INVESTIGATION INTO UNDERGRADUATE INTERNATIONAL STUDENTS' USE OF DIGITAL TECHNOLOGY AND THEIR APPLICATION IN FORMAL AND INFORMAL SETTINGS

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ABSTRACT

Digital technologies are being increasingly used in wider society including in educational settings. There are many examples that illustrate how universities embed technology enhanced learning within their educational provision. However there has been less research and evaluation of how these and other readily available technology based resources are being used in practice by students. This study aims to provide an in depth understanding of how a specific subset of higher education students, international STEM undergraduates in a large UK university are using digital technologies to support their studies. The results of a survey with a small group of students are reported. Initial findings show that students use technology in both formal and informal settings drawing on university resources but also other widely available resources. They are also routinely using more than one device to support their studies. Although they often use technology to support collaborative learning, more formal systems such as university provided discussion forums are not widely used. The results suggest that higher education should evaluate its use of digital technology and digital learning environments to determine if they are fully supporting their learners' needs and are effective. Furthermore higher education should consider how students are already using other widely available digital technology resources to support their learning and what they can learn from this to inform their own programme design and delivery.

1. INTRODUCTION

Today digital technologies often play a key role in facilitating and supporting students' learning. Digital technologies encompass the range of electronic tools, systems, devices and resources that generate, store or process data and information including social media, online games and applications, multimedia, productivity applications, cloud computing, interoperable systems and mobile devices (DET, 2014). 'Technology enhanced learning' or 'eLearning' are terms often used to refer to a type of learning that is facilitated and supported by digital technologies. The use of digital technologies can not only enhance traditional ways of teaching but also can expose learners to new and different ways of learning. They can facilitate a shared learning environment by enabling learners to collaborate in establishing communities of learners that go beyond the classroom; support the formation of learning environments and resources that cater for different learning styles and approaches; and, ultimately provide students with different learning experiences. They can also provide an opportunity to better understand students and the way they learn.

In recent years UK universities have set out to attract significant numbers of international students. In 2012-2013, around one in eight of all students enrolled in higher education in the UK were from outside the EU (UKUniversities, 2014). They now make up a significant number of postgraduate student numbers: one in four with a total of 91,485 students in 2012-2013 (UKUniversities, 2014). There are also significant numbers at undergraduate level, 69, 640 in 2012-2013 (UKUniversities, 2014) but there has been less focus on how to support this group of students. Anecdotally it has been observed that these students often use and share digital resources such as youtube, facebook and other social media to support their studies. They are also sometimes unaccustomed to the UK's higher education approaches to learning and teaching and can find

them strange and potentially challenging to engage with. This study sets out to provide a more in depth understanding of how these students currently use digital technologies to support their learning and what can be learnt from this in order to better support these students in their studies. It focuses on a set of international undergraduate students at a large UK university studying a range of STEM (science, technology, engineering and mathematics) disciplines. This paper reports on the initial findings from this study.
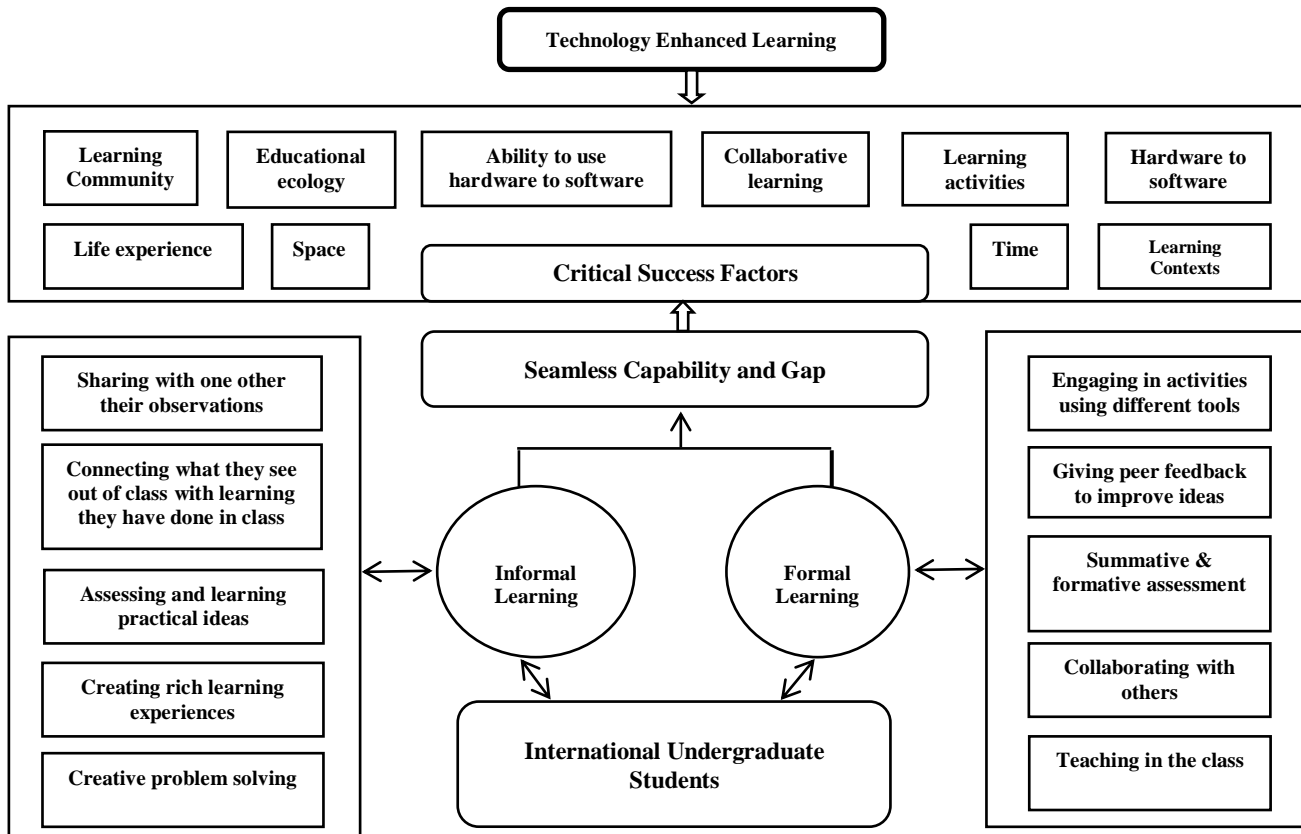
Figure 1. Framework on Digital Technologies and Informal and Formal Learning

2. RESEARCH STUDY

2.1 Research Approach and Framework

The study investigates how students learn in both formal and informal settings. Formal learning sometimes also called university learning refers to learning that takes place in formal settings such as university or tertiary institutions and is highly structured in its curriculum learning activities and assessment and usually leads to a qualification (Lai et al., 2013). It is more difficult to define informal learning, which some regard as all learning outside the classroom, while others regard it as "*a self-directed, intentional interest (rather than curriculum-based), non-assessment-driven and non-qualification-oriented endeavour*" (Lai et al, 2013). There is a growing recognition that a semiotic relationship exists between formal and informal learning and that a student's informal learning can be triggered by their work done in the formal education setting (Gurung & Rutledge, 2014; Laurillard, 2009; O'Mahony, 2010). For the purposes of this study, informal learning refers to learning that happens outside the formal learning environment and support mechanisms provided by the university to support students on their programme. In informal learning situations, whilst learners use the learning strategies gained from formal settings, they also use strategies that are not normally used in university.

The concept of seamless learning is useful as it encompasses the transitions between different learning situations and contexts (Looi et al., 2010). Drawing on previous studies in this area and the integration between formal and informal learning, (Gurung & Rutledge, 2014; Lai et al., 2013; Looi et al;, 2010; Margaryan et al., 2011; Osborne & Dillon, 2007; Sefton-Green, 2004), the authors have drawn up a framework which outlines the main critical success factors for technology enhanced learning and the key activities that underpin formal and informal learning (see Figure 1). This framework has been used to design a questionnaire, the first stage in this mixed methods study. It was distributed among a small cohort (n=11) of international undergraduate students studying a range of programmes across the STEM disciplines. A research survey approach is often used for studying behaviour and thus is appropriate for this study where the authors wanted to explore the following questions: *"what digital technologies do international undergraduate students use to support their learning?"* and *"how do they use these digital technologies to support their learning?"*

2.2 Results and Key Findings

The students were asked which digital tools they use both in a formal classroom setting and outside the university. The results indicate that they use the virtual learning environment, internet, email and standard office suite regularly in both settings. They make very little use of discussion boards and blogging/microblogging (e.g. twitter). Video sharing such as youtube, wikis, ebooks and document sharing are all popular and used more frequently in an informal setting. Table 1 illustrates the use of different types of devices by the students and clearly shows how they routinely use more than one device to support their learning. Students were also asked how many hours they typically use technology on and off campus. The results from this question are shown in Table 2 which indicate they spend more time off campus using technology than on campus. The students were asked how they usually work with other students on their course and/or share ideas with them. Although face to face is still popular, email, messaging (e.g. SMS) and social media (e.g. facebook) are all popular too. Students were also asked to indicate the main purpose of their use technology to support their learning. Their responses, shown in Table 3 indicate that interaction with others is rated highly, both in terms of sharing practice/resources and in seeking help to queries. When asked what issues they had with using technology, the general response was low indicating they had very little issues. However they do seem to make use of helpdesk support and online help, showing they seem to be able to seek out help themselves to any issues they experience.

Table 1. Frequency of Use of Digital Devices by Students (out of a total of 11)

Type of Digital Device	Use Daily	Use Weekly	Use Monthly	Never Use
Desktop computer	7	4	0	0
Laptop	10	1	0	0
Mobile phone	11	0	0	0
Tablet	2	1	4	4

Table 2. Frequency of Use of Digital Technology by Students (out of a total of 11)

Hours of Use	1-3 hours	4-6 hours	7-9 hours	10+ hours
On Campus	6	1	1	3
Off Campus	2	3	4	2

Table 3. Main Purpose for Using Digital Technologies

Purpose of Using Digital Technology	Response (out of 11)
Communicate with other students	10
Share resources among students	9
Evaluate the work of others	2
To support formal assessment	3
To ask questions	10
To engage in discussion	8

3. CONCLUSION

This paper reports the findings from an initial survey of undergraduate international students and their use of digital technologies in both formal and informal settings. The authors constructed a framework of success factors and key activities from previous work in this area and this proved useful for designing the survey for the students. The results from this survey indicate that these set of students are routinely using a range of digital tools and devices to support their learning and that they experience little difficulties with their use of technology. Although they use face to face communication for working with others, digital technologies such as social media and email are also frequently used and they value the opportunity to work with others. A limitation of this work is the small number of students surveyed and further work is underway to conduct a wider survey combined with a more in depth qualitative study to seek out a deeper understanding of the approaches and reasons behind this set of students' use of digital technologies. The results from this and the follow on study will be informative for higher education institutions in how they use digital tools and technologies to support students with a similar background.

ACKNOWLEDGEMENT

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