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<http://dx.doi.org/10.3916/C37-2011-02-04>

# Apprenticeship Students Learning On-line: Opportunities and Challenges for Polytechnic Institutions

El aprendizaje on-line: oportunidades y retos en instituciones politécnicas

## ABSTRACT

This paper presents the ongoing research on the challenges and opportunities of delivering on-line and virtual content to apprentices in a Polytechnic institution. Due to the current financial recession, apprentices are going back to academia in order to update their skills, but these potential students are not willing to leave their workplace or their personal lives behind to study. In this context on-line delivery represents an opportunity to provide access to content without leaving the work environment. However, in order to be successful in providing on-line materials for apprentices, polytechnics around the world are facing two challenges: How to transform hands-on Learning skills to on-line Learning material, and how to provide a rich-engaging environment for this group of learners. But not only the learner expectations should be taken when designing on-line learning. Instructors play also a crucial role in this endeavor, as Web 2.0 technologies offer the instructor an entirely new role in teaching: that of a facilitator. In order to analyze apprenticeship students' on-line learning, 57 on-line surveys were distributed among a group of students registered for on-line apprenticeship programs. The paper presents research findings and a comparison of these with a what the literature states regarding the new generation of learners and their use of technologies, and the behavior (learning preferences, learning styles, use of IT) presented by the research sample. Innovative opportunities for learning at the workplace (such as recommendations and future areas of research) are suggested.

## RESUMEN

Este artículo presenta los retos y las oportunidades actuales respecto a la distribución de contenidos virtuales y on-line en el marco de la institución de educación superior politécnica. Debido a la recesión económica actual, se está produciendo un retorno de estudiantes aprendices al mundo académico con el fin de actualizar habilidades y conocimientos. Sin embargo, a menudo los estudiantes con este perfil no están dispuestos a dejar de lado el trabajo o su vida personal para volver al estudio. En este contexto, el aprendizaje on-line representa una magnífica oportunidad para acceder a contenidos académicos sin tener que dejar de lado el trabajo. No obstante, para garantizar el éxito en la provisión de materiales on-line para estudiantes aprendices, las instituciones politécnicas de todo el mundo deben enfrentar dos retos: la transformación de contenidos de aprendizaje práctico en objetos educativos en línea, y la creación de ambientes educativos en los que los estudiantes se sientan involucrados y participativos. Más aún, en un ambiente de aprendizaje en el que el uso de tecnologías Web 2.0 es primordial, es importante considerar también el nuevo rol del profesor, que se ha convertido en facilitador del aprendizaje. Con el fin de analizar la experiencia educativa on-line de estos estudiantes, se distribuyeron 57 encuestas entre los estudiantes registrados en programas de formación on-line. El artículo presenta las conclusiones de la investigación y las compara con las aportaciones que se han hecho en lo relativo a la nueva generación de estudiantes y su uso de las tecnologías, así como el comportamiento registrado por la muestra de la investigación (preferencias y estilos de aprendizaje, su uso de las nuevas tecnologías). Se plantean igualmente oportunidades innovadoras para conectar aprendizaje y contexto laboral y recomendaciones para futuras investigaciones.

## KEYWORDS / PALABRAS CLAVE

Digital natives, Net Gen, on-line learning, student-centered environments, Web 2.0, hands-on learning. Nativos digitales, generación net, aprendizaje on-line, aprendizaje significativo, tecnologías Web 2.0, interactividad.

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## 1. Introduction

Educators around the world are uncertain if their educational institutions are ready to respond to student needs and expectations as they see 21<sup>st</sup> century students arriving to colleges and universities. The reason for this uncertainty is clear: these students are carrying with them an entirely different approach to learning, entertainment and life in general. The majority of students in today's classrooms are the first generation to grow up with such a vast array of information technologies. They have spent their entire lives surrounded by and using computers, video games, digital music players, video cameras, cell phones, and all the other toys and tools of the digital age. As such, they are known as the Net Generation, or Net Gen-ers.

In parallel to this challenge and due to the current working environment, apprentices are going back to colleges and universities in order to update their skills. But these potential students are not willing to leave their workplace or their personal lives behind. In this context online delivery represents an opportunity to connect content to the workplace context. However, in order to be successful, this connection should be done in the context of an engaging environment, where learners can interact with other learners in a rich virtual environment.

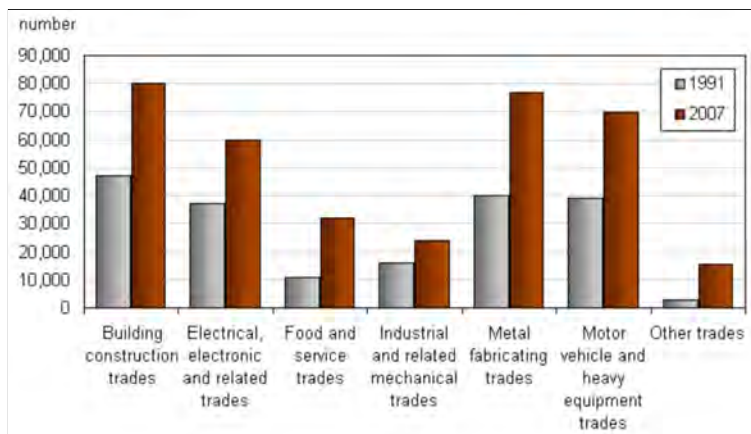


Table I. Registered apprenticeship registrations, by major trade group, 1991 and 2007  
(Source: Statistics Canada, 2010).

Table I presents a comparison of the growing number of Apprentices in Canada going back to continue their training. This, together with the fact that apprentices are now expecting content to be mobile, has encouraged higher education (postsecondary) institutions in the country, to provide different ways of accessing content.

This article is about the learning needs and

opportunities that students apprentices from the Net Generation are bringing with them when they go back to higher education. Possibilities that online learning and virtual environments offer to transform teaching and learning are presented and a case study, the online apprentices project, is analyzed in detail.

## 2. Digital Natives: The New Student Generation in the 21<sup>st</sup> Century

According to some authors in North America, average college graduates have spent today less than 5,000 hours of their lives reading, but over 10,000 hours playing video games. Computer games, e-mail, the Internet, cell phones and instant messaging are integral parts of their lives (Gibson et al, 2008; Prensky 2001; Wesch, 2007). As a result of this ubiquitous technology, a number of social scientists sustain that today's students think and process information differently than their predecessors. Even more so, their entire system of beliefs and values are different from those in previous generations, and these differences usually go further and deeper than most educators recognize. This is why Marc Prensky has named today's students «digital natives». Digital natives are those who have always known the Internet and a digital environment. Others have called this new generation of students the Net Gen, where Net refers to either networking or Internet use. Whether Digital natives or Net Gen-ers, this generation was born at a time when computers were an important part of the dynamics of a home, and where the Internet had become an integral part of daily activities.

Some argue that even if the digital natives have slight differences in speech and social interactions, they are fluent in digital communication forms that are prevalent in the new land (Jukes & Dosaj, 2004; Toledo, 2007). Oblinger (2005) characterizes

the «millennials» (as she calls the generation of students born after 1982) this way: «They gravitate toward group activity and social networking; they identify with their parents' values and feel close to their parents; they spend more time doing homework and housework and less time watching TV, they believe «it's cool to be smart», they are fascinated by new technologies; they are racially and ethnically diverse...» (2005: 2).

Academic colleagues from different countries have begun to consider whether students around the world have similar experiences to those in North America. For example, Oliver and Goerke (2007) researched undergraduate students in Australia to find out whether their students confirm these assertions. They found that «ownership of laptops, mobile phones and music devices appears to be growing rapidly among this group, along with their use of tools such as instant messaging, blogs and podcasts» (Oliver & Goerke, 2007). Another example of this is the work done by Creanor et al. (2006) and published as the Lex (Learner Experience of E-learning) Report. A total of twenty-two interviews and six focus groups were conducted that evaluated students' experiences with e-learning in the UK. Findings of the report include the fact that learners involved in the research tended to be highly skilled networkers and often use technology to pull support when needed.

The changes that today's students bring with them – with some of these changes evident even in their brain structures, according to Tapscoff (2008) when they start their post-secondary education creates an urgent call to understanding the different ways they learn. In turn, this fact calls for a change in the way institutions provide educational opportunities to them. It is time not only to radically change the way teaching takes place, but also to redesign curriculum, graduation processes, evaluation methods, infrastructure needs, etc.

### 3. Web 2.0 technologies and the changing role of the instructor

Web 2.0 technologies are the foundation of the new pedagogical model, where the instructor has become a facilitator of knowledge and is no longer the «knowledge holder» (Anderson, 2007; Evans and Nation, 2000; Deal, 2007; Daniels, 1998; Mason, 1998). Laurillard (2002) analyzes the transformation of the instructor from a knowledge source to a facilitator, as he/she provides a conversational framework for the evolution of learning. In order to enable the evaluation of the effectiveness of learning, Laurillard identifies the key elements of the process: discussion, interaction, adaptation, and reflection (on the student's performance by instructor and student). Laurillard believes that this framework can be applied to the evaluation of technologies in learning. In fact, one of the main goals for the use of technologies for teaching and learning should be to provide student-centered situations where instructors facilitate access to content in a horizontal, sharing environment.

Sfard (1998) examined the changing role of the instructor from a knowledge holder into a facilitator through the use of information technologies. He identifies two teaching and learning models: the «acquisition model» and the «participation model». In the acquisition model, the role of the instructor is to deliver, suggest, and clarify knowledge and concepts. With the acquisition model, the focus of learning goals is on acquiring pre-specified knowledge and on developing understanding of predetermined concepts.

In the participation model, he/she is a facilitator, mentor, expert participant, and guardian of practice/discourse. With the participation model, the focus of learning activities is on becoming a member of a community of practice, learning from the community but also contributing to it.

The collaboration (transformation) framework emphasises individual thinking and construction of meaning. Teaching with this approach is more tentative, flexible and experimental – hence it is student-centred. In this context, a community of learners will improve learning through their interaction (Burkle, 2003; Perry, 2003).

Collis and Moonen (2001) and Sloman (2001) conclude their comparison of the two models by stating that a pedagogical theory means little if instructors do not apply it, and also that technological resources have no value if they are not used. In fact, the authors stress the fact that the number of instructors who choose to be innovators in technology and pedagogy is limited.

Sloman (2001) maintains that the acquisition model could be associated with behaviourist theory, while the participation model is related to a constructivist approach. This assumption is based on the fact that in the transmission model, a teacher (lecturer or instructor) can pass on a fixed body of information and the «student or learner interacts with a pre-packed content» (Sloman, 2001: 114), while the transformation framework implies individual thinking and constructing of meaning.

Holley & Haynes (2003: 4) suggest that «such changes are most visible in the ongoing erosion of individual or small group teaching, and in the attempts to change the nature of contact time away from delivery of information towards more active participation». The development and implementation of widely accessible communication and information technologies has been a key driving force in the move towards the adoption of social constructivism as a guiding principle in Higher Education Institutions HEIs (Laurillard, 2002). In other words, this change has resulted

in a change in the role of the instructor from the «sage of the stage», where transmissive, didactic learning took place, to the «guide on the side», where more student-centred learning takes place<sup>1</sup> (Harasim, 1990).

#### 4. Web 2.0 technologies and learning at the Southern Alberta Institute of Technology (SAIT Polytechnic)

SAIT Polytechnic is a public two-year institution in Alberta with approximately 52, 000 learners distribu-

SAIT had a number of courses in the laptop program, or were using another learning technology such as the video iPods, YouTube videos, or Second Life virtual spaces to deliver courses and lab procedures. There are more than 90 fully wired classrooms at SAIT, and the number of computer ports on campus rose from 2,000 in 1997 to more than 15,000 in 2008.

In order to provide the leadership which resulted in SAIT's achievement of international recognition in the use of technologies for teaching and learning, and with the financial support of CISCO Systems, in 2004 SAIT opened the position of a research Chair (CISCO Chair in e-learning) and appointed Dr. Tony Bates to the position. Dr. Bates immediately reviewed e-learning strategies across campus and developed a strategic plan. At the end of the year, Dr. Bates produced the «SAIT Strategic e-Learning Plan», which proposed 82 recommendations to support student engagement with the use of e-learning technologies (Bates, 2007)<sup>2</sup>.

#### 5. Research Project

In February 2010, and with the support of AIT (Apprenticeship Industry Training), SAIT decided to explore the possibilities of using mobile technologies/online learning for apprenticeship students willing to combine work and learning.

This decision was based on the following institution's needs and expectations:

- Facilitate a flexible environment where registered students could learn at their own pace.
- Facilitate the combination of workplace and learning in an engaging environment.
- Facilitate collaborative learning among students, by promoting critical thinking in a challenging and unique environment.
- Reduce classroom time for students apprentices.

A team consisting of the academic coordinators for the Electrician and Welding programs, a project manager, an instructional designer, a multimedia expert, subject matter experts (faculty) and the CISCO Chair of e-learning was put together to design a wor-

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ted in full-time programs, apprenticeship programs, continuing education, and corporate training. Its annual budget is in the order of C\$200 million (Bates, 2007).

SAIT introduced the use of technologies for education in 1997 when it started delivering courses through the so-called «laptop program». Since then, laptop programs have been running in four of the seven Academic Schools (Business, Information and Communication Technology, Construction and Transportation). The laptop program strategy was part of the institution's vision to innovate the way teaching and learning processes took place and introduce a blended approach to learning.

By 2009, most of the seven academic schools at

king plan, redesigned the classroom taught courses and define the teaching plan.

With a plan in place, research questions and methodologies were designed for a «Pilot Research Project», between September 2010 and January 2011, with these research goals:

- To analyze student expectations of learning online
- To explore the impact of mobile content on students' learning
- To learn about online course efficiency and course engaging capacity.

The online course will combine access to learning materials through an LMS (Learning Management System), with workshop (lab) hours so that students will go the lab to test what they learned in theory.

The research population for the Pilot stage of the research project included all students registered in the Electric (17 in total) and in Welding (7 in total) Programs. Research tool and findings are analyzed below.

After the course was over, it was important to know the impact of the online materials and mobile content on students' learning. Research tools were designed in order to obtain information from instructors and students participating in the experience.

### 5.1. Research Methodology

Three research tools were used in this project: a survey, a focus group and an interview. This last one included students and instructors.

The first research tool to be designed and applied was the survey. In order to include the main issues regarding students' opinions about learning online several surveys were compared, such as the «Student instructional Report –SIR– designed by ETS. The survey was anonymous, and had a total of 23 questions (likert scale most of them). For the efficiency of the survey distribution and online resource was used: SurveyMonkey.

A total of 23 online surveys were distributed and answered by students between November and December 2010. The survey had five different sections. Section one intended to obtain information on students' demographics and their previous experience with online learning. Section two was oriented to gather students' opinions with regard to learning goals and course usability. In section three students were asked about the online learning experience and their learning management processes. Section four gathered information on instructor-student and student-student interaction by using e-mail or the online discussion

forums available in the course. At the end of the survey, students had an opportunity to write their personal comments in an open space.

Surveys were followed up by a focus group with students. Participation in the focus group was on a volunteer basis. Information gather from this focus group was compared with the one obtained from the survey.

Finally, a series of interviews with instructors took place at the end of the course. For these, a question guide was followed and the researcher tried to facilitate an open and free space for instructors to share their experiences teaching online.

### 5.2. Research findings

For the purpose of organizing the research findings, these have been classified under each of the survey sections. Below is an analysis of these.

#### 5.2.1. Students' experience with online learning

The first questions in the survey were related to students' previous experiences with and previous information about online environments for learning. Even if a good number of them (41.4%) had experience using the Internet, only one of the students in the Electrician cohort and one in the Welding group had taken an online before this one.

Qualitative analysis of students' interviews showed that even if students were not familiar with the use of computers for learning, they were extremely enthusiastic about accessing course materials online. In their own words: «Having access to the course materials anytime, anywhere, I was able to learn at my own pace, without needing to wait to receive coaching from my instructor».

Another interesting finding from this research is that motivation was an important issue for students using the LMS (learning management system) to access course content. Motivation helped engage them in self-learning. Student participants in this research believed that their instructors encouraged their learning everywhere, breaking the limits of the classroom. These findings are similar to research carried out in the United Kingdom and published by BECTA (British Educational Communications and Technology Agency) in 2007, where students' motivation was a determinant factor for the successful use of Web 2.0 technologies.

#### 5.2.2. Learning goals and course use capacity

The purpose of the next section in the survey was to provide feedback to the course development team

(Instructors, IDs, Editors, Multimedia, etc.) regarding the course's goals and use capacity. Using a likert scale, students were asked four closed-ended questions and one open-ended question, where they were able to provide further comments.

Responses show that students felt the course goals were clearly stated in the LMS. 28% stated the goal was very clear, while for 43% was clear and for 29% was moderately clear. In the framework of using an online tool to learn, stating the course goals is very important. Responses should give some feedback to developers to improved clarity in the future.

Regarding the course navigation, there was an even distribution between students who found the course very easy to navigate (29% of them), easy (29%) and moderately easy (29%). Only one student found the course «somewhat easy».

An important question was targeted to receive feedback on students' opinion regarding the function of links to websites, videos, PDF documents, etc. Only one student answered that all the links worked «perfectly», while another one stated they worked fine. 5 students said links worked «fine most of the time». One student commented that the quizzes did not work well all of the time, and another one stated he needed more info that was not available in the LMS. All of these comments should be taken in consideration when developing the next online course.

Students' opinions on this matter should be taken into consideration in future course development for apprentices. Issues of clarity of course goals should be reviewed by the instructor and the instructional designer before the course goes online.

### 5.2.3. Students' management of learning process

The next section in the survey was oriented to obtain information regarding students' experience as online learners, and their time management strategies. Using a likert scale students were asked six questions to evaluate these items.

The first question asked students how difficult the course was for them. None of them stated the course was very difficult, while six indicated it was somewhat difficult. Five students considered the level of difficulty as about right, and one of them stated that the course was somewhat elementary.

Regarding students' time management and workloads, half of the surveyed students stated the online capability of the course helped them to manage their time more effectively «most of the time». Five of them managed effectively their time sometimes. One of them said he managed effectively his time always.



Student at SAIT Welding Program during a Welding shop procedure.

A qualitative follow up of this question took place when interviewing the students. Two of them agreed that learning online is not for every student but for those who know how to manage their time properly, and are able to efficiently combine work and study.

For another student being able to access the course content online enable him to finish the course faster than planned in the academic calendar. In his own words». «I was able to complete my coursework in one month instead of three. This was fantastic!».

In regards the online course workloads, only two students stated that the online course was heavier compared with the classroom workloads. The majority of the research population (42%) indicated that the course was lighter, and 17% felt the course-work was heavier than the previous classroom courses.

In the current financial challenging times, a very important issue for the survey was to analyze if students were able to combine work with study. 42% said they were able to do both activities all the time, while 25% stated they combined work and study most of the time. The other 25% said they combined both activities only «some of the time», while one of them did not combine working and learning.

The last two questions of this section gathered students' information regarding their online experience and their willingness to take another course online. Responses in the likert scale tended to be in the middle



as the majority of the students stated learning online was a good experience «most of the time» (58 %) or «some of the time» (25%). Two students found the experience a positive «none of the time». A qualitative follow up on this issue showed that the time students spent in the workshop (or lab) was very valuable for them. They were grateful with the fact that the instructor was always available to answer questions in the lab (in a face-to-face environment), and that they could practice immediately what they have learned in the online materials. Below is a photo of a student in the Welding program interacting with his instructor while he learns how to do metal cutting.

#### 5.2.4. Instructor-student interactions

An important factor to analyze in this research was the impact online learning had on instructor-student interaction both inside and outside the lab. According to Collis and Moonen (2001), in order to use technologies for teaching and learning, universities have to transform themselves in a number of areas, including the interaction between students and instructors and the ways in which students' access knowledge.

For 57% of the students in the research, the online course provided them with a variety of opportunities to interact with the instructor. The majority of the students (86%) found that directions for contacting the instructor were always or most of the time clear and specific.

During the interview students were asked about the interaction they had with the online instructor and all of them agreed that having previous knowledge of the workshop (lab) procedures allow them to reduce the questions to the instructors inside the lab so that instructors could focus more on those students who will have more difficulty with learning the procedure. As one student expressed it: «Online materials allowed us to answer our own questions and therefore reduce the demands on the instructor».

These findings concur with what is stated in the literature with regard to what information technologies in general can do to facilitate interaction with instructors (Hiltz, 1990; Moller, 1998; Holley & Haynes, 2003). For example, Moller (1998) remarks that when using technologies to interact with their instructors, students feel they are more involved and that they have learned more.

Instructors played a crucial role to support the interaction with students learning online. When interviewed, they stated that they motivate the students to be critical and analytical with what they were learning online. Motivation has been noted in the literature

with relation to the fact that technologies per se do not change settings, interaction, access to knowledge, etc. The use of technologies to facilitate instructor-student interaction depends on the instructors' input and attitude towards the students, as well as the students' disposition and skill in using the technologies. As Holley and Haynes (2003) have noted, students who actively contact their instructors and participate in collaborative activities tend to be more motivated and are actually more familiar with mobile technologies. If these students encounter a problem, they approach the instructor to solve it.

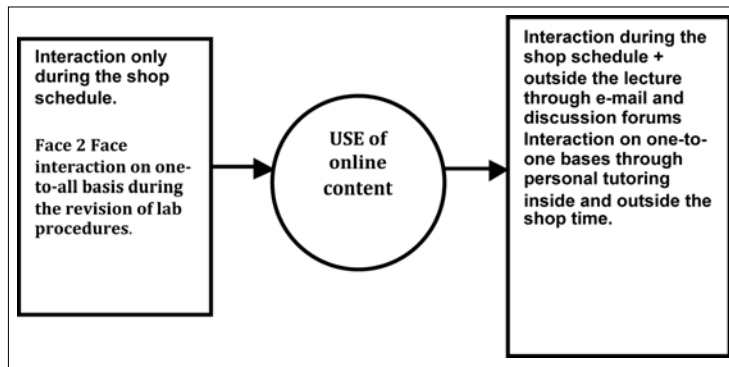
#### 5.2.5. Instructor's perception of role change after the use of online content

Within the framework of this research, it was been clear that instructors played a crucial role in bringing online technologies to their teaching experience. Instructors interviewed for this research stressed the fact that the changes in students' learning did not come only from the use of the online materials, but from their use of different learning techniques. The fact that they knew that their students were familiar with the content review in the lab allowed instructors to let the students help each other solving problems in a collaborative way. Furthermore, instead of lecturing, instructors developed a «problem based» approach where students in the lab came to them only if they were not able to solve a particular problem on their own.

Instructors' pedagogic views are decisive when they use new technologies in teaching. For example, Bates (2000) underlines that new technologies need different teaching approaches and an understanding of



Student at SAIT Electrician Program practicing in the lab.



Model 1. Before using online content  
Model 2. After using online content

the teaching process itself. The application of new pedagogic models has resulted in an ideological shift in the relationship between instructors and students (Collis & Moonen, 2001; Laurillard, 2002; Sloman, 2001). In this research, the application of a new pedagogical framework was crucial for the success of the use online learning technologies inside and outside the workshop (lab).

One instructor in the interview emphasized the fact that it was his personal challenge to use innovative pedagogic techniques that motivated him towards the use of online learning materials. It was with the application of innovative pedagogic techniques that he made valuable use of online content to prepare students for the workshop (lab): «My challenge is more related to an innovative pedagogic practice, not to the use online curricula».

## 6. Conclusions, Research Limitations Recommendations & Future Research Directions

Research presented in this chapter is only an example of how online learning can contribute to new pedagogical practices across colleges and universities and how these educational institutions are responding to the Net Gen students' learning expectations. The research population in this paper was rather small and researchers are aware of the fact that a larger group of students' opinions should be taken into when considering further actions in the design and use of online learning materials.

However, from the research findings analyzed in this paper, the following recommendations can be proposed:

- When changing from a classroom-based teaching environment to an online one, both instructors and students should be provided with the proper tools and training to be able to take advantage of the new

teaching-learning environment.

- Instructors should be aware of the fact that teaching in an online environments requires from them to be able to interact with students using Web 2.0 technologies, such as social media, or e-mail. This interaction is crucial for students' successful completion of courses and programs.

- When teaching online, it is important to consider that not all the students have the same reading capabilities and learning style.

Therefore, online environments should be customized according to individual learning differences and students' expectations.

What can institutions, instructors, and students expect to see over the next number of years as online learning technologies become an even greater part of education contexts? Although there is not a certain answer to this question, we suspect that changes will be seen in all the areas connected to students' learning, including pedagogical practices, learning styles, faculty development, mobile technologies use and appropriation. Further areas for research should then be:

- Effective training practices for both instructors teaching and students learning online.

- Analysis and measurement of students' motivation in relation to the introduction of online learning technologies should be further explored.

- Students' individual differences, such as age, gender, educational experience and learning style should also be explored when analyzing the potential use of online learning technologies.

## Acknowledgments

This research project was possible thanks to the innovative leadership of SAIT VP Academic, Dr. Gordon Nixon, and to the valuable contribution of the Academic Chairs for the Electrician & the Welding Programs, Dr. Lionel Shewchuk and Prof. George Rhodes. My gratitude goes to them, to the instructors involved in the project and to the students at the School of Construction and the School of Manufacturing and Automation.

## Notes

<sup>1</sup> Young (1998) maintains that there are three models that determine educational policies priorities. These models could be compared with the discussion of the transmission versus participative model discussed in this section. The three models that Young defines are the «schooling model», the «credentialist model», and the «access model». The 'schooling model' puts the emphasis on the transmission framework, where learners are expected to have a high degree of participation in post-compulsory schooling. The «credentialist model» places priority on the aim that learners should have the qua-



fications to achieve future employment. The «access model» represents a vision of society where learners, freed from constraints, learn in any context they find themselves.

<sup>2</sup> In 2006 the author of this chapter was appointed as the new CISCO Chair in e-learning. Dr. Burkle has continued the work that Dr. Bates started.

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