

Chinese Students' ICT Readiness for a Blended Teaching and Learning Environment

Jinjin Lu ^{1*}, Janet Price ²

¹ China University of Geosciences (Wuhan), Wuhan, CHINA

² Sanda University, Shanghai, CHINA

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ABSTRACT

Information Communications Technology (ICT) plays an important role in enhancing Chinese students' learning efficiency and preparation for successful participation in a Western learning and teaching community. In the past, Chinese students' ICT preparedness for Western higher-education has not been emphasized in Chinese domestic K-12. Consequently, this lack of skills might be the cause tension between students and university academics in a blended learning and teaching environment. This pilot study used the Survey of Higher Education [15] to investigate 120 Chinese students between 16-18 years old who are commencing study in Australia and compared their responses with the expectations of 356 Australian academics. The results show that both Chinese students and Australian academics regard 'Data Retrieval and Data Management' skills as the most important skillsets. But gaps were discovered between commencing Chinese students and Australian academics in a number of communication and digital interactive skillsets used in a blended learning environment.

Keywords: blended learning, ICT proficiency, Chinese students, communication and interaction

INTRODUCTION

Information and Communications Technology (ICT) skills have been widely used for the last decade by students and teachers to enhance learning and teaching effectiveness. These ICT include using personal computers, Internet, mobile phones, digital music players, online games, etc (Adcock & Bolick, 2011). Due to the benefits ICT brings to education, learning models have changed from traditional 'teacher-centered' and text driven modes, to 'student-centered' modes driven by digital access (Primary teaching and learning tools also have changed from traditional print and written sources to multimodal tools delivered in a multimedia context. Since the introduction of the Internet (1983) knowledge of ICT skills to enhance online learning and teaching became essential for students' academic study.

Changes in academic policies are not easily made. Unfortunately, Western institutions are not known for flexibility and making rapid changes to their business models (AGBUC, 2013, p. 2). Administrators admit that *how to implement* a mutually beneficial technology programs lacks economic precedence and clear data. It is a "*work-in-progress*" and that often they are woefully unaware of their campus' grass-roots essentials (AGBUC - Association of Governing Boards of Universities and Colleges, 2013, p. 3). In such cases, they would better benefit by developing IT growth plans based directly on the expressed needs of the students and classroom educators, the two groups who are, too consistently, the last to be consulted in the decision-making process (Jones, 2013, p. 97).

Blended teaching and learning is a popular e-learning technology "capable of solving multiple tasks" and is often thought of as "a way that both educators and students can meet their teaching and learning needs" (Krasnova & Vanushin, 2016). This type of blended learning and teaching model is used all over the world, in both formal and informal learning, to improve the educational transformation and impact the learners' motivation (Nafukho, 2015).

Contribution of this paper to the literature

- Providing decision-makers and stakeholders with the first-hand data to decision makers that they need to rethink and reorganize a flexible sustainable approach addressing the Academic ICT Gap
- Assisting Chinese international students to successfully transit to a blended learning environment.
- Improving understanding of the ICT gap between Chinese K-12 students and Australian academics.

An increasing number of Australian universities have adopted curriculum designs that blend teaching and learning models. Australia is an excellent resource for collecting Western higher education ICT data because of its unique features: geographical location, multicultural and multilingual population and political positioning in the Asian region. Though it is geographically located in Asia, Australia is similar to the other Main English-Speaking Destination Countries (MESDC) offering an English-language and quasi-national curriculum. Historical data indicates that the MESDC began integrating ICT into education in similar fashion and on similar timelines. All five countries offer similar theoretical and philosophical content based on their shared Greco-Roman, liberal arts tradition. Academically, the position of the Australian government with regards to higher education aligns with the current international trends that focus on authentic and sustainable assessment that have relevance beyond the classroom (Kearney, 2012, p. 876). However, the Australian government, in order to reduce institutional funding, supports an increase in blended learning, arguing that students and instructors would also benefit from the online delivery vehicle and the innovation it provides for research and data management (Crawford & Jenkins, 2017). Many Australian institutions express interest in adopting methodologies that provide more effective interaction and flexible choices between students and teachers. Such innovative methods merge two forms of teaching by combining face-to-face teaching techniques with simultaneous, online interactions.

Although blended learning and teaching has advantages, it requires both students and academics to have substantial ICT proficiency. In blended learning environments, students need ICT skills that are related to interactions with peers, collaboration with academics, and mentors, independent learning in data retrieval and data management (Krasnova & Vanushin, 2016). In the last two decades, the Ministry of China (MoE) has emphasized that schools and universities should improve technology infrastructure to enhance the effectiveness of using ICT tools in classrooms. However, disparities are still found between regional areas, larger cities and rural community schools in terms of ICT infrastructure, construction and teacher professional development programs (Lu, Tsai, & Wu, 2015). For this reason, Chinese graduates from K-12 might be expected not have the ICT skills required to succeed in the ubiquitous blended learning and teaching environment of Western universities. The discrepancy between Chinese students' training and the ICT skill-level expected by Western higher education indicates a measurable Academic ICT Gap. This research study aims to provide decision-makers and stakeholders with the first-hand data they need to rethink and reorganize a flexible-sustainable approach addressing the Academic ICT Gap and assisting Chinese international students in the transition to the new blended learning environment in Western universities. The study significantly benefits Chinese international students and Western educators in their attempt to identify and better understand where the ICT gap lies and develop the curriculum to mediate the ICT gap before the Chinese K-12 students enter the Western universities.

BRIEF REVIEW

The Digital Age has had a major impact on fields, such as marketing, education, tourism, and health, making them more globally-competitive. China entered the Digital Age and quickly prioritized domestic economic development and the corresponding educational improvements required to support domestic growth. In 2000, the MoE instructed domestic schools that Chinese K-12 students should obtain ICT skills that strengthen students' information literacy, enhance students' learner autonomy and support life-long education. However, this directive was not compulsory and only provided administrative guidance. With no increase in funding and support for hardware, software, infrastructure and training, this priority ICT training was never initiated. Subsequently, long-standing disparities in access to technology education between rural and urban areas have resulted in unequal educations (Qian & Smyth, 2000; Zhang, Fang, & Ma, 2010). A recent large-scale study (Lu et al., 2015) revealed that Chinese K-12 schools in rural areas had profound differences in the application of ICT in classrooms, including materials design, construction of digital resources, and ICT learning environment. This is supported by Yu et al. (2016) who found that the effective use of ICT tools in Chinese K-12 education varied, as it was based on the teachers' work and subject load. The use of ICT tools supporting teacher effectiveness was more positive in English classes than in other subject area. In general, Chinese K-12 ICT education proficiency may be highly dependent on the school's locations, rankings and the quality of teachers' education. Yang, Huang, and Liu (2014) believe that if the Chinese central government allocated more educational funding into under-development areas the Academic ICT Gap could be narrowed.

Many Australian universities and colleges have adopted blended learning to support flexible learning and teaching environments. "The Turnbull Government's 2018 plan includes taking \$2.8 billion in public funding from Australia's universities during the next four years" (IQPC cooperate, 2017, p. 1). This approach could severely impact the international student. This innovative model has attracted attention from K-12 educators, university academics, administrators and educational designers. The University of New South Wales, Western Sydney University, James Cook University and St. Stephens College have implemented blended learning programs across a range of faculties and disciplines to encourage students' active learning. Although these universities have made significant improvements in e-design, e-mentor, and learning management system (LMS), few studies have been conducted into the investigation of Chinese students' readiness in this blended learning environment. On the topic of ICT and the internationalization of higher education, universities often discount the input of its own researchers and instructors. "There is still too great a focus on political and economic rationales from an international and institutional perspective, in which the perspective of those for whom it is all intended are underrepresented" (Jones & de Wit, 2012)

Disregard for the ICT training needs of foreign students may be under reconsideration. Chinese students comprise the largest international student cohort in Australian schools. However, their ICT assimilation issues have not been addressed when compared with student health, stress and English language issues (Lu, Dear, Johnston, Wootton, & Titov, 2014; Price, 2016). Emphasis may change for economic reasons. Many academic studies have recommended conducting ICT skills assessment as a valuable student recruitment tool. However, this important tool has yet to be employed. Kennedy et al. (2008) and his colleges claimed that "little empirical research has been published on students' general use of technology in the context of Australian higher education (p. 109).

Han (2012) used a biographical approach to investigate Chinese HDR (higher degree by research) students' information literacy in Australia. She argued that "training in western countries has tended to regard international HDR students no differently from their undergraduate counterparts" (p. 3). Han's result showed that Chinese Ph.D. students faced significant challenges in technology information learning partly due to "their unfamiliarity with the terminology of library and information science in the new learning environment; and the previous academic culture and the political cultural value systems they experienced in their home country" (p. 15). Price (2016) found that the ICT skill expectations of 356 Australian academics was markedly different from the commencing international students. Multicultural factors have made it difficult to investigate domestic K-12 Chinese students' ICT proficiency to determine the influence it may have on their blended learning experience.

The studies above indicate that, although the Chinese government has paid attention to Chinese K-12 students' ICT education, their ICT performance and digital literacy are not sufficient to enter Western universities. In order to identify an Academic ICT Gap in the domestic Chinese population, it is essential that to obtain data from Chinese students who intend to enter Western universities and investigate if they are ready in being involved in blended learning environment.

THE STUDY

This study was the first stage of the big project that aims to develop personal Apps to enhance students' learning efficiency (iOS and Android) in blended learning. This blended learning model was designed for the Chinese K-12 graduates who would be enrolled in a joint programme with Western Universities, primarily located in Australia. These Chinese students receive the same quality of education as those entering domestic universities. The lectures will be conducted in the traditional theatre houses but tutorials will be delivered in various forms. Students could be provided with the recorded sessions if they missed the live-streaming lessons. In order to develop effective personal Apps, the researchers need have a better understanding of Chinese K-12 graduates' ICT proficiency. This study focused on examining the following two questions:

- 1) When conducting a self-assessment, what are the Chinese students' basic levels of ICT skills?
- 2) Do gaps exist between Australian university ICT requirements and the Chinese students' ICT proficiency?

This pilot survey was developed based on Price's study (2016)¹. The question content was derived from curriculum standards and educational resources set by both Western and Chinese professional and governmental administrators (UNESCO, 2008). The first part of the project, as reported in this paper, used only quantitative research methods to complete data collection and analysis. Generally, the 'what' or 'how' questions could be answered more effectively by using quantitative research methods than qualitative research methods (Matthews & Ross, 2010). In this study, quantitative research methods are suitable as they are "concerned with collecting and analysing data that is structured and can be represented numerically" (Matthews & Ross, 2010, p. 465). It was conducted through a paper questionnaire for the sake of the participants' convenience.

The questionnaire survey was composed of three parts:

Table 1. Frequencies of Top-10 ICT skills most highly self-assessed by respondents

| | Top-10 Proficient ICT skills | Yes% |
|----------|--|-------------|
| Obtained | • Hardware - Smart phones | 84% |
| | • Hardware - External storage, USB & thumb drives | 80% |
| | • Interactivities - Mapping & location programs | 77% |
| | • Data Retrieval & Research - Understand browser uses | 77% |
| | • Spreadsheet Calculating - Understand terminology: column, row, cell | 76% |
| | • Interactivities - Games & gaming | 74% |
| | • Word Processing - Manipulate text | 74% |
| | • Spreadsheet Calculating - Alignment & adjust column width & row height | 73% |
| | • Hardware - Audio recorders or players | 72% |
| | • Hardware - Video recorders or players | 71% |
| | • L/CMS Skills - Access grades for units | 71% |

Table 2. Frequencies of students' least proficient ICT skills

| | Least Proficient ICT skills | Yes% |
|-----------|--|-------------|
| Deficient | • Communication & Email - Reproduce academic formats | 19% |
| | • Interactivities - 3D or animation software | 12% |
| | • L/CMS Skills - Participate in a webinar | 8% |

- Part One: Background information in which students provided demographic information, such as gender, disciplines, and provinces.
- Part Two: 58 multiple choice questions asked students to rate their proficiency in various ICT skills common to academic use. They were given choices, Likert options of "Obtained", "Not obtained, but necessary" and "Important for study".
- Part Three A: open-response question asking students if they would like to receive ICT training and workshops
- Part Three B: open response question inviting students to make comments on the personal Apps (both IOS and Android) they currently use

The first part was composed of six question items mainly asked Chinese students' background and other demographic information. Students were asked to choose the most suitable answer. In the second part, the question items were grouped into six subgroups: Hardware; Multimedia Presentations; Interactive Applications; Research and Data Management; Spreadsheet Calculation and Word Processing. In this section, the students were allowed to choose multiple answers, if applicable. The final two questions of Part Three were designed to have a better understanding regarding students' perceptions of their personal Apps. These responses will be used for the Apps development and applications at the second stage of the project.

There were 120 volunteers from a research-intensive university ranked among the top-100 in China. Participants ranged in age from 16-18 years and represented 12 Chinese provinces. All had received their K-12 educations in Chinese domestic schools and had been accepted by Australian universities as self-funded or government-funded international students.

Responses were initially examined using frequency analysis to develop a ranking system, and then comparison analysis to determine how the student ranking compared with the academics' expectations as identified by Price (2016).

RESULTS

Although the 120 voluntary participants received the surveys, there were 119 participants signed the consent forms and completed the surveys. Anonymous paper surveys were issued and collected by the university's International Office. Eighty-percent (N=95) had science and technology backgrounds and 20% (N=24) studied various social science and humanities disciplines. Nearly half of the respondents expressed interest in ICT training and workshops to enhance their learning before and after university enrolment.

Frequency analysis was used to produce the students' self-assessed ranking of ICT-skill proficiency. After completing domestic K-12 educations, most Chinese students positively self-assessed their use of hardware, mastery of basic word processing, understanding of number calculations, basic data retrieval and research. **Table 1** provides a list of the Top-10 ICT skills self-assessed by respondents as their most proficient. **Table 2** lists 3 of the students' least proficient ICT skills. The students indicated that they expected it would be necessary to master these three skills once they arrive in their university environment.

Table 3. Expectations from Australian academics as expressed in Price's study [15]

| | Question items | Yes% |
|----------|---|------|
| Expected | • Hardware - Desktop & laptop computers | 98% |
| | • Data Retrieval & Research - Use keywords in advanced search | 95% |
| | • Data Retrieval & Research - Search sites with accurate information | 94% |
| | • Data Retrieval & Research - Record, catalogue & cite data | 93% |
| | • Word Processing - Manipulate text | 92% |
| | • Hardware - External storage, USB & thumb drives | 90% |
| | • Word Processing - Use reference, thesaurus & language tools | 87% |
| | • Hardware - Printers, copiers & scanners | 87% |
| | • Data Retrieval & Research - Understand browser uses | 87% |
| | • Graphics Manipulation - Create clear, concise & logical presentations | 86% |

Table 4. The ICT gap between Chinese students and Western academics

| ICT skill unit | Students (Yes) % | Academics (Yes) % | Discrepancy |
|--|------------------|-------------------|-------------|
| • Interactives - 3D or animation software | 65% | 23% | -42% |
| • Interactives - Web development/editing tools | 61% | 31% | -30% |
| • Interactives - Media streaming | 54% | 43% | -12% |

Chinese students indicated they understood basic L/CMS skills: how to access grades and unit work. Interestingly, they believe that they were more proficient in ICT related to their specific disciplines, such as mapping & location programs and games. However, two blended learning skills, communication with emails and webinar participation, need improvement.

Price's study (2016) presents the ICT use and student expectations of 356 university academics representing 12 of the total 31 Australian university systems. The academics were all experts in ICT technology, ICT instructors and technology educators in Australian public universities. Their views were collected after the research team obtained the Ethical approval of the research project by the University. These Australian academics were provided with a list of traditional ICT skills that were federally-mandated by the MESDC for inclusion into K-12 domestic education, over 20 years ago. **Table 3** indicates the Top-10 ICT skills required by Australian higher education.

When comparing academic responses in **Table 3** with student responses **Table 1**, there is commonality in the 3 ICT skills highlighted above in yellow.

Other notable finding:

- 1) Australian academics have high-expectations for a student's ability to locate and retrieve accurate data and then use that data in completing rigorous research projects.
- 2) Expectations include ICT skills related to identifying keywords when searching for information, identifying relevant sites and recording and citing data.
- 3) Only 30% of the student respondents self-assess as a competent in using references, language tools and graphics manipulation.
- 4) Less than 50% of the students feel proficient when using hardware like printers, copiers and scanners.
- 5) Although L/CMS-related skills were not ranked in the top 10 ICT skills required, more than 2/3 of the Australian academics surveyed believed that accessing learning materials and grades for units; discussing work on bulletin boards, and uploading assignments to the L/CMS were mandatory ICT skills that Chinese students should have acquired before entry to the Western universities.

Given the importance of skills in communication and interaction, gaps were found between academics and Chinese students' expectations. The details are in **Table 4**.

The data computation in **Table 4** indicates that many Chinese students believe that proficient use of interactive tools and software would be necessary in a blended learning environment: tools and software related to media, graphics and the Internet. However, the Australian academics indicated that these skills are not important in their L/CMS learning. Price believe that the discrepancies between student use and instructors' value of these Internet interactive skills are a possible indicator of the future of these emerging technologies as highlighted by the Academic ICT Gap study.

Students who develop *fast-fingering* skills using social media in everyday life are optimistic about their ICT proficient levels. *Fast-fingering* skills creates the illusion that users are adept and analysis of the responses for "Important for Study" indicates that at university. Chinese students intend to use social applications to successfully transition from formal K-12 instruction to informal, flexible blended learning and teaching environment. While manual dexterity may improve students' interface but it does not improve content management or research

capabilities. Social media may prepare a student for the mechanics of L/CMS interface, but it cannot duplicate full immersion in L/CMS skills. When surveyed, many commencing students rank their ICT abilities as adequate and above. However, research shows that self-assessment of ICT skills is rarely accurate with most individuals, students and teachers, overestimating their ICT abilities (Jung, 2009).

In the open question section, the 59 Chinese students commented that they would like to be provided with free ICT training and workshops before and after they study in Australia. Regarding the last question, a considerable number of Chinese students held positive attitudes towards using online applications in blended learning. The popularity and favour of online applications were listed as: Easy access (N=102), Free usage (N=98), Peer interaction (N=83), and User friendly (N=70). Although Chinese students commented positively on the convenience and ease-of-download of personal Apps (iOS and Android, there was concern that using online applications out of classrooms would be time consuming and increase their Internet cost. Generally, most participants felt confident in choosing suitable online applications to assist them in blended learning.

DISCUSSION AND CONCLUSION

Two questions were posed, addressed and answered in the study. The MoE efforts to address Chinese students' ICT skills proficiency have not been overly successful. Unequal development in technology education still exists (Yang et al., 2014). Only 10 of 58 ICT skills were mastered by at least 70% of respondents. This result supported Han (2012), who posited that Chinese students could not be expected to have ICT proficiency comparable to their undergraduate counterparts in Australia. However, guidelines as to what ICT items a university-bound 2nd language learner must prepare for do not exist. A new expanded conceptual framework as to what kind of foreign language literacy students should acquire is needed. That framework would reflect the role of ICT in social, cultural, political and economic transformation, which in turn has a real impact on changes in the characteristics of foreign language literacy in the 21st century (Chauhan, Zhong, & Li, 2013, p. 411).

Chinese students lack ICT skills related to academic email etiquette, 3D software production and webinar participation. This result is in accordance with Zhang's study (2014) which indicated that Chinese students' ICT proficiency was heavily depended on their teachers. Chinese students would like to be taught in classrooms rather than exploring after school. Li and Ranieri (2010) surveyed over 300 middle-school students from Ningbo City, south of Shanghai regarding their ICT access and use. Of concern to the researchers was "the digital gap due to uneven opportunities for teenagers to access digital tools, and the emerging need to integrate the use of ICTs within the school system and into the curriculum (p. 1030). The lack of ICT education in daily coursework might also be due to the less funding on the infrastructure construction and teacher professional training in undeveloped areas (Yu et al., 2016).

This study provides insight into the attainment level of Chinese students' digital awareness since the ICT Innovative Programme was launched by the MoE (2000). Chinese students highly ranked the importance and their mastery of online interactivity and social communication skills. However, this is converse to the needs of Australian university instructors. The ICT skills most needed for higher education remain the same traditional ICT skills first introduced to educators in the 1990's. Even in Western K-12 education, these skills have been marginalized as they are not entertaining nor are they easy to self-teach. They must be presented to students in an authentic blended-learning context such as science investigation, mathematics computation, researching and writing projects. These skills are the key to successful blended learning L/CMS formats (Krasnova & Vanushin, 2016).

More importantly, this study supports the existence of an Academic ICT Gap between Chinese students and Australian higher education (Price, 2016). The major disparity is in the use of online interactivity and social communication tools: valued by the Chinese students surveyed but ranked at the bottom for university use. This result does not support the study undertaken by Adcock and Bolick (2011) who argued that skills related to online education were needed for both teachers and students in blended learning. Instead, recent research from Europe and America indicates that for sustained progress and educational transformation to occur, educational objectives and strategies do not require cutting-edge technologies. This is possibly an area in which emerging educational technologies can be identified. Definitive research is needed to develop subgroups of ICT skills in an educational context and that can be compared to broader areas such as fields-of-study and cultural teaching and learning conditions.

This study aims to determine if Chinese students are ICT ready to enrol in Western universities, particularly, in Australia. This is a pilot study with a small number of participants. In Stage II, we will make improvements on sample recruiting and use a mixed research method to gain further understanding of the Chinese students' digital literacy and their preference of personal Apps (iOS and Android).

Note 1 The Cronbach's alpha reliability coefficient ($>p$ value) for the ICT items in questions ranged from .859 to .869 (58 items; $\alpha = .868$). Therefore, the questions are considered to be highly reliable with a high level of internal consistency, since a figure of Cronbach's alpha >0.8 is taken to assure validity (Pallant, 2016).

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