the sense of joining a live class, held in another city. To use Ihde's terms, the "selectivity" of online conferencing is its ability to draw students and teachers towards virtual places while simultaneously reducing their sense of actual (or inhabited) places.

The pedagogical significance of this selectivity may not be obvious unless we also consider Ihde's (1979) assertion that this "...technologically saturated experience of contemporary life..." (p. 65) influences our self-understanding. While this existential question is beyond the scope of this study, it is interesting to reflect on the different language and terminology used by students and teachers because it hints at a changing sense of self and others.

## The Language of Online Conferencing

The words used to describe online communication in this study were often different from those we use when we meet in-person. For instance, it would sound odd if a teacher described his or her students as a group of "smiling face icons" if they were meeting in-person but that was how one teacher described the students she taught online. In another interview, a student recalled: "...I mute myself once again and the speaker resumes. As she speaks, I take notes... when she concludes, there is a pause and we unmute ourselves and wait to see who is

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the first to speak". Although the words "muting" and "unmuting" appeared in this student's account, we would find it strange if the same student used these terms to describe face-to-face interactions. Instead, we might expect the student to say: "I was about to speak when another student in the front row caught the teacher's eye and he spoke instead." Particular words and phrases such as "muting", "unmuting" and "smiling face icons" hint at something significant: the existential of the lived body and the important (and subtle ways) that we use our bodies to understand, interact and communicate with others. As Abercrombie (1968) notes, "We speak with our vocal organs, but we converse with our entire bodies..." (p. 55). Although we may not pay careful attention to our bodies, they are the means by which we make contact with the world and the people we meet.

## Influence of New Technologies

New technologies are often implemented soon after they are introduced but it takes experimentation, time and careful study to evaluate them and determine whether they meet or fall short of the anticipated advantages. Those who were in favour of integrating technologies such as email, class discussion boards and online conferencing systems in educational practice said that these tools would support active learning, encourage reflection, and foster collaboration beyond traditional classrooms (Eastmond, 1998; Hashemi & Azizinehad, 2011; Hart, 2014).

Besides studying the anticipated advantages and determining whether or not they are met, it is also helpful to understand what it is like to use, experience and communicate with online conferencing because it begins to fill the distance of space and time that separates students and teachers, a gap identified and theorized by Moore in the 1970s, and expanded upon by many others, including Anderson & Garrison (1998) and Anderson (2003). In this study, the theoretical model of student-teacher, student-student and student-content interactions (Anderson & Garrison, 1998) is momentarily brought to life in the anecdotes shared by teachers and students. We have seen how a teacher logs into her

computer and is greeted by a group of "smiling face icons" on the screen; how another student can see only half faces while she struggles to find an "optimal grip" on the classroom; and the experiences of another student who is surprised to meet her former online teacher and discovered that the teacher does not know her. By considering students' and teachers' pre-reflective, experiential accounts, it becomes clear that the orderly, two-way interactions between students, teachers and content as presented in Anderson & Garrison's (1998) diagram is actually far richer and more complex that it is portrayed.

It is also possible to think about the role of technology in education from a yet different point of view. In distance education, technology is often thought of as the means of bringing students and teachers together. In fact, the history and development of distance education are often described in technological terms, e.g. first generation - correspondence study; second generation – broadcast radio and television; third generation – open universities; fourth generation – teleconferencing; fifth generation – Internet/web (Moore & Kearsley, 2005, p. 25). While there is no doubt that technology has been the means of bringing distance students and teachers together to communicate and interact, it has also played another, less obvious role in education; one that lies beneath our conscious field of attention and often goes unnoticed.

**Conclusion**

Many teachers, learning designers and administrators might prefer using Moore's framework of instructional dialogue, structure, learner autonomy and inter-learner dialogue rather than reflect on Turkle's (2011) sense of being "alone together" or Merleau-Ponty's (2002) "optimal grip". Yet if we were limited to Moore's framework as our guide then we might conclude that what happens in our classrooms can be duplicated online, a conclusion not upheld in the present study.

Postphenomenology provides us with a means of understanding the differences between meeting together in-person and meeting via online conferencing technology. It offers an alternative to the dominant discussion of the convenience and flexibility of online conferencing and allows us to consider our experiential use of this technology. While online conferencing's ability to bring students and teachers together in cyberspace is appealing, it comes with trade-offs and some surprising consequences. This study looked at students' and teachers' experiences of online conferencing and revealed some of the unexpected ways this technology is influencing our communication and interaction patterns. When students and teachers communicate through online conferencing, they do not develop the same sense of space and others that is possible through face-to-face communications. Bodies are reduced to sounds, two-dimensional images and icons and attaining an "optimal grip" on the classroom situations is limited. If we reflect on the quote from Albert Borgmann (1992) at the beginning of this article with online conferencing tools in mind, we might ask, "When online conferencing is added to education, what holes are created by the new technology and how is the pattern (or arrangement) of educational practice torn, rewoven and changed?"

# Chapter 6: Conclusion

## Mobilizing Education

The integration of small, hand-held mobile technologies in teaching and learning and the corresponding mobilization of teachers and students are significant developments in higher education. Mobile technologies are among the top strategic educational technologies today and described as "...relatively new technologies [that] institutions will be spending the most time implementing, planning, and tracking in 2014" (Grajek, 2014, p. 1).

The prediction that the computing capabilities of desktop computers would be integrated into everyday objects is now a reality for most students and teachers (Hansmann, Merk, Nicklous & Stober, 2001). Computers are embedded within common educational objects including: smartphones, digital pens, tablets and video projection units. Students and teachers are increasingly intertwined with these "miniaturized mobilities" (Elliott & Urry, 2010, p. 5) and "...wandering in and out of the physical real" (Turkle, 2011, p. 152).

## Development of Mobile Technology

As mobile technology has become indispensable to many students and teachers, there has been a corresponding increase in the number of research articles about mobile and ubiquitous learning (Hwang & Tsai, 2011). A review of the literature highlights how the field of mobile technology has evolved. Smartphones, tablets and laptops have replaced early devices such as portable media players, personal digital assistants and cell phones. The newer technologies provide a wider range of functions and nearly universal access to the web. Students and teachers can install free and low-cost apps for time and classroom management, organization, professional development and reference, among other activities (Heick, 2012).

**Themes in the Literature**

Two distinct themes emerge when reviewing the educational technology literature: the "technology-as-tool" theme, which maintains that technology is a means of attaining an educational outcome; and the "technology-as-future" theme, which argues that technology has fundamentally changed the way students think and learn (Brown, 2002; Brooks-Young, 2010; Jukes, McCain & Crockett, 2010; Prensky, 2001; Richardson, 2009). These perspectives for conceptualizing educational technology have some strength and some limitations. By considering how technology shapes and changes our everyday practices (Dreyfus, 2009; Introna, 2007; Postman, 1993; Winner, 2009) it is possible to gain a different understanding of the use of technology in education. Postphenomenology is one approach that can be used to gain insights into our pre-reflective interactions with mobile technology and an appreciation of how it is subtly influencing, shaping and changing our educational practices.

**The Research Question**

This study was inspired by Borgmann's (1984) observation that things (including technologies) are inseparable from their contexts or worlds (p. 41) and Richardson's (2007) insight that mobile technologies are experienced as "pocket techno spaces". The two primary goals of the study were to consider the mobility of students and teachers through the use of mobile *things* in postsecondary education and to explore students' and teachers' pre-reflective experiences with mobile technology. The study's aim was to move beyond the "technology-as-tool" and "technology-as-future" discussions and to engage with understandings and vocabulary from phenomenology and actor-network theory (ANT).

**Organization of the Study**

The study is divided amongst four papers. The first paper, "Postphenomenology, smartphones, and learning: Students and teachers in higher education" describes how to combine understandings from phenomenology and actor-network theory

for a new postphenomenological method that is suitable for studying mobile teaching and learning. The second paper, "A phenomenology of the podcast" examines what it is like to experience pre-recorded or podcast lectures on a mobile device, and how this experience is different from listening to live lectures in classrooms. The third paper, "Shape shifting smartphones: Riding the waves in post-secondary education" considers the educational use of smartphones using actor-network theory in order to learn how students, teachers and smartphones are entangled in overlapping networks or assemblages and the pedagogical practices created within them. The fourth paper, "Telepresence and online conferencing" investigates what it is like to experience the classroom remotely through the use of online conferencing systems.

When the papers are considered together, it is noticeable how each begins by considering a *thing* or phenomenon (e.g. a smartphone, a podcast lecture or online conferencing software) and asking questions such as: what are students' and teachers' pre-reflective experiences of this *phenomenon*? What is this thing's role? (e.g. Is it acting as a mediator or intermediary?) How is it changing educational practice? This focus on technological things was inspired by the writing of Heidegger (1977) who proposed that we could understand technology in a multi-dimensional way if we thought about it as more than a tool. Although the study focused on *things*, it was with the understanding that *things should be considered in relation to humans, their practices and other things within their worlds*. As Ihde (1993) has noted, "Once taken into praxis one can speak not of technologies 'in themselves,' but as the active relational pair, human-technology." (p. 34).

**Comparing Phenomenology and Actor-Network Theory**

Phenomenology and ANT both recognize the importance of human-technology pairings or relationships though each method frames and describes them differently. Phenomenology focuses on people and their pre-reflective experiences of phenomena without differentiating strongly between subjects and

objects, while ANT describes humans and objects as actors, and identifies the ways these join together and the effects they produce as assemblages. Postphenomenological research begins when a technological artifact is taken into practice (e.g. listening to a pre-recorded lecture on a smartphone). Meanwhile in ANT, a researcher may begin by describing one or two interesting assemblages of humans and non-humans that are present at the beginning of a study, then trace the formation of other, unexpected assemblages that appear during the study and discuss how these actor-networks are influencing (or creating) educational practices.

The phenomenological heuristics that were most important in this study included: van Manen's (2014) five lived existentials (spatiality, temporality, embodiment, relationality and materiality), Ihde's (1979) human–technology relationship framework, and Dreyfus' (2009) notion of telepresence. Key concepts from actor-network theory such as actors, assemblages, black boxes, mediators, intermediaries and fluid objects were considered as well as some of the overlaps and similarities that exist between phenomenology and actor-network theory.

## Importance of Presence/Absence and Space

Two central themes that emerged in the study were: the importance of presence (and absence) and the influence of time and space. Both phenomenology and ANT take an interest in these themes. Heidegger (1971) wrote that, "*All distances in time and space are shrinking*" (p. 164, emphasis in original) while Fenwick & Edwards (2010) note that human and non-human entities, "... assemble together, [and] they form associations or networks that can keep expanding to extend across broad spaces, long distances and time periods" (p. 3). How to study questions about time and space and presence and absence is approached differently in these methods. Actor-network theory focuses on how objects and humans join and stabilize into actor-networks while van Manen's phenomenology of practice method considers the human experiences of a

phenomenon and whether these experiences can be reflected upon in terms of the lived existentials of space, time, body and relationship with others.

In this study, the paper that examined smartphones as shape-shifting objects described how mobile technologies have irregular patterns of presence and absence. Through a smartphone, a student can momentarily overcome the limitation of being at school and be virtually present in another place. This theme was also in the papers on podcast lectures and online conferencing; students may experience irregular patterns of others' presence (or absence) depending on whether their smartphones and computers are functioning properly and if there are other persons nearby with whom they may interact instead of (or in addition to) those who are virtually present.

Besides this shifting sense of presence/absence, there was also the theme of space. Whether a student was listening to a podcast lecture, or conducting research on her smartphone, or a teacher was communicating with students via online conferencing while in a deserted building, it seemed that the physical and virtual spaces often merged together and were experienced as one. Through the use of a postphenomenological lens, this interest in space and presence and absence, shared by both methods, was revealed and clarified. This shifting sense of space was also noted by Richardson (2007) who uses the term "pocket techno spaces" to describe how we can experience other spaces, places and people that are outside of our physical surroundings through the use of mobile technologies.

**Reflections on Using Postphenomenology**

One of the potential shortfalls of using a hybrid, postphenomenological method was the danger of producing a study that was fragmented and unfocused. A paper-based dissertation format helped to address this risk because each paper provided an opportunity to explore the topic of mobile technology from a different perspective. In the end, the result was similar to the effect of a prism, which separates light into its different colours. The "postphenomenological lens"

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used in this study had the effect of separating different aspects (or components) of mobile technology and mobile learning for closer examination.

Perhaps one of the biggest challenges of using postphenomenology is the effort required to maintain the integrity of the phenomenology and ANT methods of data collection, analysis and writing. The task of becoming skillful with one research methodology can be challenging for many researchers; becoming fluent with two or more is even more demanding. While it was my intention to blend hermeneutic phenomenology and actor-network theory in a hybrid approach called postphenomenology for the final paper, this goal proved difficult to achieve.

Tension was created by the differing orientations or world viewpoints of phenomenology and ANT. Phenomenology is a human-centred methodology that begins analysis with human experiences while ANT takes a symmetrical stance and equally views human and non-human actors. This difference in orientation became problematic during the data analysis phase. A phenomenology researcher would seek to interpret the meaning of lived experiences while an ANT researcher would focus on writing detailed descriptions of what was occurring in the human and non-human assemblages. In the end, it was more feasible to blend phenomenology with other, more closely-related understandings, such as Turkle's (2011) notion of "alone together", Merleau-Ponty's (2002) sense of "optimal grip" and Ihde's (1979) amplification-reduction framework. These concepts share more common ground with phenomenology than ANT does, making them more amenable to blend together in a hybrid approach, in a way that was more fruitful than combining phenomenology and ANT.

## Future Studies

The field of mobile technology continues to change and this uncertainty will impact future studies of mobile teaching and learning. At the beginning of this

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study, there was a clear and obvious separation among smartphones, tablet and desktop computers based on size and weight. At that time, a smartphone (Apple's iPhone 4) was 115.2mm (height) x 58.6mm (width) x 9.3 mm (depth) and 137g (weight) as compared to a tablet (Apple's first generation iPad) which was 243mm (height) x 190mm (width) x 13mm (depth) and 680g (weight). There was an obvious difference in size and weight that made it possible to define smartphones as more mobile than tablets, laptops and desktop computers. But today, the distinction between these devices is no longer as clear; many new smartphone models are larger and some tablets are much smaller. To account for this shift, the word "phablet" (a combination of the words phone and tablet) was created in order to signal the significant overlap between smartphones and tablets. Increasingly, it is now hard to say that smartphones are more portable than tablets. While smartphones grew and tablets shrank, it also became more difficult to distinguish these devices from laptop computers. Today there seems to be a convergence among smartphones, tablets and laptop computers in size, weight and ease of portability, which may make it harder for researchers to say clearly which device provides the most mobility.

Along with this convergence of devices, researchers may find it difficult to see meaningful differences between mobile and non-mobile forms of teaching and learning. This concern emerged in the research for the third paper, "Shape shifting smartphones: Riding the waves in post-secondary education" when it became obvious that students will use whatever computing device they have at hand that was functioning normally. When students encountered problems, they readily abandoned their smartphones and picked up tablets and laptops. In the students' minds, there was no distinction between mobile and non-mobile forms of learning; instead, they approached each learning task and used whatever handy computing devices would meet their needs. Some students might prefer to use their small, mobile smartphones; they would however easily switch to tablets and laptops if the smartphones failed or the other devices offered enhanced features, such as a larger screen for reading.

The terms "traditional" and "distance" that were formerly used to distinguish between learning that takes place in-person and remote learning with the aid of technology have become inadequate for distinguishing between these two different learning arrangements. The division between traditional and distance education is no longer as clear as it once was because students and teachers have ready access to mobile technologies and can choose between in-person and distance communication. As a result, terms such as online, blended and hybrid are increasingly used to describe the many current variations of in-person and distance courses (Johnson et al., 2014).

The advantage of using terms like blended and hybrid rather than traditional vs. distance (or mobile vs. non-mobile) is that these terms acknowledge how learning is occurring in a *blended or mixed format*. Although the existence of a blended format is not new (consider the high-school student who takes most of her courses in person but completes one correspondence course that is not offered locally), it seems that there are now so many different learning opportunities made possible through mobile technologies that it is difficult to make learning fit neatly into categories like traditional, distance, mobile and non-mobile.

As students and teachers continue to use all types of mobile technologies in education, it is clear that the model of meeting in classrooms altogether will exist alongside (and sometimes be replaced by) the experience of communicating and collaborating via mobile technologies. Whether the practice of meeting remotely will eventually drive out all other styles of human communication is unknown; what is clear is that there are already many education practices that are uncommon to students and teachers because of our increasingly "technologically textured" (Ihde, 1990, p. 1) lifeworld. The acts of: researching topics in libraries, writing notes, reading physical books and writing reports and papers have been replaced by researching in databases, typing on keyboards and reading computer

screens. The disappearance of these ancient, time-honoured practices may not seem worth considering unless we remember that they are all examples of how computer technologies increasingly shape, form and influence our information gathering, communication and education methods.

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## Appendices

**Appendix A: ANT Study**

Invitation to Participate in an Interview

Date:
Dear:
My name is Peggy Jubien. I am writing to ask whether you be interested in participating in an interview with me on the topic of mobile technology in education.

Currently, I am working to complete the requirement of a PhD program in the Department of Secondary Education at the University of Alberta. I would like to conduct this interview in order to complete an assignment for an independent study course that I am taking. The topic of the course is research methods in education. In particular, I am studying a research method called Actor-Network Theory, which examines how students, instructors and technological objects interact and are linked together in educational settings. The purpose of this study is to gather information that will be incorporated into a final paper entitled "Unraveling Actor-Network Theory for Mobile Educational Research". My instructors will read the paper and the paper may eventually be submitted to a journal or conference.

If you were interested in participating, our interview would explore how you use mobile technologies such as smart phones, course management systems and the Internet for educational purposes. Two sample interview questions are:

1. What types of technology do you use to participate in educational activities? (Such as accessing a course website or communicating with your instructor)
2. Could you describe an educational experience when you used this technology?

The interview would be scheduled at a time and place that is convenient for you, on or off the University of Alberta campus. The interview will take about 1 hour of your time. Once the session was over, I might ask you to clarify some of the points in our discussion via email.

Your participation in this study is entirely voluntary. If you decide to participate in this interview, your anonymity will be maintained and all identifying information will be removed. You would be free to end the interview at any time without penalty or prejudice. In addition, you may choose not to answer any question and you may decide to withdraw your participation up to 3 months after

the interview and any data collected from you would be withdrawn from my final written assignment.

A digital audio recorder may be used to record the session and I may transcribe the interview. If your material is used in my final paper, I will use a pseudonym to represent you in all work that is written about the interview. In order to maintain confidentiality, I will ensure that no one else will hear the audio recordings or see the notes or transcripts except me. I will keep your interview recordings, transcripts, and any written or typed notes in a secure place for a maximum of five years following completing of this research activity.

I do not expect there to be any harm resulting from this study. In fact, many people find the opportunity to reflect on their experiences of mobile technology to be beneficial. I will share the transcripts of the interview and any written notes that I create with you. If you are interested, I will also provide you with a copy of my final paper.

If you have any further questions about the proposed interview, please feel free to contact me at jubien@ualberta.ca or 403-217-3265, or my course instructors, Dr. Catherine Adams (caadams@ualberta.ca or 780-492-3674), and Dr. Terrie Lynn Thompson (terrie@ualberta.ca or 780-492-7625). If you prefer, you could contact me by regular mail at: 347 Education South, University of Alberta, Edmonton, Alberta, Canada T6G 2G5. You may also contact the Research Ethics Office at 780-492-2615 if you have any concerns about this project as it has no direct involvement with this project.

If you decide to participate in this study, please complete the attached consent form. Thank you for considering this request.

Yours sincerely,


Peggy Jubien

**Appendix B: Informed Consent Form**

Two copies of the form will be provided. One is for the participant to submit to the researcher and the other is for the participant to keep.

Project Title: Unraveling Actor-Network Theory for Mobile Educational Research
Course Number: EDSE 602
Study Investigator: Peggy Jubien

_____ **No**, I do not choose to participate in the interview.
_____ **Yes**, I agree to participate in the interview.

I have read and understand the invitation letter. I give my consent to be interviewed on the above topic for this research course. I understand that the interview may be recorded on a computer or on a note pad. I understand that only the investigator, Peggy Jubien and her instructors, Dr. Catherine Adams and Dr. Terrie Lynn Thompson will have access to the content of the audiotape, transcripts, notes, or written material shared by me. I understand that the information I provide will be kept anonymous by not referring to me by my name or location, but by using a pseudonym. I understand that the information I provide may be used in a written paper shared with the instructors of this class but that my name will not be used. I understand the interview recording, transcripts, note-pad, or written material will be locked in a secure place for a maximum of five years following completion of this research activity. I understand the interview notes will be shared with me to clarify themes or insights drawn from the interview.

I understand that I am free to refuse to answer specific questions, and/or to withdraw my participation at any time up until 3 months after the interview. I understand that participation in any aspects of the study is voluntary.

I understand that there will be no risks involved in this study. I may, in fact, benefit from reflecting upon my practices.

The plan for this study has been reviewed for its adherence to ethical guidelines and approved by the Research Ethics Board 1 (REB 1) at the University of Alberta. For questions regarding participant rights and ethical conduct of research, contact the REO at 780-492-2615.

Name of participant (Please print)

_____

Signature of participant

_____

Date     _____

If you have any further questions about this study or the interview, please feel free to contact me at jubien@ualberta.ca or 403-217-3265, or my course instructors, Dr. Catherine Adams (caadams@ualberta.ca or 780-492-3674), and Dr. Terrie Lynn Thompson (terrie@ualberta.ca or 780-492-7625). If you prefer, you could contact me by regular mail at: 347 Education South, University of Alberta, Edmonton, Alberta, Canada T6G 2G5.

**Appendix C: Phenomenology Study**

Invitation to Participate in an Interview

Date:
Dear:
My name is Peggy Jubien. I am a PhD student in the Department of Secondary Education at the University of Alberta. I am conducting a research study on the use of online conferencing programs in education and I am writing to ask whether you be interested in participating in an interview or short writing exercise with me.

**Background**: Currently, I am doing this study in order to learn more about what it is like for teachers and students to use online conferencing programs like Microsoft Skype, and Apple FaceTime, in post-secondary. I am interested to learn more about this experience and discover how it is different from the experience of meeting face-to-face with others in classrooms. While we know that online conferencing technologies have become indispensable tools for students and teachers, we know less about what it is like to actually *use* these tools.

In order to learn more, I am using a research method called phenomenology. Phenomenology focuses on our actual, lived experiences of a phenomenon like online conferencing software programs, rather than our theories, beliefs or opinions of them. In order to recall our lived experiences, it is often beneficial to describe them to another person or to write them down.

**Participants and procedure**: My investigation will include undergraduate and graduate students and faculty from all departments at the University of Alberta. I am seeking 10 -15 students and teachers. If you were interested in participating, our interview or short writing activity would explore how you use online conferencing. A sample interview questions I may ask is:
1. Recall a time when you used online conferencing to meet with a teacher or student,
2. Describe that time and include as many details as you can recall. For instance, who were you communicating with? Was it one person or a group of people? Approximately how long did you meet for?

The interview would be scheduled at a time and place that is convenient for you, at the University of Alberta campus. The interview will take about 1 hour of your time. Once the session was over, I might ask you to clarify some of the points in our discussion via email.

Your participation in this study is entirely voluntary and you may withdraw your consent up to 1 month after the interview is over, should you so request. You may also withdraw at anytime during the interview session and up to 1 month

afterwards. If you withdraw your consent within this time frame, I will not include your data in my dissertation or publications. If you decide to participate in this interview, I will provide you with the interview questions before our meeting and your anonymity will be maintained and all identifying information will be removed. You would be free to end the interview at any time without penalty or prejudice. In addition, you may choose not to answer any question.

A digital audio recorder may be used to record the session and I may transcribe the interview. If your material is used in my dissertation or any work that I publish, I will use a pseudonym to represent you. In order to maintain confidentiality, I will ensure that no one else will hear the audio recordings or see the notes or transcripts except me. I will keep the interview recordings, transcripts, and any written or typed notes in a secure place for a maximum of five years following completing of this research activity. After that time, it will be destroyed.

**Possible benefit to participants**: I do not expect there to be any harm resulting from this study. In fact, many people find the opportunity to reflect on their experiences of online conferencing systems to be beneficial. I will share the transcripts of the interview and any written notes that I create with you. If you are interested, I will also provide you with a copy of my final dissertation.

If you have any further questions about the proposed interview, please feel free to contact me (jubien@ualberta.ca or 403-217-3265), or my supervisor, Dr. Catherine Adams (caadams@ualberta.ca or 780-492-3674). If you prefer, you could contact me by regular mail at: 347 Education South, University of Alberta, Edmonton, Alberta, Canada T6G 2G5.

You may also contact the Research Ethics Office (REO) at 780-492-2615 if you have any concerns. Although the REO has no direct involvement with this project, it has approved this study plan to ensure that it adheres to the University's strict ethics guidelines.

If you decide to participate in this study, please complete the attached consent form. Thank you for considering this request.

Yours sincerely,


Peggy Jubien

**Appendix D: Informed Consent Form**

Two copies of the form will be provided. One is for the participant to submit to the researcher and the other is for the participant to keep.

Project Title: Understanding telepresence in online conferencing programs
Study Investigator: Peggy Jubien
Student's Supervisor: Dr. Catherine Adams

\_\_\_\_\_ **No**, I do not choose to participate in the interview.
\_\_\_\_\_ **Yes**, I agree to participate in the interview.

I have read and understand the invitation letter. I give my consent to be interviewed on the above topic for this research project. I understand that the interview may be recorded as a computer audio file or on a note pad. I understand that only the investigator, Peggy Jubien will have access to the content of the recording, transcripts, notes, or written material shared by me. I understand that the information I provide will be kept anonymous by not referring to me by my name or location, but by using a pseudonym. I understand that the information I provide may be used in a written paper shared with the student's supervisor but that my name will not be used. I understand the interview recording, transcripts, note-pad, or written material will be locked in a secure place for a maximum of five years following completion of this research activity. I understand the interview notes will be shared with me to clarify themes or insights drawn from the interview.

I understand that I am free to refuse to answer specific questions, and/or to withdraw my participation at any time up until 1 month after the interview is over. I understand that participation in any aspects of the study is voluntary.

I understand that there will be no risks involved in this study. I may, in fact, benefit from reflecting upon my use of online conferencing software for learning.

The plan for this study has been reviewed for its adherence to ethical guidelines and approved by the Research Ethics Board 1 (REB 1) at the University of Alberta. For questions regarding participant rights and ethical conduct of research, contact the REO at 780-492-2615.

Name of participant (Please print)

_____
Signature of participant

_____
Date _____
If you have any further questions about this study or the interview, please feel free to contact me at jubien@ualberta.ca or 403-217-3265, or my supervisor, Dr.

Catherine Adams (caadams@ualberta.ca or 780-492-3674. If you prefer, you could contact me by regular mail at: 347 Education South, University of Alberta, Edmonton, Alberta, Canada T6G 2G5.