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How Canadian and Chinese High School Students Access and Use ICT: An Exploratory Study

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Abstract: *This paper reports the findings of an exploratory study that examined two secondary schools: one from a big city in eastern China and the other from a middle-sized city in eastern Canada. Data were collected using a paper-based survey questionnaire that included multiple-choice, open-ended, and scaled questions. Responses indicate that ownership and access to ICT devices were quite similar between Canadian and Chinese participants, but the learning and use of ICT between the two groups of participants differed due to various reasons. Results seemed the Chinese participants relied more on classroom learning, and teachers of the Chinese participants did not integrate much use of ICT outside of the classroom. The findings of this paper support the literature about ICT integrated teaching that indicates the need for Chinese educators to make more efforts in making full use of available ICT for teaching and learning purposes when ICT access becomes a less critical issue.*

Keywords: ICT access, ICT use, learning, Canada, China

1. Introduction

The last decade has witnessed big advancement of various types of Information and Communication Technologies (ICT), namely personal computers, Internet, mobile phones, digital music players, online games, etc. being used in educational settings as well as in other fields (Adcock & Bolick, 2011). This rise is due to numerous pedagogical benefits that ICT brings to teachers and students (Buechler, 2010).

Together with the fast developments in China in recent years, the increase in the access and availability of ICT, especially Internet-connected computers and mobile phones, are dramatic. Today, many elementary and secondary school students, whether they are from cities or the countryside, can access the Internet from school, home, or Internet cafes that are widely available in their communities (China Internet Network Information Center, 2014). Compared with desktop and laptop computers, the ownership and use of mobile phones are increasing

faster among all types of users, including students from rural areas of the country (China Internet Network Information Center, 2013). The Chinese government emphasizes the importance of ICT in education and has in recent years started a number of initiatives to promote the use of ICT in education. Many difficulties exist with integrating ICT into education due to various reasons such as the imbalance of the development in different areas, difficulty in integration of ICT into teaching and learning, demand for the people who are skilled in ICT, constraints of the education informationisation facilities in elementary schools, etc. (Li, n.d.).

In terms of access to ICT, in 2009, Canada “was tied for second in the G8 with the USA” (Human Resources and Skills Development Canada, 2013), at a ratio of 1.4 fifteen-year-old students for each computer across the country (Statistics Canada, 2012). However, due to factors such as language barrier, gender, geographic location, and especially socio-economic status (SES), digital divide remains an issue in Canada. In order to bridge the divide, besides efforts from the government, charity organizations like Sky’s the Limit Youth Organization (STL) are providing refurbished computers to under-resourced youth across Canada (Government of Canada, 2011). Many teachers view access as one of the top challenges to technology integration (Gao, Choy, Wong, & Wu, 2009). Having access does not necessarily mean effective use of ICT as ICT are available in some schools, but they are either used ineffectively or under-used by most educators (Chen, 2010; Mueller, Wood, Willoughby, Ross, & Specht, 2008). These educators often fail to use technology in ways that promote students’ knowledge construction. The use of technology as a pedagogical tool cannot be fully realized unless there is adequate technical support and modeling within a school (Teo, Lee,

Chai, & Choy, 2009). This means the school culture, in terms of ICT integration, directly affects teachers’ use of ICT in the classroom (Hammond, Crosson, Fragkouli, Ingram, Johnston-Wilder, Johnston-Wilder, Kingston, Pope, & Wray, 2009).

In recent years, the author of this paper observed similarities and differences in regard of ICT access and use in Canadian and Chinese schools, and is interested to conduct an exploratory study to investigate ICT and student learning in the two countries. The focus of this study is not intended to perform a comparison between the two contexts, but explore and gather empirical data that could be used to support research findings instead of anecdotal observations. The objective of this study is to understand what types of ICT are available for secondary school students in the two countries, and how they are utilized in and outside of schools, especially participants’ access to ICT, ways they learn and use them, and possible reasons for these phenomena. The author hopes that findings of the study can help develop suggestions for educators, particularly schoolteachers in China, on effective use of ICT for teaching and learning.

2.Literature Review

Over the last two decades, the use of Information and Communication Technologies (ICT) has been an important topic in education. Faced with the fact that ICT have penetrated to every corner of daily lives, scholars have advocated the necessity to develop students’ ICT literacy (Markauskaite, 2006). Students today belong to the generation that is sometimes referred to as “Net Generation,” who are accustomed to operating in a digital environment for communication, information gathering, and analysis (Oblinger, 2004), and it is believed that these people are tech-savvy and their preferable ways of

learning are represented by ICT (Oblinger & Oblinger, 2005). This does not necessarily mean the Net Generation can make full use of ICT for teaching and learning (Katz, 2007). Studies have indicated that ICT can enhance teaching and learning in different disciplines (Anderson, 2008; Grabe & Grabe, 2007; Sutherland, Armstrong, Barnes, Brawn, Breeze, Gall, Matthewman, Olivero, Taylor, Triggs, Wishart, & John, 2004; Wong, Quek, Divaharan, Liu, Peer, & Williams, 2006). For these reasons, most curriculum documents state the importance of ICT and encourage school teachers to use them. Particularly, ICT implementation becomes a key factor that leads to school curriculum reforms in many regions.

Access to ICT, once identified as one of the major barriers to teachers' use of technology (Fabry & Higgs, 1997; Lehman, 1994), has become a less critical issue. As various kinds of ICT such as computer hardware and software, Internet, digital camcorders and cameras, digital music players, and mobile phones become available and affordable, people from both developed and developing nations now at a certain degree have access to one or more kinds of ICT. Therefore, what is expected of educators today is to help learners use technologies not only for social purposes, but also for learning purposes (Kennedy & Levy, 2009). Attewell (2004) asserts that "Mobile phones and PDAs are no longer just for chatting and organizing contacts and diaries, they are now pocket-sized computers and as such have the ability to deliver learning objects and provide access to online systems and services" (p.16). Given the fact that mobile phones are widely used among young people, one of the remaining issues about the use of ICT in schools is how they could be integrated into the curriculum (Plante & Beattie, 2004; Wang & Woo, 2007; Yuen, Law, & Wong,

2003), and this integration requires efforts of the administrators, educators, and students themselves. Tsai and Hwang (2013) suggest that research should be conducted to analyze patterns of students in terms of their economic and cultural backgrounds and their motivation orientations to obtain information that can help researchers and teachers to improve their instructional design for students in specific regions. With the development of ICT, researchers also urge that attentions should be paid to the paradigm shifts in e-learning and make good use of context-aware ubiquitous learning (Liu & Hwang, 2010).

In schools, factors that influence the integration of ICT include access, support, and school culture. Although schools from both developed and developing nations have access to one or more kinds of ICT, those technologies are under-used by most educators (Chen, 2010). The use of ICT as a pedagogical tool cannot be fully realized unless there is adequate technical support and modeling within a school (Teo, Lee, Chai, & Choy, 2009), meaning means the school culture plays an important role in ICT integration (Hammond et al., 2009). According to Caplan and Graham (2008), teachers should use computers and the web to promote active learning that can effectively lead to higher order and critical thinking skills.

Research shows that although most secondary school students in Canada have access to ICT at home as well as at school, integrating ICT into the teaching and learning in school is still a challenge (Martinovic & Zhang, 2012; Plante & Beattie, 2004). The Chinese government emphasizes the importance of ICT in education and has in recent years started a number of initiatives to promote the use of ICT in education. However, there are many difficulties with integrating ICT into education due to various reasons (Li, n.d.). Due to various factors, even though ICT

are made available in schools, they are not used as widely as expected. This is because for teachers, using ICT may mean “risks of facing conflicts with robust educational tradition and administrative systems, which are often not in favor of technological innovations” (Zhang, 2007, p. 311). By exploring schools in Canadian and Chinese contexts, this study aims to make some useful suggestions for educators on the use of accessible and ubiquitous ICT to enhance student learning.

3. Research Methodology

In this exploratory study, a survey questionnaire was used to collect participants’ demographic data and their self-report of access, learning, and use of ICT at home and at school, and their perspectives of and attitudes toward ICT use for learning. The purpose of the questionnaire was to collect both qualitative and quantitative data that helped the researcher understand the research questions about the access, learning, and use of ICT in Canadian and Chinese schools.

The data collection instrument was adapted from some similar instruments the author and his collaborators have designed from previous studies (e.g., Martinovic & Zhang, 2012; Rankin, Quaglia, Baggio, Pearce, Quaggitto, Wiens, & Zhang, 2012; Zhang & Martinovic, 2008). The questionnaire was administered at two secondary schools: one in eastern Canada and the other in eastern China (see Appendix). Each school had about 100 students participating in the study. The research participants were students in grades 8 and 9. Both participating schools were considered “good schools” in their own jurisdiction in terms of location, reputation, ICT infrastructure, parents’ socio-economic status (SES), and both genders were equally represented from participant pool of the schools. An English version of

the questionnaire was used for Canadian participants and a bilingual (English and Chinese) version was used for Chinese participants. Chinese participants were encouraged to respond in either language. Considering that there were different popular tools in the two countries, some modifications were made for Chinese participants, such as adding Renren and QQ to Facebook, replacing Twitter with WeChat, and Youtube with Youku (the former ones have restrictions in China). Most of the Chinese participants responded in Chinese, and the response rate of the anonymous survey was about 95% for each research site.

The frequencies and percentages of close-ended responses were calculated, and frequency tables and bar charts were created using Microsoft Excel. These figures were used to present relationships that existed among certain variables (Creswell, 2005). Text-based and open-ended responses were typed in Microsoft Word and subsequently categorized and color-coded according to (a) the question itself and (b) a theme identified with the participants’ response.

4. Findings and Discussion

An analysis of research data indicates that most participants had access to a variety of ICT, a phenomenon shared by students in both Canada and China. Participants in the two contexts had access to similar amounts of ICT both at home and at school. They were also using ICT for social and/or entertainment purposes equally for both groups of participants. However, due to educational systems, their living environments, and school cultures, Canadian students seemed to be more encouraged to participate in the ICT mediated learning activities while their Chinese counterparts mainly used ICT for resource searching or personal communication.

By examining a few aspects of ICT ownership, access, learning, and use, the following subsections are intended to illustrate similarities and differences between Canadian and Chinese secondary school students who participated in the study.

4.1. Ownership and Access to ICT Devices at Home

4.1.1. Canadian participants: To the question “What ICT devices do you have access to at home?” almost 40% reported having a cell phone, 57% reported having a smartphone, and about 86% reported having a gaming device. Almost 70% reported having a mobile computer and over 40% reported having a tablet computer, which indicates that there was a great potential for students to access online resources and learning environments if a reliable WiFi was provided. These participants reported that they were allowed to bring their own ICT devices to school and they would use their wireless devices to access the Internet in and out of the classroom for learning resources and activities.

4.1.2. Chinese participants: In terms of ownership and access to ICT devices at home, the situation seems that Chinese participants had a higher ratio (cell phone, 50%; smartphone, 95%; mobile computer, 93%, and tablet computer, 78%) except for gaming device (42%). These participants reported that they were not allowed to bring their ICT devices to school, and they did not have much time to use them at home as they reported, “having a lot of homework to do after school.”

4.2. Resources for Learning How to Use ICT

4.2.1. Canadian participants: In their response to the question asking from what resources they learned to use ICT, a great majority (79%) said they learned from their friends, 56% said they learned from their teachers, and 73%

said “I like to play around.” This could be interpreted that collaborative learning plays an important role in the learning experience of these students, and an interpretation could also be made that, in terms of learning ICT, most of these research participants had the preferred learning style of experiential learning.

4.2.2. Chinese participants: In response to the question asking from what resources they learned to use ICT, a similar percentage (72%) said they learned from their friends, which could be interpreted that collaborative learning also takes place among Chinese students, at least in terms of learning how to use ICT. However, the percentage of responses regarding learning from teachers (79%) and “I like to play around” (57%) was sort of reversed compared to those of the Canadian participants. Maybe this could be interpreted that Chinese students rely more on classroom learning while Canadian students apt to employ more experiential learning, at least in terms of learning ICT.

4.3. Use of School/Teacher Websites for After Class Learning

4.3.1. Canadian participants: When asked how often they accessed the school website/teacher webpages, 75% reported doing this daily/frequently. Responses to follow-up open-ended questions show that the frequency of the access to such websites positively correlated with the frequency of updates of the content in those spaces. Students checked the school website for announcements and reports, and as some teachers frequently posted assignments and course materials on their webpages, students would often visit the webpages for their learning outside of the classroom. Some students reported making frequent visits to the website/webpages as a venue to learn about events of the school, and also used them as a reminder for school activities and assignments.

4.3.2. Chinese participants: Responses to this question was quite different from those of their Canadian counterparts. Only 10% of the participants reported that they would access their school website or teachers' webpages. In response to the follow-up open-ended question about the reason for the response, most stated that the school website was "boring" or "worthless," and their teachers did not have course webpages. This could be interpreted that this group of students did not make much use of the online space of their school because they believed that they could not find much in the spaces that would be interesting or useful for them.

4.4. Subject Areas That Would Benefit the Most from Using ICT

4.4.1. Canadian participants: Answers in this area were various. Business was the most frequently mentioned answer (approximately 60%), followed by math (a little over 50%). Other commonly mentioned subjects included French, English, science, etc. To a certain degree, students' understanding of the importance of ICT depends on how the subject teachers utilize them in their classes. Business courses are where students learn how to use application software packages, and math and computing are two closely related subjects. In this particular school, one math teacher used a variety of Apps (application programs) on iPads for classroom activities, and this apparently exposed students to how to use ICT to enhance their learning.

4.4.2. Chinese participants: Answers also varied in this area. The most common answer was drawing or editing images (about 30%). The other common answers included music, English, math, science, etc. Answers were varied and no one subject evidently exceeded the others. It can be interpreted that in this school, or at least for this group of students,

the use of ICT is mainly focused on certain software programs (e.g., Photoshop or similar image manipulation software).

4.5. Satisfaction with School's Use and Teaching of ICT

4.5.1. Canadian participants: Regarding this question, 90% of the students were completely satisfied with school's good job on using technology; 4% of them held "half-half attitude"; 6% of them were unsatisfied with their school's ICT use and teaching. From their comments, these participants did not only pay attention to the availability and accessibility of hardware, software, and network aspects of ICT in their school, but also how different types of ICT were utilized through the teaching and learning in the school.

4.5.2. Chinese participants: Most students were satisfied with technological facilities, software, teachers, and Information Technology class (approximately 60%). Some of them were unsatisfied with the limited access to technological devices (approximately 35%). This group of participants seemed to be paying more attention to the ICT facilities than their integrated use in the learning experience. Accessibility seemed to be a significant issue related to participants' low level of satisfaction.

5. Limitations of the Study

The major limitations of this study lie in the areas of data types and participant representation. In terms of data types, although both quantitative and qualitative data were collected with a survey instrument, some more in-depth investigation needs to be carried out to obtain answers to questions such as why the school of the Chinese participants would not allow students to bring their ICT devices to school, what reasons the Chinese participants used their smartphone, what they

would like to see on their school website, etc. Future studies need to be performed to involve a larger variety of schools in terms of student population, school culture, and socio-economic status, and include interviews and focus group discussions in order to gather richer data that could be used to strengthen the results of the study.

6. Concluding Remarks

With the increasing availability and affordability of ICT in both Canada and China, especially given the fact that even though there are differences as to what ICT are more widely used depending on geographical locations, Internet connected computers and mobile phones are ubiquitous among the youth. Therefore, educators and educational policy makers need to pay attention to this phenomenon and find ways to make best use of the available ICT by developing programs for e-learning and ubiquitous learning (u-learning), and at the same time, encourage teachers and students to take advantage of ICT to enhance teaching and learning. Currently, the ICT, especially mobile phones, are mainly used for social purposes such as daily communication and entertainment, and this may be due to the limited e-learning and u-learning programs that have been developed to streamline the connection between the available ICT and learning activities in and outside the schools. Some research has reported positive results on mobile learning in some developed countries. However, in many developing countries, there needs to be further research on how to make best use of those digital devices for learning purposes. Researchers and practitioners in the domain of education have the responsibility to advocate a better understanding of ICT-enhanced learning and implement pedagogy aligned learning environment in the technology-rich societies.

As argued by Fabry and Higgs (1997), ICT access is no longer a crucial issue in the schools studied. Yet, there still remains a need for policy makers and teachers to realize the important pedagogical values of ICT as a leaning enhancer. Schools need to build an ICT culture that better meets the learning needs of the “Net generation,” who grew up with ICT, but does not necessarily know how to use them for learning purposes (Oblinger & Oblinger, 2005). This requires not only pre-service teacher education programs to place more emphasis on new teachers’ competence of ICT integration in the curriculum, but also design programs for in-service teachers’ professional development to help update and upgrade school teachers’ knowledge and skills for the pedagogical use of ICT.

The wide availability of mobile phones, especially smart phones, among secondary school students in China provides great potential for these students to experience flexible learning. With proper support from different levels of administration, it is very likely that educators in China will be motivated to find ways to make full use of the ICT students have access. Developing learning resources for mobile phones and designing online learning activities that engage students both in and outside of the classroom would be the end-result.

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Appendix: Survey Questionnaire

Understanding Students' Access to and Use of Technologies

This survey is anonymous, so please do not write your name anywhere in this questionnaire. Thanks.

In this survey the term “technology” includes, but is not limited to, desktop computers, laptop computers, printers, LCD projectors, iPods, digital cameras, fax machines, cell phones, Smart Boards, Internet, and tablet devices.

Section 1: Your Information

1.1 What is your age 12 13 14 15 16

1.2 What grade are you currently in? 8 9

1.3 What is your gender? Female Male

1.4 Rate your overall ability for using technology:

- An advanced technology user who has more advanced skills than most people I know.
- An average technology user who has skills that are the same as most people I know.
- A beginner technology user who is still learning how to use technology.

Please explain why:

Section 2: At Home

2.1 What electronic and communication devices do you have access to at home? (Check all that apply)

- Cell phone (without Internet access)
- Smart Phone (with Internet access, including iPhone, Blackberry)
- Desktop computer
- Mobile computer (e.g., laptop, netbook)
- Tablet computer (e.g., iPad)
- Printing/scanning device
- Music device(e.g., MP3/MP4 player, iPod)
- Digital reader device (e.g., Kindle, Sony Digital Reader)
- Gaming device (e.g., Xbox, Nintendo, Playstation)
- Other Please specify

2.2 I learn how to use technology from: (Check all that apply)

- Friends
- Siblings
- Parents or guardians
- Teachers

- Organized programs outside of school(e.g., camp, workshops)
- Online “how to” guides
- Online forums or discussion boards
- Product manuals
- I like to play around with technology
- Other Please specify

2.3 How often do you access the school website and teacher course pages from home?

- Daily Weekly Monthly Rarely Never

Please explain why:

2.4 Outside of school, how much time do you spend on the Internet on average?

- Less than 1 hour 2 to 3 hours 4 to 6 hours More than 6 hours

Please explain why:

2.5 How often do you use a computer (not at school) to complete your assignments?

- Daily Weekly Monthly Rarely Never

Please explain why:

2.6 Please check all the social networking websites that you regularly use, as well as whether or not you have posted content to any of the website(s).

I use this website regularly:

I have posted content on this website:

Facebook Yes No

Twitter Yes No

YouTube Yes No

MySpace Yes No

Other: Yes No

Other: Yes No

Please explain why:

Section 3: At school

3.1 How often do you use a computer (at school) to complete your assignments?

Daily Weekly Monthly Rarely Never

Please explain why:

3.2 Check all of the technologies that you have used in your classes for the purpose of school work since last September: (Check all that apply)

- Smart phone (with Internet access)
- Desktop computer
- Mobile computer (e.g., laptop, netbook)
- Tablet computer (e.g., iPad)
- Interactive websites (e.g., Blogs, wikis)
- Curriculum software (e.g., any software used on a school computer)
- Cloud computing (e.g., Google Docs, Drop Box)
- Other Please specify

3.3 How often do you bring a technology device to school?

Always Sometimes Rarely Never

Please explain why:

3.4 What subject area(s) would benefit the most from using a tablet (iPad) computer? (Check all that apply)

- Languages (English and/or Chinese) Mathematics
- Business/Computer Studies Arts Social Studies (Geography)
- Physical Education Science
- Other Please specify

3.5 What subject area(s) would benefit the most from using a mobile (laptop/netbook) computer? (Check all that apply)

- Languages (English and/or Chinese) Mathematics
- Business/Computer Studies Arts Social Studies (e.g., Geography)
- Physical Education Science
- Other Please specify

3.6 How much do you agree with this statement: My school is doing a good job on using technology to enhance my learning?

- Very much agree Agree Somewhat agree Very much disagree

Please explain why:

3.7 What is your ideal school environment in relation to technology?