

# The Normalization of Mobile Devices in Clinical Nursing Education and in Clinical Practice

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**Abstract— Significant knowledge gaps exist in how students and clinicians recognize the meaning or coherence of using mobile technology in practice, and how they have used this technology to develop communities or learners. In investigating these gaps, our research has looked at various elements including what social or organizational factors influence the normalization of the practice of using mobile technology in clinical education, and as students' transition to licensed clinician. This descriptive research currently in progress uses qualitative and quantitative methods over a six year period (three within nursing education, three as licensed clinicians) to ascertain the confidence of our participants in information and communication technology, usage information, and their views on factors which promote or inhibit successful normalization of mobile technology at the point of care. Preliminary data based on Normalization Process Theory and the Unified Theory of Acceptance and Use of Technology model indicates that mobile technology is being normalized in our students' social realm but hindered in the clinical realm by health care policy and lack of understanding of the affordances available through the technology.**

**Keywords-** *mlearn, UTAUT, nursing education, point of care technology*

## I. INTRODUCTION

Mobile technology and hand-held communication devices are now a significant part of life for many professionals. They afford both unprecedented communication opportunities (individual, group and mass) anywhere, anytime as creative new services are offered from amateur creators to gigantic corporations. Research about the influence and contribution of mobile communication devices to professional life is still emerging. There is a change to Canadian culture that has presented itself well ahead of our understanding. This is particularly so in relation to the impact mobile devices may have on those who are engaged in formal learning.

Using mobile phones and nursing resource software from an infrastructure grant is allowing us to compare the normalization of mobile enhanced clinical practice across two nursing education practitioner groups: students in a baccalaureate of nursing program, and nurse practitioner students. Specifically, we are examining "How and why things become, or don't become, routine and normal components of everyday work" [1] and to explore of mobile community of inquiry development [2]. Preliminary data indicates that mobile technology is being normalized in our students' social realm but hindered in the clinical realm by health care policy and lack of understanding of the affordances available through this technology. As well, professional and moral issues are surfacing in our preliminary data analysis of the interviews.

Previous research points to the added value of mobile technology in nursing practice education, but demonstrates the need to introduce the technology early in the program and for a sustained period. [2]

Our program of research continues to build on our previous research and proposes to break new ground in terms of: a) longitudinal studies of participants using mobile learning technologies b) the diverse comparison groups involved, and c) the multi-disciplinary nature of the research team.

This paper will describe our research activities and will lead to a new understanding of the role of m-learning in education. In addition, we will introduce an innovative test of existing theory in distance teaching and learning, the Community of Inquiry model, in a context (mobile learning) different than that for which the theory was initially conceived.

## II. RESEARCH TO DATE

Our program of research is currently entering its second phase. In **phase one**, we have used mobile phones and nursing resource software from an infrastructure grant, which

has allowed us to compare the normalization of mobile enhanced clinical practice across two nursing education practitioner groups, i.e., “How and why things become, or don’t become, routine and normal components of everyday work” [1], and to explore of mobile community of inquiry development [2].

There is a plentiful body of knowledge on the perceptions about and ways to use mobile devices in health practice, but there is a dearth of information about the added value if any of using mobile devices in health care education or practice. This study will allow us to “normalize” the use of mobile devices in clinical education through the early receipt of devices and software and the use and encouragement of use over several semesters of clinical use. We expect that students who have used the technology through their entire program will demonstrate that they have “normalized” the technology into their clinical practice leading the way for follow up studies in the working world in the future.

Preliminary data from phase one indicates that mobile technology is being normalized in our students’ social realm but hindered in the clinical realm by health care policy and lack of understanding of the affordances available through the technology. As well, professional and moral issues are surfacing in our interviews.

The **second phase** of the study will allow us examine any changes in use of the technology in the transition from the education setting to the work setting. The graduates/participants are either registered nurses or nurse practitioners in a variety of work environments across the country. Social and policy implications will emerge in the data.

Researchers will benefit from the knowledge of how mobile technology is utilized and normalized in practice; this in turn will potentially positively impact their ability to prepare students for practice. We expect that students who have used the technology through their entire academic program will continue to demonstrate that they are normalizing the technology as they transition into their clinical practice.

The purpose of this research project is to extend the normalization of mobile technology in nursing clinical education to the workplace, after the participants of our concluding project.

### III. IMPORTANCE OF RESEARCH

Our program of research builds on our previous research and proposes to break new ground in terms of: a) how long participants using mobile learning technologies will be studied, b) the diverse comparison groups proposed, and c) the multi-disciplinary nature of our research team.

Our research activities will lead to a new understanding of the role of m-learning in education. In addition, these proposed research activities introduce an innovative test of existing theory in distance teaching and learning, the Community of Inquiry model, in a context (mobile learning) different than that for which the theory was initially conceived. Funders continue to invest money into the development of technology, but take for granted the adoption and normalization of this technology in teaching and

learning. This is a missing piece in the use of such technology.

### IV. CONTEXT

Personal Digital Assistants (PDAs), laptop computers, and MP3 players is now irrefutable [3, 4]. Current mobile technologies - especially third generation (3G) wireless devices such as the Apple iPhone and Google Android cell phone - provide an unprecedented opportunity for inexpensive and beneficial computing power for learners [4, 5]. A recent online poll revealed that seventy per cent of wirelessly connected Canadians are accessing the mobile Internet for personal e-mail and more than one quarter are browsing the web from their mobiles at least once a day. Half of those are accessing popular social networking sites like Facebook and Twitter directly from their mobile devices.

Educational institutions must meet the ever-changing needs of the current and new generations of learners by delivering relevant education anytime, anywhere that also exposes learners to current technologies [6]. It is pertinent to ask why this mobility should not be tapped into to support learning. Keegan [4] has declared that the future of distance education is wireless and claims that the challenge for distance educators is to now develop pedagogical environments for mobile devices.

To answer that challenge, one must first ask what m-learning allows educators to do differently than other forms of teaching and learning. In 2005, Keegan defined m-learning simply as the provision of education and training on PDAs / palmtops / handhelds, smart phones and mobile phones. However, others now see m-learning as more, as the use of information and communication technologies to facilitate learner’s mobility in different contexts. Kukulska-Hulme and Traxler [7], for instance, view the most significant attributes of mobile technologies as their ability to support learning that is more situated, experiential and contextualized within specific domains and to support the creation and use of more up-to-date and authentic content. Access to up-to-date information aligns mobile learning with a long standing distance education commitment to improving access to learning opportunities. In addition, mobile learning supports the more recent commitment to interactive, collaborative constructivist learning that distance online education offers [9]. Models of online distance and distributed education offer insight into the potential benefit of mobile devices for learners. The scope and format of mobile learning as well as the technologies and devices utilized in the process are, indeed, context contingent and depend largely on the needs of learners, the unique setting and the available infrastructure [6].

Presently, we are witnessing the advent of the mobile and wireless technology era influencing contemporary businesses and organizations [8]. Mobile technologies have been used broadly across sectors to provide goods and services to consumers and have revolutionized how organizations and individuals go about their daily activities [6]. Mobile devices are significantly changing human-computer interaction, communication, and learning activities. Ubiquitous access to

remote resources is one of the most interesting characteristics achievable by using mobile or handheld devices [10].

Mobile technologies do not offer just another way of doing what is already done, but open up new possibilities in terms of learning and teaching. The m-learning literature focuses on changes in the learning environment, characterized by the pervasiveness and ubiquity of the technology, and on the changing characteristics of higher education students in relation to their use of mobile devices for learning [11]. Few studies have explored the potential of existing infrastructures of personal mobile devices, particularly in settings such as placements where access to a computer may be difficult [12].

Mobile learning takes place when a student uses portable devices, such as smartphones, netbooks or tablets, or handheld gaming devices, to access learning materials and systems, create content and interact with other students, teachers, learning systems and the world around them [13]. Mobile Learning (m-learning) refers to the use of emerging technologies to enhance students' learning experiences. The m-learning literature continues to debate the pervasiveness and ubiquity of mobile devices and their potential use for learning [6, 11, 12, 13, 14].

There is a need to re-conceptualize learning for the mobile age, to recognize the essential role of mobility and communication in the process of learning, and also to indicate the importance of context in establishing meaning, and the transformative effect of digital networks in supporting virtual communities that transcend barriers of age and culture [15]. The scope and format of mobile learning as well as the technologies and devices utilized in the process are, indeed, context contingent and depend largely on the needs of learners, the unique setting and the available infrastructure [7]. Learning activities include complex cognitive and social processes that are necessarily to interact with the world around it. M-Learning systems provide opportunities for learners to communicate with the real world and to search interdisciplinary domains [11]. Higher education establishments will need to shift resources and skills in order to fully exploit the potential benefits of mobile technology for learning [12].

Previous research from our university [16, 17] points to the added value of mobile technology in nursing practice education, and demonstrates the need to introduce the technology early in the program, for a sustained period of time. More recently, our research team is concluding a three year research project which has permitted us to engage student nurses (Licensed Practical Nursing-Bachelor of Nursing and Nurse Practitioner) and faculty during the clinical practice education at the undergraduate and graduate level.

“Whilst universities have attempted to integrate information and communication technology into nursing curricula it is not known whether the skills developed for educational purposes are relevant or transferable to clinical contexts” [18]. It is prudent therefore to ascertain the confidence of our graduates in select areas of Information and Communication Technology (ICT) skills.

## V. NORMALIZATION PROCESS THEORY AND UNIFIED THEORY OF ACCEPTANCE AND USE OF TECHNOLOGY

Our past research identified two major issues that impede the “uptake” or normalization of mobile technology in practice. Those are, the short time frame of the studies and the lack of ownership or lack of “bonding” with the technology. This led us to consider Carl May's [1] Normalization Process Theory (NPT) which describes “the dynamic process of implementation, embedding and integration that run(s) through new ways of thinking, acting and organizing” (p.536). While May identifies the sociological tools that frame the stages of Coherence, Cognitive Participation, Collective Action and Reflective Monitoring, the theory has not been tested in relation to normalizing mobile technology in education.

The NPT model briefly defines these terms as follows: coherence as the meaningful qualities of a practice; b) cognitive participation as the enrollment and engagement of individuals and groups; c) collective action as interaction with already existing practices and; d) reflective monitoring as how a practice is understood and assessed by actors implicated in it [1].

There has also been ongoing research in Information Systems for four decades on how and why people adopt information technology [19]. A recent cumulative model, Unified Theory of Acceptance and Use of Technology (UTAUT) has been used by several research teams to estimate the variance of performance expectancy, effort expectancy, social influence, behavioral intention and facilitating conditions in the prediction of actual use of technology. We believe that the repeated use of the UTAUT scale over time, will measure the movement of nursing students and faculty along the process continuum of normalizing mobile technology into their clinical learning and practice, and again as they transition into novice practice.

## VI. DISCUSSION AND FUTURE WORK

The study of the development of mobile communities of inquiry could also prove to be a useful tool as educators consider the effectiveness and quality of emerging education technologies [20]. Our belief that mobile technology will enhance student-faculty, student-student and student-expert communication leads to the concept of mobile, virtual communities or networks of learners and potentially of practicing nurses. This in turn leads us to also consider the application of the Community of Inquiry (CoI) model [20] to m-learning in this context.

The CoI model assumes that learning occurs within the community through the interaction of three core elements: cognitive presence, social presence, and teaching presence. Since the educational experience is a social transaction, special consideration must be given to the social interactions and climate. Teaching presence is defined as the design, facilitation and direction of cognitive and social processes for the purpose of realizing personally meaningful and educationally worthwhile learning outcomes [21]. Three elements, design and organization, facilitating discourse and

direct instruction, make up the central activities of teaching presence.

We are interested in determining in particular how improved communication might help to build and maintain learning community by increasing learners' cognitive presence and teaching presence. As such, we are looking for the direction and structure of the relationship between an online Community of Inquiry and the realities of accessing this community through mobile devices. Can mobile devices be used to generate and/or sustain community?

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