Studying the Digital Competencies of Enabling Education Students at a Regional Australian University

Michael Cowling
School of Engineering & Technology
CQUniversity Australia
(+61) 7 3295 1196
m.cowling@cqu.edu.au

Michelle Gray
School of Access Education
CQUniversity Australia
(+61) 7 49804157
m.l.gray@cqu.edu.au

Phillipa Sturgess
School of Access Education
CQUniversity Australia
p.sturgess@cqu.edu.au

Studying the Digital Competencies of Enabling Education Students at a Regional Australian University

Abstract

As technology-based devices become increasingly pervasive in everyday life and we use them in new and different ways, it is not surprising that higher education is looking at how these devices will be integrated into the classroom, and how a student's pre-existing digital competencies impact their learning. Therefore, effective teaching practice must focus also on understanding the affordances that students bring to the learning situation. This paper reports on a project comparing students' attitudes and performance prior to and after completion of a computing unit, as part of an enabling education course, to map their digital competency, allowing us to assess these affordances, and the impacts they have on the learning process. The results revealed that age had no correlation to the level of digital competency, and that the mode of device usage was a much more important measure of digital competency than other factors tested. Overall, these results, despite a small sample size, demonstrate the need for greater granularity in the description of the technical skills of students, and suggest that digital competency should be measured using a combination of confidence, applications used and also device and purpose-specific experience.

Introduction

As technology-based devices become increasingly pervasive in everyday life and we use them in new and different ways, current trends in higher education research have focused increasingly on the use of computer technologies in teaching, in particular investigating how new devices might be integrated into the classroom. Indeed, the proliferation of technology into general society, and in particular, the use of the internet as part of everyday life in much of the western world, means that if higher education institutions were not integrating technology into their delivery, then they might be considered to be inefficient, ineffectual and outdated.

For this reason, the use of internet-based applications for content delivery, communications, assessment, etcetera has moved from leading edge to the norm in most Australian universities. However, whilst much of the research in this area focuses on the latest trends, such as the use of tablets, smartphones and wearable technology, effective teaching practice must focus also on understanding the affordances that students bring to the learning situation.

The aim of this research was to assess students prior to and after completion of a computing unit, as part of an enabling education course, to map their digital competency, allowing us to assess these affordances, and attempt to measure the impact of these existing digital competencies on their learning. The key questions asked were "What are the base digital competencies of commencing enabling-education students?" and "How do these pre-existing digital competencies impact the acquisition of further computing skills?". This paper focuses specifically on students enrolled in the Skills for Tertiary Education Preparatory Studies (STEPS) course, offered by Central Queensland University (CQU) in Australia, which is designed to teach students skills such as writing, math, basic computing and introductory science, as well as the study skills necessary to successfully navigate university.

Background

Many studies exist that look at the digital competency of students. For instance, Bennett, Maton and Kervin (2008) and Bennett and Maton (2010) discuss the use of technology, such as computers, by individual students and how this relates to the ability of these individual students to engage with these technologies in their learning. Oliver (2001) also looks at competency of students, and argues that institutions need to provide formal support for new students to ensure that they are proficient with computers, in the context of their learning environment and needs.

Combined with this, are studies that look at how the general student cohort has changed over the years, with Corrin, Bennett and Lockyer(2013) arguing that as educators, we are increasingly surrounded by a new breed of individuals who tackle problems in new and different ways through technology. Jones , Ramanau, Cross and Healing (2010) also point out that these students expect to be engaged by their environment, with participatory, interactive, sensory-rich, experimental activities (either physical or virtual) and opportunities for input. They are more oriented to visual media than previous generations and they prefer to learn visually by doing, rather than by telling or reading.

And then of course there is the oft-maligned work by Prensky (2001, 2009), who coined the term “digital natives” to describe these students, as defined by age, indicating that they differed from previous generations, not only in the degree to which they used technology, but also in more qualitative ways, such as the way they interact with technologies and even the way they think and learn. This work, despite having been disputed over the years, still maintains a presence in the literature.

Yet, despite much of this work on the use of computing devices by students, which is often considered to be their digital competency, research on the digital literacy of students, which we see as more specifically relating to the skills and attributes they have to build these competencies, is more difficult to come by. Even the term digital literacy is hard to define, with the term indeed often used to describe the skills and attributes associated with the use of digital technologies. Extensive literature review reveals that it actually incorporates a broad range of different literacies (or competencies), from technical competence using digital applications, to higher order analytical skills using digital applications, (Bawden, 2008, Covello, 2010). For this reason, anyone using the term digital literacy in practice must necessarily tease it out to show the specific subsets of skills that are relevant to the specific context in which they are using it.

And, just as the word literacy can embrace a multiplicity of attributes, the term digital is also broader than it may appear, with some sources using it to refer to any task that involves a computer, and others using it to refer to activity on the internet specifically. Another aspect that often arises when discussing this area is individual differences in engaging with technology. Age is often suggested as an important differential affecting digital experience. In fact, when Prensky (2001) coined the phrase "digital natives", he included a generational aspect in his definition, indicating that a digital native was somebody born after 1980, with those born before described as "digital immigrants".

Finally, in some circles, commentators have observed a phenomenon where students demonstrate a high level of skills with social media applications but low competency with basic computer tasks such as saving files (Herron, 2013). Herron (2013) describes these types of students as "tech savvy" but not "digitally literate", and it is suggested that digital competence with one set of technologies (in this case phone-based social media) is not necessarily transferable to a different digital context. Herron (2013) implies that this phenomenon is partially a result of a change in the dominant hardware trend from full computers to mobile devices such as smart phones.

It is into this mix of different definitions and contexts that this study fits, looking specifically at the practical approach of assessing digital competencies of students just starting at university, and investigating the impact of these on their learning. In our context, we see 'literacy' to imply that one 'knows' the skills, whereas 'competency' implies one 'can apply' the skills.

Context

The STEPS course offered by CQU, Australia, is an enabling course which aims to teach adults the necessary skills in preparation to successfully undertake university study, such as study skills, writing, maths, basic computing skills and introductory science content. This course has been offered since 1986, with a major expansion in 2006 when the course became available for distance education. The course currently achieves annual enrolments of over 1200 students, with approximately two-thirds being enrolled in the distance mode (Sturgess & Gray, 2014).

The Computing Skills for University (CSU) unit teaches computing skills required for university studies, from generic tasks such as saving files, to productivity skills such as word processing, presentation slide creation and spread sheeting, using Microsoft Office as the platform. This unit uses a combination of printed study material, video demonstrations, integrated activities and extensive lecturer feedback to support learning for both on-campus and distance students. Because of the large number of distance students enrolled in the unit, it is important that these materials are effective for self-managed learning. One of the main concerns with developing these materials is gauging the digital competency of students as they commence the STEPS course to ensure that the materials are developed in an appropriate manner to cater for the dynamic nature of the student intake each term.

The coordinators of this unit recognise that with an enormous diversity of age, experience, attitude and transferability of skills, the large enrolment of students each term into CSU presents a continuum of pre-existing computing skill levels – from those who have never turned on a computer, to those who use social media every day, to those working in administrative roles using various software in their employment.

Our current research is a pilot study to try to gain an understanding of the existing digital competency that commencing STEPS students bring to their studies. Based on our findings in the literature, the aim is to not simply measure digital competency as a single dimension, but to try to understand the range of skills and experiences of individual students and how these relate to the requirements for their higher education studies, and impact on their learning experiences.

Methodology

Initial data collection was conducted with volunteer STEPS students across two CQU campuses, immediately prior to commencing the computing unit and again after completion of the unit. Independent interviewers conducted both sessions, which were recorded for later transcription and consisted of three sections: A series of open ended questions focusing on previous experience with computers; structured questions about digital devices regularly used, the most common activities performed and a self-assessment of their skill level for the nominated activity; and a practical task involving applying specific formatting to a Word document.

Participants were drawn from the on-campus classes on two of the university's regional campuses. The interviews were conducted by independent interviewers. The anonymised data was then analysed by the research team looking for emerging patterns and trends. From a pool of 14 participants in the pre-test, 8 students returned to conduct the post-test, allowing longitudinal comparison between these students across the term, though providing a fairly small data set for analysis. For this reason, conclusions are specific to this cohort and should not be generalised for enabling students as a whole. However, it's hoped that the study will give insight into points to look for with these students into the future.

Results

Results from this study can be divided into two categories. The first grouping of results is around the qualitative data gained from the participants' performance on the practical task, and their responses to the structured questionnaire around their use of computers and experience with technology. In contrast, the second grouping of results is around the more qualitative data gathered from the students' responses to the open- ended interviews pertaining to their attitudes to and self-assessment about technology. Results are divided in this way in the analysis section.

Student Performance

Many of the insights from this study come from the first group of data relating to student performance on the practical test, before and after completing the unit. The pre-test showed that all students felt (through self-assessment) very confident in their technical abilities prior to starting the unit (Sturgess, Cowling & Gray, 2016), but struggled with the practical test that was taken as part of the pre-unit assessment. So, evidence of how they improved on the post-unit assessment shows how this might have changed.

Importantly, it is clear from the results within our dataset, that all students show definite improvement in skill level as a result of the CSU unit, with an average of a 28% increase in demonstrated skills after completion of the unit. It is also apparent that the age of the students has no bearing on the abilities of participants to use or to learn to use computers in the functional work context, with no correlation appearing between the age of the participant and the relative increase in skill level. This leads us to conclude that, for our cohort of participants, age does not define the level of digital competency that we are measuring, nor the level of improvement of skill as a result of completing our computing unit. Figure 1 demonstrates the results of degree of improvement in the context of age amongst the sample of participants, which also reflects the anecdotal feedback from lecturers within the unit, over several terms.

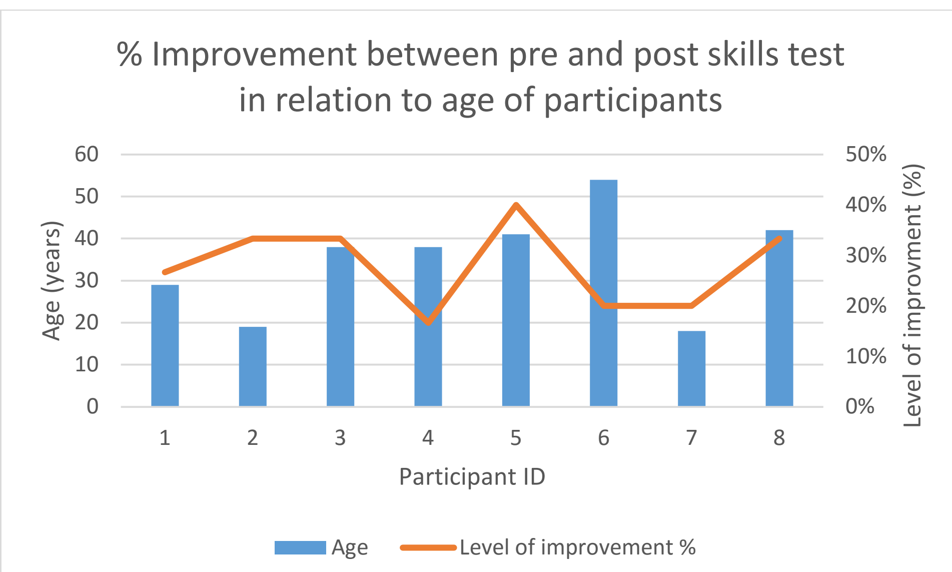

Figure 1 Level of improvement between pre and post testing in relation to age of participants.

Secondly, in the context of our study (where we used basic Word functions as a measure), evidence shows the exposure to and use of computers in the workplace had the greatest impact on the level of improvement in skills after doing this unit, as demonstrated in Figure 2, where it can be seen that any participant who reported a level of work PC use ended with the higher levels of improvement. This could be as a result of a better understanding of context for the use of computing as a more work/academic function, or a higher level of comfort and/or experience with computers in general, being more regularly used as part of a job, or possibly even a higher aptitude for learning new skills (an area that was not explored in this work). Mostly, if the participants had previous exposure to Microsoft Word, they showed the highest level of improvement in skills after completing the unit.

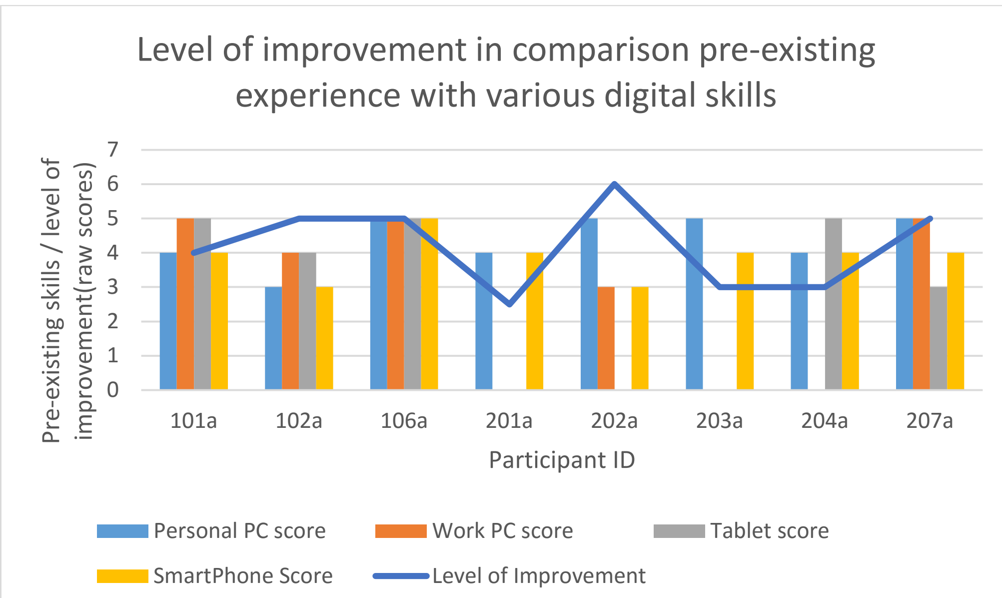

Figure 2 Level of improvement in relation to various contextual exposure to digital experience

Finally, in contrast, the influence of the use of a home computer had mixed results, possibly reflecting the wide range of purpose and regularity of use (i.e., gaming, social networking, transacting, etcetera). Nor did the use of smartphones have any demonstrated impact on the level of students' improvement after completing the unit, possibly inferring that the skills and functions used/available on a smartphone are of a completely different context and/or nature to the use of functional software, as used in the academic environment. This is again demonstrated in Figure 2.

Student Perception

The second group of data relates to students' perceptions of their abilities after the unit was run, as reported in the post-unit interview questionnaire. This data is interesting because it reinforces the practical test data and also shows the change in attitude from the pre-unit questionnaire.

In general, looking at the responses from students, it is clear that the use of technology for a particular set of tasks does not necessarily translate to the skills that they need for computing at university. For instance, one participant said, "Before I thought I could bluff. Now I think I can do it and if not I know where/how to get the information to be able to do it," and another said, "Much more confident than before. I thought I was pretty good before but I have learned a lot and it has been good", with another saying, "I was pretty confident before the [unit] but I think that I have learned a lot more". As noted, this narrative supports the previous conclusions from the practical test that students needed to be exposed to the specific skills in order to improve them, and that general digital competency was not as helpful to students, as perhaps it appeared when they completing the pre-unit questionnaire.

Students also indicated that the coursework helped them to understand the specific literacies of computing they needed, and that even if they did not know the answer, they could "Understand troubleshooting more – go back and work on something to work it out – don't get cranky" and also "Understand how things work".

Finally, students indicated that their use of computing had improved in the unit, not just with the tools used, but also in a more general way, with one student saying "I understand things better now as they make more sense. I have a deeper understanding of how to use the computer." This supports some of the conclusions drawn from the practical measure, in particular the conclusion that students would now have a higher aptitude to engaging in learning new skills.

Discussion

The unfortunately small dataset of this study precludes the possibility of making broad generalisations about digital competency of commencing university students. However, it does provide some interesting insights that can be inferred about this group, and provide some guidance and opportunities for work conducted with further cohorts.

First, this sample strongly suggests that age has no bearing on the ability of students, especially when they are participating in a computing skills unit. This would appear to support conclusions by Bennett & Maton (2010) and dispute the generational aspects of the definition by Prensky (2001), in line with many other studies that have come to this conclusion.

It would also appear that experience with computing devices and contexts, in particular of the same type as those being used for their university work, does make a significant difference to the results of student performance and their competencies after completing a computing skills unit. This would support the work of Bawden (2008) and Covello (2010) indicating that digital competencies relate to a broad set of skills, and that experience in one skill set does not necessarily translate to experience in other skills areas, especially when this requires a transition between different devices, and/or purposes.

Finally, this cohort appeared to feel that studying this unit helped not just with their specific skills, but also their ability to troubleshoot and also their deeper understanding of the material, leading us to conclude that this might assist students with their aptitude to adopt new digital skills in the future. This dovetails with conclusions from Herron (2013), and also indicates that our students, through this unit, are moving from being “tech savvy” to being “digitally literate” in some ways. Further work could help to cement this conclusion.

Conclusion

This paper has reported on the results of a study of enabling students on their digital competency both pre- and post- study of a computing unit. The data revealed that students showed an overall average improvement in skill level of 28% after the completion of the unit. It also showed that age had no bearing on the ability of participants to learn the material, however exposure to and use of computers in the workplace had the greatest impact on the level of improvement in skills after completion. Mostly, if the participants had previous exposure to MS Word, they showed the highest degree of improvement in skills, or ability to learn. The influence of the use of a home PC had mixed results, and the use of smartphones had no demonstrated impact on the level of improvement, or ability to acquire functional digital skills.

Overall, these results, despite a small sample size, demonstrate the need for greater granularity when describing the technical skill of students. Whilst on the surface students appear, and are often assumed to be technically savvy, this research indicated that there is far more to digital competency than a single measure along a linear scale, rather digital competency should be measured using a combination of confidence, context, applications used and also device specific experience. Future work should look at exploring indicators for each of these dimensions in greater detail with a view to a more robust multi-faceted understanding of digital competency.

References

Bawden, D. (2008). Origins and concepts of digital literacy. *Digital literacies: Concepts, policies and practices*. C. Lankshear and M. Knobel. New York, Peter Lang: 17–32.

Bennett, S., Maton, K., & Kervin, L. (2008). The 'digital natives' debate: A critical review of the evidence. *British journal of educational technology*, 39(5), pp. 775-786.

Bennett, S., and Maton, K. (2010). Beyond the 'digital natives' debate: Towards a more nuanced understanding of students' technology experiences. *Journal of Computer Assisted Learning*, 26(5), pp. 321-331.

Corrin, L., Bennett, S., & Lockyer, L. (2013). Digital Natives: Exploring the Diversity of Young People's Experience with Technology. In R. Huang, Kinshuk, & J. M. Spector (Eds.), *Reshaping Learning: Frontiers of Learning Technology in a Global Context*, pp. 113-138. Berlin, Heidelberg: Springer Berlin Heidelberg.

Covello, S. (2010) *A review of digital literacy assessment instruments*. Syracuse University School of Education/IDD & E, IDE-712: Analysis for Human Performance Technology Decisions. Retrieved from http://www.apescience.com/id/fulltext/ research-on-digital-literacy-assessment-instruments

Dijk, J. A. G. M. v. (2012). The evolution of the Digital Divide - The Digital Divide turns to inequality of skills and usage. *Digital Enlightenment Yearbook 2012* and M. C. Jacques Bus, Mireille Hildebrandt, George Metakides, IOS Press: 57 -75.

Guo, R. X., T. Dobson and S. Petrina (2008). 'Digital natives, digital immigrants: an analysis of age and ICT competency in teacher education.' *Journal of Educational Computing Research* 38(3): 235 - 254.

Jones, C., Ramanau, R., Cross, S., & Healing, G. (2010). Net generation or Digital Natives: Is there a distinct new generation entering university? *Computers & Education*, 54(3), pp. 722-732.

Prensky, M. (2001). Digital natives, digital immigrants. *On the Horizon*, 9(5), pp. 1-6.

Prensky, M. (2009). H. sapiens digital: From digital immigrants and digital natives to digital wisdom. Innovate: *Journal of Online Education*, 5(3), 1.

Sturgess, P. and M. Gray (2014). Do you see what I see?: The challenges of teaching basic computing skills at a distance, *Proceedings of FABENZ Challenges & Innovation Conference 2014*, Tauranga, NZ, FABENZ.

Sturgess, P, Cowling, M. A., Gray, M. (2016). Unpacking 'Digital Competency': Exploring the Pre-Existing Skills of Enabling Education Students, *Proceedings of Australian Computing Education Conference*, Canberra, ACT, Feb 1 – 4, 2016.