Investigating the Digital Literacy Needs of Students in Healthcare Education (Project Report)

Abstract

Aims of the research project were a) the investigation of existing digital skills concerning the use of mobile tablet devices, and b) the development needs of nursing students as to the use of these devices. The students' digital attitudes will inform the feasibility for the assessment of their competences in clinical practice by utilisation of tablet devices. The completion of a bespoke skills-based, self-assessment questionnaire, based on the EU DIGCOMP framework, enabled the extraction of conclusions on group digital competence. Further investigation of intricacies on how students perceive and use technologies in education and their daily lives has been proposed.

Keywords

Measuring Digital Competence, Digital Literacy, EU DIGCOMP Framework

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Introduction

Digital competence is considered as the most transferable competence (Balcar *et al.*, 2011) among the eight key-competences for continuous, life-long learning (Figel', 2007). In 2011 the European Union Directorate-General for Education and Culture commissioned the Digital Competence (DIGCOMP) project which documented the current state of knowledge among experts in research, education, training and work. It utilised an iterative Delphi method survey that recorded the views of experts, validated, refined and shared the results among an expert group, and collected feedback from peer review by engaging a significant number of 95 other experts (Janssen & Stoyanov, 2012). Work on a review of the literature (Ala -Mutka, 2011) and the analysis and synthesis of existing digital competence frameworks (Ferrari, 2012) preceded this study; it also established a baseline of the prevailing digital competence and digital literacy theories.

Digital competences are a requirement for managers, doctors, nurses and other health-related professionals in the health sector as digital technologies are increasingly used for office administration as well as for medical diagnostics and interventions. The pervasiveness of digital technology and the resulting demand for digitally-competent users can threaten traditional jobs; people who lack the required digital skills may see their positions worsening and progressively marginalised in the labour market (Didero, Husing & Korte, 2009; The Economist, 2014; Jones, 2014). This suggests that healthcare trainers have a duty to modernise their curricula and ensure that digital skills become a graduate attribute (Kerrigan *et al.*, 2013).

Project Aims

This research project was conducted as a case study investigating the digital literacy of nursing students when using mobile tablet devices to assess student-nurse competencies in clinical practice.

There were two main outcomes of this project:

1) The measurement of the digital competence of the students
2) The recording of the students' experience on using mobile tablet devices

This research project was complimentary to the project, *Evaluation of the use of tablets to assess student nurse competencies in practice* (Shaw, Evangelinos & Holley, 2015), which was also funded by Anglia Learning & Teaching. Shaw, Evangelinos and Holley's (2015) project piloted an electronic assessment portfolio for the assessment of practice competence of student nurses. Assessing the digital competences of students by establishing a baseline of students' digital literacy can inform the planning and implementation of support mechanisms, and highlight the development needs of students. This is an integral part of introducing tablet devices for the assessment of clinical competences in practice.

This project is part of a wider action research project that has identified and validated the suitability of an appropriate digital competence framework through a qualitative analysis of the views of students and staff (Evangelinos & Holley, 2014a), has developed self-assessment tools for quantitative assessing and mapping of their digital competences (Evangelinos & Holley, 2014b), and documented the views of students about the delivery of digital-literacy skills embedded within the curriculum delivery (Bottom & Evangelinos, 2015) by utilisation of technology-enhanced activities designed along Dalziel *et al.*'s (2013) Learning Design principles.

Methodology

The research design adopted both quantitative and qualitative methods conducted in parallel to quantify and describe the digital literacy of students in the form of a case study (Denzin & Lincoln, 2011, p. 246). This mixed method approach gathered two sets of data: a) digital literacy quantitative indicators and technology-use distributions, and b) diaries in which students reflected on their digital literacy affordances.

The participants completed a bespoke scenario-based online digital competence self-assessment questionnaire. The questionnaire toolkit development was based on the EU DIGCOMP framework (Ferrari, 2013). The participants were asked to identify the technologies used in their personal life or work, for

formal or informal learning, and in research, and were invited to complete short, reflective diaries to record their experiences of using technology in their private, academic and work lives, and to report their perceptions of digital literacy.

Development of the questionnaire was based on the EU DIGCOMP framework (Ferrari, 2013) and included 21 questions organised into five themes, or Competence Areas.

DIGCOMP Framework Digital Competence Areas	
1. Information 1.1 - Browsing, searching and filtering information 1.2 - Evaluating information 1.3 - Storing and retrieving information 2. Communication 2.1 - Interacting through technologies 2.2 - Sharing information and content 2.3 - Engaging in online citizenship 2.4 - Collaborating through digital channels 2.5 - Netiquette 2.6 - Managing digital identity 3. Content Creation 3.1 - Developing content 3.2 - Integrating and re-elaborating 3.3 - Copyright and licences 3.4 - Programming	4. Safety 4.1 - Protecting devices 4.2 - Protecting personal data 4.3 - Protecting health 4.4 - Protecting the environment 5. Problem Solving 5.1 - Solving technical problems 5.2 - Identifying needs and technological responses 5.3 - Innovating and creatively using technology 5.4 - Identification of digital competence gaps

Figure 1: DIGCOMP Framework Competence Areas

The questionnaire presented the participants with five Competence Areas comprised of groups of questions. Each question presented four examples of possible *hypothetical role-play, technology-use scenarios* and asked the participants to select the answer that *best matched their skills*. It has to be emphasised that the scenarios were designed to reflect *attitudes as well as skills*. The scenarios became increasingly complex as they were designed to represent different digital literacy profiles ranging from lack of skills to elementary, intermediate and advanced, and presented the students with authentic situations relevant to their academic experiences. Figure 2 is an example of a scenario-based question.

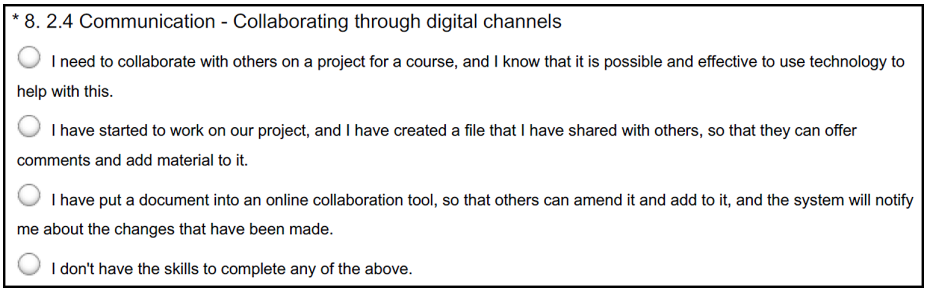

Figure 2: Question 2.4 of the DIGCOMP Self-assessment Questionnaire

Twenty-four of the 30 students completed the questionnaire (a return rate of 80%). The results were exported from the survey tool (*SurveyMonkey*) and analysed using Microsoft Excel 2010. Although a wide range of data was collected, this paper focuses on the group characteristics of the students.

The completion of short diaries aimed at collecting reflections of the students' technology-use experiences in their private, academic and work lives; they were asked to report their perceptions of digital literacy, comment on the views concerning the acquisition of skills, areas for further development, and provide feedback suggestions on how the university could facilitate the enhancement of their digital skills. Half of the participants (50%, *n*=15) completed reflective diaries. Analysis was conducted using QSR NVivo 10

software and the reflective diaries were coded into themes using Grounded Theory (Glaser & Strauss, 1967; Miles & Huberman, 1994; Guest *et al.*, 2012).

Results

The mean score of responses to the questions was calculated for each Competence Area. The number of questions was different in each Competence Area: the Information index is composed of three information-literacy sub-questions; the Communication area includes six sub-questions, and the Content Creation, Safety and Problem Solving areas contain four questions each. The group digital-literacy map (see Figure 3) presents the average (mean) group digital literacy indices on a scale from 0-3, where 0 means No Skills, 1 means Basic, 2 Intermediate, and 3 is considered as Advanced.

As Figure 3 illustrates, the Information index with a mean score of 2.17 denotes that on average students self-declared just over an intermediate level of competency. The group was least confident about their self-declared skills in the competence area of Content Creation with a mean score of 1.65, reflecting basic competence. Further insights can be gained through analysis of the frequency distribution of the indices seen in Figure 3.

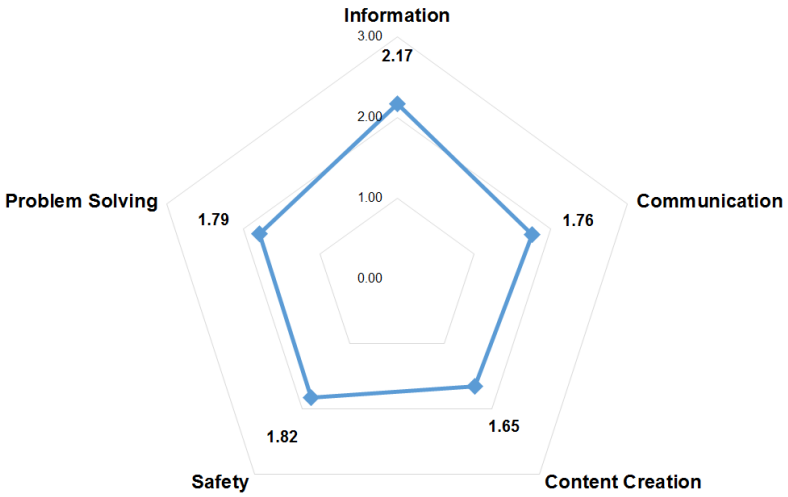

Figure 3: Digital Literacy Group Indices

The number of individuals plotted against their self-assessed digital competency on a scale from 1 to 4 (where 1 means No Skills, and 4 means Advanced) broken down in the five high-level competence areas (i.e. Information, Communication, Content Creation, Safety, and Privacy and Problem Solving) can be seen in Figure 4 below.

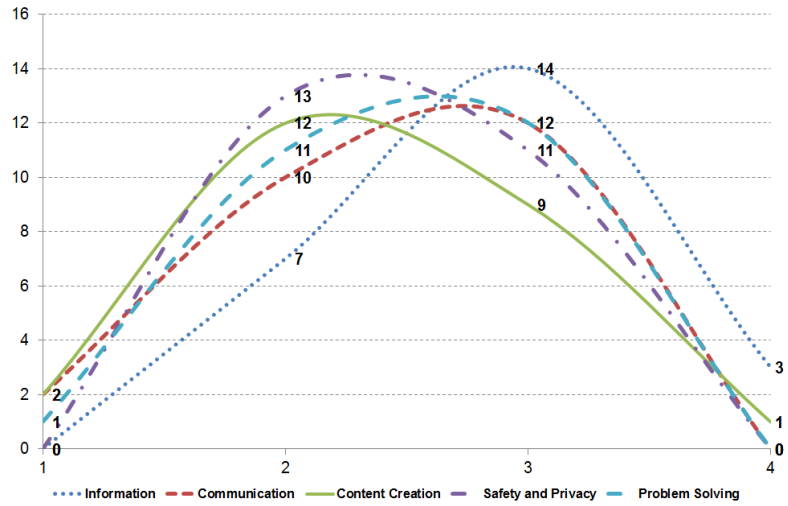

Figure 4 - Digital Literacy Group Distribution

The frequency analysis reveals in more detail the group characteristics for each area by assessing the number of students that exhibit a certain level of competency. For example, in the highest performing, high -level competence area of Information, 29% of the respondents self-assessed as having intermediate competency and 71% as advanced with a mean average score of 2.17. At the other end of the spectrum students self-assessed as least competent in the high-level competence area, Content Creation, with 8% demonstrating basic competency, 50% intermediate, and 42% advanced. Overall students self-assessed as more competent in the high-level areas of Information, Communication and Problem Solving, and as less competent in the areas of Safety and Privacy, and Content Creation.

It is important to note that there is evidence of significant variance within the basic, intermediate, and advanced competencies, and a score closer to the lower margin should be interpreted as substantially different in terms of the corresponding competency, from a score closer to the upper margin, bearing in mind that these indices are the mean value of sub-indices derived from a set of questions that have been grouped together to enhance reliability.

The participants were also asked to identify their technology use, and establish the different utilisation types of technology, as it is used in their private, academic and work life. Figure 5 shows that a laptop computer (*n*=20) is still the predominant technology in formal learning, with desktop computers (*n*=16) and tablets (*n*=15) being the next most frequent, and smart phones being used to a limited extent (*n*=10). In their private lives, students reported using a wider variety of technologies where tablets (*n*=20), smart phones (*n*=20) and laptops (*n*=19) are the most frequently used. Laptops (*n*=19), tablets (*n*=17) and smart phones (*n*=16) are most often used by participants for research purposes.

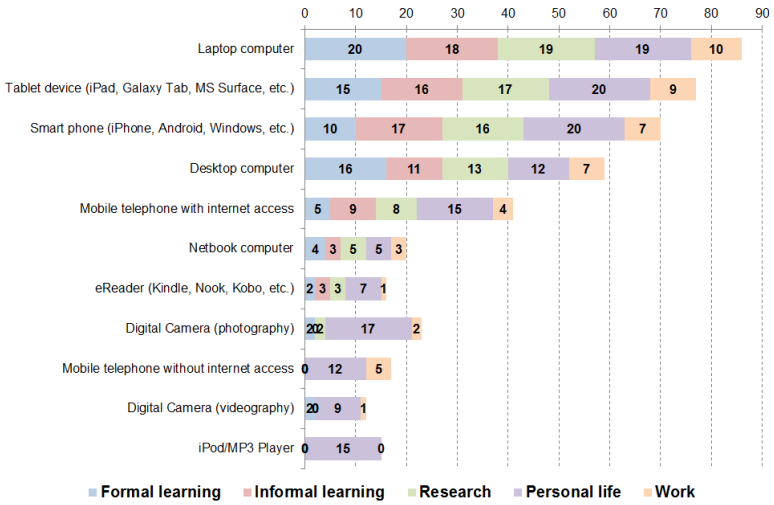

Figure 5: Technology Use

Twelve weeks after the students were given the tablets, and completed the questionnaire, they were asked to consider their digital literacy learning and development cycle and critically document their experiences on using mobile tablet digital-technologies in their private, academic, and work lives by reflecting on their individual practice.

The initial analysis of the reflective diaries showed that in their private life, students were concerned with communication (*n*=11), usability (*n*=11), and experience (*n*=9). Social networking and communicating with friends and family when travelling or being on the move was one of the most appreciated affordances of technology. Students also use mobile digital technologies to access systems for carrying out everyday activities, including communication and interacting with the University. They expect a seamless experience when accessing systems from their smart phones or tablets, and expect to be supported when things do not work properly.

Private		**Academic**		**Work**	
Communication	11	Experience	12	Experience	10
Usability	11	Usage	11	Communication	8
Experience	9	Information	8	Organisation	8

Table 1: Diary Analysis Top Three Categories

In academic life they are concerned with experience (*n*=12), usage (*n*=11) and information (*n*=8). Most participants admitted that technology engagement for higher education study is a necessity and that they generally feel comfortable using more than one type of technology. Tablet and smart phone use was widespread, and although some individuals admitted they were lacking the necessary skills for making effective use, they were willing to acquire the missing competences and skills. The main usage patterns included the use of subject-specific apps to acquire knowledge, revising the PowerPoint handouts from the Virtual Learning Environment (VLE), using single sign-on to access the University infrastructure, using tablet apps for note taking, accessing University information and timetabling and e-submission of the assessments of nurse competencies. From the Information perspective, mobile technologies are used for exam revisions, and information retrieval online that includes books, journals and websites enabling the users' studies. Eight students emphasised the value of using tablet devices within lectures to broaden their understanding, check facts and definitions, or review and focus their study on difficult concepts.

The top three categories of student concern are work-life balance (*n*=10), communication (*n*=8), and organisation (*n*=8). There is consensus that mobile technologies are becoming increasingly pervasive in all aspects of everyday life, including work and use in the workplace. Participants generally felt comfortable with using the tablet devices for work and they offered examples such as how tablets are successfully used for taking orders in restaurants. The participants also reported that similar applications of technology could potentially change their work attitudes. From a Communication perspective, they generally found it useful to have access to technology when in clinical placements as they often needed information and/or communication with the university and their tutors. Examples of organisational implications of technology use in the workplace include the use of mobile devices, applications such as the calendar, reminders which are used to manage diaries, and the setting of work-related reminders and notes. One participant reflected, '… for patients for their doctors' visits, and their families' visits', while another reported the use of social media as tools for publishing and managing rotas.

Conclusion

At a group level the quantitative data seemed to accurately measure a snapshot of the digital competences, skills and attitudes of students as identified in the DIGCOMP framework. Students as a group seemed to be reasonably comfortable in using technologies to communicate, learn, research, and generally engage with technologies in a number of ways; on average they showed a command of above basic digital competences located at the borderline of intermediate. This type of analysis is of interest for the optimisation of teaching as it offers a method for determining a baseline and thus enables early identification of students with intermediate, advanced, or even lacking in essential, digital skills.

From a technology-use perspective student self-reporting of use of laptops and tablets in their private and work lives was widespread. However, the group seemed less comfortable in the areas of Content Creation, Communication, and Problem Solving, and more competent in information management and safety. This indicates that, although the majority of students use technology in some ways, they may not have the full set of skills and attitudes needed to classify one as digitally literate.

The research diaries documented the intricate details of the individual competences, skills and attitudes, and allowed for the appreciation of the main areas of focus of each student. It seems that students face academic life as a part of their 'everyday' life, and practice placements as their 'workplace'. However, these distinctions are arbitrary as most students reflected from their *individual circumstances and experiences*. There was no evidence to support that students differentiated their technology engagement in these contexts. What mattered to them was the way they individually used technology to achieve *their own aims* in their private, academic and work lives.

The non-uniformity of the digital capacity measured across the different digital-literacy areas, combined with what can be described as highly-individual experiences of engaging with digital technologies, supports the idea that engagement does not necessarily equate to digital competency. Digital capability is increased by the purposeful use of digital technology, considered in a specific context as a task, that produces a certain output. For this reason it is not possible to become digitally literate by abstract knowledge alone, without having applied technology for the achievement of specific outcomes within specific contexts.

These insights can be useful for academics seeking to enhance the students' digital literacy in increasingly digitised teaching environments. Utilisation of technology-enhanced learning activities can be achieved through the application of appropriate pedagogic / andragogic models of collaborative learning that are delivered by purposeful teaching designs as the proposed method enables the construction of more balanced groups and, thus, scaffold informal learning of digital skills by considering ideas of, 'the more capable peer' (Vygotsky, 1978). In its simplest form, the digital literacy of students can be improved through a 'buddy system' where skilled students are paired with less capable ones in a way that will enable learning of the less able through the support of the capable.

In conclusion, the project established metrics for defining and measuring digital literacies in higher education based on the development of the Competence Areas as they are defined in the DIGCOMP framework. The metrics offer robust descriptors of digital competence which, when combined with an analysis of technology-use and diary-analysis, suggest types of technologies that indicate the preferred private, workplace and academic contexts for learning.

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