A Qualitative Exploration of the EU Digital Competence (DIGCOMP) Framework: A Case Study Within Healthcare Education

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Abstract. A case study on qualitative exploration of the EU Digital Competence framework within Healthcare Education; it investigates one of the eight lifelong learning key-competences required for managers, doctors, nurses and other health-related professionals. The research was conducted in a Higher Education Institutional setting through semi-structured interviews according to the hermeneutic methodologies allowing for a dialectic approach; it aims at gaining a better understanding of the digital skills which are considered as the most generic and transferable skills, and the training needs of healthcare professionals. The results, defined by 22 themes, express the participants' experiences, knowledge and level of comprehension of the subject. The research reveals that the DIGICOMP framework is applicable as a generic framework for professional practice. The interview data indicate highly individualised digital competence characteristics and behaviours of the participants.

Keywords: Digital competence · Digital literacy · EU DIGCOMP digital competence framework · Competence analytics

1 Introduction

Digital competence is considered as the most transferable competence [1] among eight key-competences for continuous, life-long learning [2]. In 2011 the European Union Directorate-General for Education and Culture commissioned the Digital Competence (DIGCOMP) project. The project documented the current state of knowledge among experts in research, education, training and work. It utilised an iterative Delphi-type survey that recorded the views of the experts, validated, refined and shared the results among the expert group, and collected feedback from peer review by engaging a significant number of 95 experts [3]. Work on a review of the literature [4] and the analysis and synthesis of existing digital competence frameworks [5] preceded this study and established a baseline of the prevailing digital competence and digital literacy theories.

In the Health Sector digital competences are a requirement for managers, doctors, nurses and other health-related professionals; 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

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users can threaten traditional jobs; people who lack the required digital skills may see their positions worsening and progressively marginalised in the labour market [6–8]. Thus it can be argued that healthcare trainers have a duty to modernise their curricula and ensure that digital skills become a graduate attribute.

This paper documents a qualitative exploration of the DIGCOMP framework within a higher educational institution in the United Kingdom in an attempt to assess its applicability as a theoretical framework for a wider research project aiming at embedding digital competences into curriculum development and delivery. This project is a partial fulfilment of the requirements of the main author's professional Doctorate in Education and has been carried out in the third year of a five year doctoral programme.

2 Methodology

Participants completed a bespoke online digital competence self-assessment questionnaire prior to the interviews commencing. The Evangelinos and Holley questionnaire toolkit [9] comprised of groups of five statements that described in detail each of the competence areas summarised in the table below that emerged from the initial results of the DIGCOMP framework [3] (Table 1).

Table 1. DIGCOMP framework competence areas

DIGCOMP Framework Digital Competence Areas	
▪ General knowledge and functional skills ▪ Use in everyday life ▪ Specialized and advanced skills for work and creative expression ▪ Technology mediated communication and collaboration ▪ Information processing and management ▪ Privacy and security	▪ Legal and ethical aspects ▪ Balanced attitude towards technology ▪ Understanding and awareness of the role of ICT in society ▪ Learning about and with digital technologies ▪ Informed decisions on appropriate digital technologies ▪ Seamless use demonstrating self-efficacy

Interviews were conducted according to the hermeneutic methodology [10] utilising a dialectic approach with eleven participants who volunteered from a pool of healthcare trainees and academic professionals within the institution. Informed consent was obtained in writing according to the research protocol governed by the university's ethical procedures. To investigate the interviewees views, assess their experiences and gain an insight into perceptions on their digital competences they were asked to describe, comment and expand on their choices in the questionnaire. Barker and Johnson [11], Walford [12] and Kvale and Brinkmann [13] all claim that this type of enquiry allows for a higher degree of variability of experiences, knowledge and level of comprehension of the subject matter among the research participants.

Five academics, three students and three admin professionals self-selected for interview and established the participant group. The inclusion of participants from all stakeholder groups of healthcare education was deliberate as the suitability of the framework had to be investigated from all perspectives and incorporate a variety of experiences and views. The audio recordings ranged from 90 to 120 minutes for each interview and produced a transcribed corpus of approximately 193,000 words. The interviews were recorded, transcribed and analysed through the use of the QSR NVivo software. The analysis was conducted by coding the interview corpora into emerging themes following the recommendations from Miles and Huberman [14] and Guest et al. [15]. The theme patterns were formed by counting the frequency of occurrence of the digital competence references mentioned by the participants and the number of individuals reporting on a theme to indicate its relative 'power'. The themes were then mapped onto the appropriate DIGCOMP framework area to investigate its suitability.

3 Results

Overall twenty-two themes emerged; twelve of them were mentioned by most of the participants. The first number in the parenthesis next to each theme indicates the number of individuals that mentioned a theme and the second number accounts for the total number of references (Table 2).

Table 2. Interview themes mapped onto the DIGCOMP framework areas

Dominant Competence Areas	Secondary Competence Areas
Use in everyday life (11/205) - *Technology use* (11/116)* - *Technology-use barriers* (9/47)* - Digital devices (10/28) - Online banking (8/14) **Specialized and advanced skills (11/119)** - *Technology use in education* (9/86)* - Content authoring and remixing (11/22) - Specialist digital skills (9/11) **Learning about/with technologies (11/97)** - *Learning skills and support* (11/85)* - Learning about new technologies (6/12) **Communication and collaboration (11/89)** - Communication/collaboration (10/43) - Social networks and media (11/37) - Communities of practice (5/9) **Balanced attitude (10/76)** - *Balanced use of technology* (10/76)* **Privacy and security (11/55)** - Security and privacy (11/55) **Information management (11/54)** - Information management (11/54)	**General knowledge and functional skills (7/38)** - Manuals and instructions (7/16) - General knowledge (5/9) - Hardware and software (7/9) - Operating systems (4/4) **Legal and ethical aspects (9/33)** - *Legal and ethical aspects* (9/33)* **Understanding and awareness of the role of ICT in society (8/20)** - Social issues (4/11) - Technology and the environment (4/9) **Informed decisions on appropriate digital technologies (0/0)** - N/A **Seamless use demonstrating self-efficacy (0/0)** - N/A

An analysis of selected (*) themes follows.

3.1 Analysis

'Technology use' emerged as the most significant theme and a fairly broad category that included a variety of user experiences. This was a direct result of an extensive range of the interviewees' experiences, and the non-prescriptive nature of the questionnaire toolkit used. This theme includes everything that can be interpreted as belonging to the sphere of technology use and does not fit within any of the other themes. Examples of common attitudes include the various types of e-commerce, the use of e-Government services (online taxation, driving licensing and passport renewals), the listening of music, reading e-books, watching movies and TV programmes, the use of mapping services, photography, auctioning, accessing information and news, word processing, video editing and job hunting. The use of technology specific to health included the online or over the phone booking of medical appointments, getting the results from clinics as a text message, digital vital sign monitoring and tele-care.

'Technology use in education' was equally important mainly due to the characteristics of the group of participants (academic professionals and students). Naturally, interviewees were expressing their lived experiences, and were drawing examples from their day-to-day engagement with the institution. Their examples can be split into technology-use in and outside the classroom. In-classroom technologies included the better utilisation of interactive boards, the use of digital assets such as hand-outs, visual aids and mind maps. The use of dynamic visualisation software, lecture capture/recording and the structured use of multimedia such as video and audio to enhance the lecture with activities and make the delivery more interesting, interactive and engaging. Other uses of technology in education include: technology for assessment in the form of e-submission and e-assessment, video conference and other types of communication (including social and new media networks) to facilitate learning at a distance and experimenting with creative use of video logs and blogs for teaching.

The '*Learning skills and support'* theme included the preferences on how interview-participants best acquire technological skills and the kind of support they prefer. All traditional ways of learning (formal, classroom-based, self-directed, peer-learning and on-the-job) have been mentioned. All of the participants indicated that they preferred to learn through examples relevant to their jobs and they would like to be given opportunities to try things out themselves (hands-on the job); they said they learn best what to do through example and demonstration, rather than through the narrative process. They would also like to engage with technology from an early stage and to be informed in what ways this engagement could be beneficial to them. Continuous support and the availability of help were also their concerns; some of them admitted that without support and help they feel helpless and they panic at times. The majority of the participants seek support and help from friends or family and only the confident ones search for answers online. Help sheets and/or online e-learning should be made available in addition to other forms of learning. All interviewees commented that they learn best if up-to-date software and other equipment are owned, since ownership provides them with opportunities to engage with technology in an informal way.

The *'Balanced, safe and efficient use of technology'* theme included comments on how people feel with (and without) technology and how technology should be used in a

safe and healthy way. To some extent, all the participants mentioned the importance of technology in their lives, and all but one reported negative consequences of lack of technology at their fingertips. However, one interviewee makes a conscious effort not to be dependent on technology and actively avoids using it when not necessary. Comments such as '*I could survive but it will be hard*', '*iPad and phone are never off*' and '*... there are very close to my heart but I could survive without them*' indicate dependence on the use of technology. This view is strengthened by the fact that in certain cases technology is so embedded/merged in the participant's daily life that they are not aware they are using it and at times they are multi-tasking with two kinds of technology (for example, they are using a phone/tablet while watching TV). The health and safety aspects of using technology safely include posture, positioning, size of screen, keyboard layout, foot rest, use of light, document holder and hearing protection, just to name a few. The participants have often felt that the relentless use of technology induces a type of techno-stress that arises from endless information overflow that often acts sub-consciously.

'Technology-use barriers' were also expressed by the participants. Academics highlighted the fact that even relatively simple tasks such as referencing can be challenging to some students. This may be due to a more generic trend of lax student engagement with particular technologies, not due to lack of engagement with technology in general, or lack of skills. This fact was attributed to a generic trend of '*lack of student motive*', which means that the students are not in charge of their learning and they have not become independent learners. Academics also mentioned that students still see learning as '*parts of knowledge related to assessment*' and not as a continuous, life-long process for self-improvement. The merging of their personal and professional identities and transferability of skills are not always apparent. One of the academics, when she tried to enhance her teaching with technology, noticed that digital devices (especially phones) are considered as private devices for fun, not as tools for work and learning by students. This view was reinforced by the fact that when they were asked to use a different device (a laptop or tablet) their mind-set often shifted and they became more open in using it for work or study. Another barrier highlighted by academics is that of some students' digital competence and engagement with technology. As one participant put it, '*Some students I could email from now until eternity and they may never read any of the emails that I send*'. This could be due to lack of skills and/or interest; however, this is the group of students we target to engaging, as they will benefit the most. Other students, although technologically capable and engaged, use only specific platforms and technology (e.g. mobile phones and social networks).

'Legal and ethical implications of technology use' also formulated a theme. Participants collectively expressed an awareness of copyright legalities, and academic attribution ethical requirements. Illustration of this understanding could be seen in responses that included the downloading of music, videos, films and software, just to name a few. The right of an individual to privacy and personal space was also discussed. Participants defended the right to privacy and respect of the individual's rights even in a public space. It was also acknowledged that since the development of modern technology and the advent of social networks the right to privacy is being increasingly diminished. The need for establishing appropriate, informal codes of conduct (sort of behavioural etiquette) for online digital communications (including social networks) was a consistent theme.

4 Discussion and Conclusion

The aggregate numbers of individuals and of mentions of the themes are ranked in the figure below per each competence area. Arrangement of the data according to the DIGCOMP competence areas reveals that two significant areas, 'Informed decisions on appropriate digital technologies' and 'Seamless use demonstrating self-efficacy', were not discussed/mentioned by any of the participants; therefore, they are not appropriate as participants cannot identify with them. The structure of the framework with its 12 competence areas is very accommodating and flexible and can be used to categorise the experiences of the participants (Fig. 1).

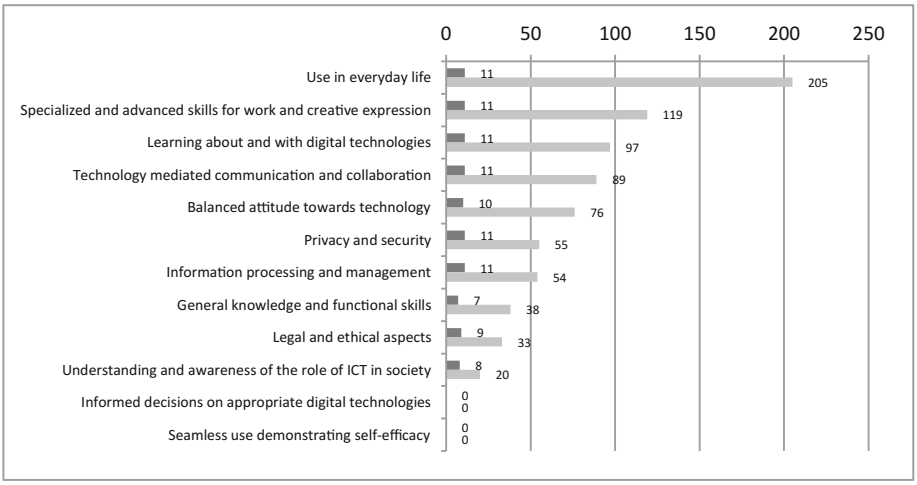

Fig. 1. Mapping of themes onto the DIGCOMP areas

Students were mainly preoccupied with the use of technology for academic study and in their personal lives. Examples of engagement with digital information through the library, the use of the World Wide Web, the Virtual Learning Environment and the creative use of technology to compile assignments and presentations were pervasive. In their personal lives they used technology mostly to communicate with their friends and family via a mixture of phone calls, messaging services and social networks. Most seemed to be aware of the 'dangers' of technology use and in particular of the Internet but did not always know how to protect themselves. Students seemed to be technologically fairly capable and engaged but this was primarily with a relatively small set of specific platforms and technology (e.g. mobile phones and social networks). This type of user is difficult to engage as their experiences (and consequently their skills) are limited and narrow and they often do not recognise their lack of necessary digital skills; on the contrary, they consider themselves as reasonably (and sometimes very) technologically competent. A student was using a Kindle E-Book reader to store a large collection of PDFs and books that practically could not be stored in student accommodation premises if they were in printed editions; otherwise the student would enjoy reading the printed books and other material.

Most academics stated that they are engaging with technology on a regular basis as they use it for work and leisure. They were particularly concerned with the continuous influx of work-related information on their private devices (such as smart phones or tablets). They felt that digital technologies offering enhanced access encourage the culture of considering a person as 'always on' and 'always available'. This has increased their stress levels and the feeling of restlessness [16]. They also felt that although technology-use in education can enhance the student experience, device ownership is not universal and some students do not own smart technologies; some students are completely disengaged from technologies and involving them in the use of technology may prove really difficult. One academic reported that when experimenting with interactive whiteboards and tablet technologies to deliver group work in the classroom, it was discovered that some students were less likely to engage with technologies; however, exposure to technology was beneficial and allocating a device to a small group of students rather than to each individual student spurred their motive for engagement.

Administrative professionals seemed to be using technologies as a matter of routine in their day-to-day lives, to carry out their work and for personal use. Reported experiences were similar to those of the academics and to some extent to those reported by the students that had shared use of a number of institutional systems. Their attitudes towards technology were positive as confidence was being increased and eventually they started carrying out complicated technology tasks as part of their workload. They welcomed the policy and protocol for technological system processes and they perceived these as advantageous; exactly the opposite assumption was reported by the academics who described the same processes as restrictive and bureaucratic. A senior administrator argued that advanced technological skills, such as drawing in specialist design software, could be gained 'on the job' and on-demand as these were required by the business workflow.

Given that digital technologies are increasingly used in healthcare provision [17] further work is required to define the digital competence characteristics pertinent to the healthcare profession. The DIGCOMP framework areas can be used as a generic guide to characterise the digital competence profiles of groups and individuals [9].

The interviews have identified significant themes that can be explored in more detail to further define the skills, views, practices and attitudes of the participants. Profiling of the digital competences and skills of groups and individuals can be used to baseline the digital competence characteristics of groups and individuals. The research data indicate that the characteristics of digital competence tend to be highly personalised and depend upon the individual's experiences. Specifying healthcare-specific digital competence characteristics may not be possible as, quite often, technology is used pervasively and interchangeably across education, work and leisure.

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