

# FACTORS INFLUENCING DIGITAL COMPETENCE: A FOCUS GROUP STUDY FROM THE PERSPECTIVE OF THE MEDICAL COLLEGE STUDENTS

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## ABSTRACT

Over the last decade, learning and working in medicine has been increasingly influenced by digital tools. Today's medical students are growing up in a digital age where digital tools and devices are a regular part of professional life. The development of digital competence is crucial for healthcare education, as healthcare professionals will be the ones helping orientate patients in digital healthcare systems and tools. This study aims to explore the opinions and experiences of medical college students regarding the factors influencing digital competence. Four focus group discussions were organised, with 26 medical college students in total in various study programmes in December 2021. The interviews were conducted in Latvian and transcribed by the lead researcher. Thematic analysis of the focus group discussions identified four main themes to be associated with the factors influencing digital competence: personal factors (self-confidence in using Information and Communication Technologies (ICTs), attitudes towards ICTs, prior training on ICTs, motivation), learning design (online, blended learning), lecturers' digital competence and external aspects (family support, Covid-19 pandemic). This study presented results that could also be helpful for other universities to promote targeted development and improvement of digital competence of their students.

**Keywords:** *digital competence, focus group, healthcare education, information technology, students' perspective*

## Introduction

In recent years digital competence has become the main notion in the discussions about which kinds of skills and competences would be required in the future society. Healthcare is one of the fields where development of digital competence plays the key role, especially taking into consideration digital revolution and development of e-health system. Healthcare is

introduced to a huge number of new digital solutions, such as Big Data, Artificial Intelligence, bio-sensory technologies, which allow to monitor health quicker, and discover various health problems in the society and issues in the healthcare industry (Sharma et al., 2018). Healthcare professionals are more and more often using e-health system in their work; patient health data is stored digitally, and taking into consideration the Covid-19 pandemic, there has been a huge increase in demand and offer for e-appointments and consultations. As the result of digital transformation, technologies and tools such as virtual reality, Artificial Intelligence, Big Data etc. are entering the healthcare field (Sætra et al., 2021). In order to successfully work in the digitalized healthcare industry, healthcare professionals have to learn new multi-layered competences and new fields, including a different model of the staff-patient relationship that is based on the mutual trust. Gradually, as the result, training digital tools are to be mastered, and there are also changes to happen in healthcare service technical representation, as well as cooperation and sharing approach with the help of a working system (European Economic and Social Committee, 2017).

Certain research data reveals flaws in the knowledge of healthcare professionals, for example, in relation to the principles of data processing and analysing, or to the knowledge of basics qualities of the clinical information system (Dixon et al., 2017; Walpole et al., 2017; Jimenez et al., 2020). It is very important though for the healthcare professionals to have digital knowledge, as it will help them to provide better service for their patients.

The level of digital competencies of healthcare professionals is closely linked to evidence-based healthcare and includes patient education. Healthcare professionals can encourage patients to critically evaluate the available health-related information resources so as not to jeopardize their health (Theron et al., 2017).

The development of digital skills and competences is particularly important in healthcare studies, as healthcare professionals will be the ones to help patients navigate digital healthcare services. In order to effectively include development of digital competence in healthcare studies, it is first necessary to understand how digital competence is acquired. It is important to see how much depends on the content of studies, and how much depends on other influencing factors.

Based on the above, focus group discussions were organised within the framework of this study to find out the opinion of medical college students about the factors influencing acquisition of digital competence.

### **Digital competence**

Digital competence is a relatively new term that has not yet been precisely defined. It first appeared in the documents related to politics

(European Council, 2006; European Commission, 2010; Eurydice, 2011). This term has also been differently interpreted (for example, digital ability, digital competence, e-ability, e-skills, e-competence, computer skills and media user skills) in both political and academic background. All these terms point out the necessity to use technologies in the digital age (Ferrari, 2012).

Digital competence is one of the eight lifelong education basic skills defined by the European Commission, and it is defined as follows: “Digital competence is confident, critical and responsible use of digital technologies for learning, working and integrating into society. It includes the ability to use information and data, use of communication, cooperation and mass media tools, creation of digital content, security, problem solving and critical thinking” (European Council, 2018).

Most researchers point out that digital competence is not simply the use of ICT technologies, but also a requirement for employment and citizenship, that helps individuals to successfully participate in the society of the 21<sup>st</sup> century (Guzmán-Simón et al., 2017; Ala-Mutka, 2011; Ferrari, 2012).

Digital competence is researched in various frameworks; for example, Calvani working in collaboration with other colleagues developed a framework that includes 3 dimensions: technological, communication and ethical, and mutual integration of these areas (Calvani et al., 2008).

Delphi research involved 95 experts from various industries in Europe, and Janssen with colleagues (Janssen et al., 2013) concluded that digital competence has 3 main components: knowledge, skills and relationship, which are related to 12 different fields – general knowledge and functional skills, use in everyday life, specialized and advanced competence 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 role of ICT in society, learning about and with digital technologies, informed decisions on appropriate digital technologies, seamless use demonstrating self-efficacy.

Another widely used framework is the framework of digital competence of European citizens, which is also known as DigComp, divided into 5 areas: information and data literacy, communication and cooperation, creation of digital content, security, and problem solving.

### **Digital competence influencing factors**

Research until now suggests that development of digital competence is influenced by many factors simultaneously; for example by personal environment factor, socio-demographical factor (Hatlevik, 2015; He & Chang, 2017; Benali et al., 2018; Jiménez-Hernández et al., 2020), views

and relationship in the society in regards to information technology, study results, learning strategies and digital competence of tutors (Cote & Milliner, 2016; Jiménez-Cortés et al., 2017). Current available research is mainly focused on representatives of the field of education or students and there are relatively few publications specifically about factors influencing digital competence amongst medical students or amongst healthcare professionals.

For example, in the research conducted by a scientist Jiménez-Cortés amongst 368 female students it was discovered that there is a connection between the learning style and digital competence. Students who used a wider range of learning strategies showed higher results in digital competence (Jiménez-Cortés et al., 2017).

In the research conducted in 2015 in Norway (amongst 9th grade students, however) it was discovered that digital competence is influenced by factors such as study results in the previous semester, mastery aim or task completion driven studies, socio-economic background of student's family and also the language spoken in the family (Hatlevik, 2015).

The research conducted amongst teachers showed that age, professional experience and previous ICT studies significantly affect the level of digital competence (Benali et al., 2018; Jiménez-Hernández et al., 2020)

In turn, the research conducted amongst university students shows that sex is an important factor that influences the self-evaluation of student's digital competence. Most research showed that male students rated themselves higher than female university students in several sections of digital competencies such as information and data literacy, digital content creation and problem solving (Zhao et al., 2021; Cabezas González et al., 2017).

Research conducted about digital competence level amongst healthcare specialists and its influencing factors shows that important are demographical factors, work experience, professional qualification and specialization.

For example, participants of a research conducted in Ethiopia – healthcare professionals – showed relatively low level of basic digital competence. Problem solving, communication and safety were the main indicators in lower scores in digital competence. This study found that sex, educational status, profession type, monthly income and years of experience all significantly affect healthcare providers' digital competence (Shiferaw et al., 2020).

In turn, the research carried out in Scotland, in which took part 131 pharmacist, did not indicate that sex, age or previous work experience impacted healthcare providers' digital competence level (MacLure & Stewart, 2015).

A research carried out in Switzerland amongst medical professionals and nurses in psychiatric hospitals studied the relation between technostress and digital competence and revealed that higher digital competence was tightly

associated with lower technostress levels. The same research concluded that younger healthcare professionals perceive themselves as having higher digital competence (Golz et al., 2021).

The use of digital services has become an integral part of a nurse's profession and it makes digital competence crucial to carrying out daily responsibilities. Research amongst nurses up until now has been more connected with informatics competence or computer literacy. For example, a study carried out in Finland aimed to evaluate the potential impact of national educational initiatives launched in 2015 on the nursing informatics competences of Finnish registered nurses. Nurses' graduation year was associated with their overall nursing informatics competence and the specific competence related to terminology-based documentation. Nurses who graduated after the initiatives had higher informatics competence than nurses who had graduated before that (Kaihlanen et al., 2021).

Research conducted amongst nurses confirm the connection between computer literacy and positive attitude towards computers. Computer-literate nurses displayed positive attitudes towards the use of computers in health care (Gürdaş Topkaya et al., 2015; Malo et al., 2012).

The results of research conducted in Taiwan and South Korea revealed that personal innovativeness in ICT, computer education and age are significant factors that raise computer literacy levels (Hsu et al., 2009).

There are relatively few studies about external factors influencing digital competence amongst healthcare professionals. Biggest part of available research is mainly focused on self-assessment of digital competence and computer literacy. This research, however, mentions various factors influencing digital competence, such as sex, age, work experience, attitudes toward ICT, graduation year and technostress. Considering all of the above, this research will explore opinion of medical students about factors influencing digital competence. This will possibly help to discover some other important factors that contribute towards developing digital competence.

## Methodology

This is a focus group study. We aimed to collect qualitative data by engaging groups of medical college students in an informal group discussion focused on their perceptions of factors influencing digital competence.

Focus group study happened in several stages:

- theory and context study;
- choice of appropriate qualitative method;
- drawing up questions for focus group discussion;
- inviting the research participants to attend the discussion;
- focus group organization (data collection);

- data processing (thematic analysis);
- result processing.

The participants were students recruited from one of Latvia's medical colleges. The study was approved by the medical college's Ethics Commission and participation was voluntary, with prior informed consent given of the purpose and its confidentiality.

### Participants and recruitment

Information about the opportunity to participate in a focus group discussion was published in the medical college's e-study environment in the news section. The participation in the discussion was voluntary. When registering for the discussion, the students were asked to provide information about their age, sex, education level, study program and year. A total of 26 medical college students (24 females and 2 males) participated in four small group online discussions. The average age was 31.30 ( $SD = 10.46$ ). Ten participants already had higher education, while the remaining 16 had secondary education.

Four online focus groups were formed according to the study programs (Treatment, Nursing, Therapeutic Massage and Pharmaceuticals) involving students of different study years and were organized in December 2021. The composition of each focus group is illustrated in Table 1.

**Table 1.** Focus groups participants

Focus group	Participants	Study program
Group 1	8 students: 2 men, 6 women	Treatment
Group 2	11 women students	Nursing
Group 3	5 women students	Pharmaceuticals
Group 4	2 women students	Therapeutic Massage

The length of each focus group discussion was from 45 to 60 minutes. In the beginning of the focus group discussion, the participants were introduced to the definition of Digital competence based on the Citizens' digital competence framework (DigComp 2.1: eight learning levels and usage examples).

The interviews were conducted in Latvian. At the end of each interview, the moderator provided a summary and feedback on the answers received from the respondents. Then respondents reflected, confirmed or added to the content of their answers. After each focus group discussion, the moderator prepared a detailed interview transcript.

## Focus Group Protocol

The main aim of the focus group was to understand what factors are influencing digital competence from the perspective of medical students. To achieve this goal and promote a more productive discussion, the students were asked the following question:

- Which factors influence digital competence?

## Qualitative analysis

This study used the thematic analysis approach outlined by Braun and Clarke (Braun & Clarke, 2006).



**Figure 1.** Thematic analysis approach by Braun and Clark (2006)

The qualitative data analysis was done following the six steps shown in Figure 1. After each discussion, researchers read transcripts of all the focus groups to get an overall idea about the answers. The next step was to encode the obtained data, and in this phase, researchers started to organise the data in a meaningful and systematic way. The researchers were concerned with addressing specific research questions and analysed the data with this in mind – so this was a theoretical thematic analysis. The researchers coded each data segment relevant to it or captured something interesting about the research question. Finally, the researchers compared the codes, discussed them and modified them before moving on to the rest of the transcripts. After generating codes, the researchers moved to search for themes. In this process, themes were characterised by their significance. In the next step, the researchers read the data associated with each theme and considered whether the data did support it. The final step involved weaving together the analytic narrative and data extracts.

## Results

The thematic analysis was conducted to explore the opinions and experiences of medical college students regarding the factors influencing digital competence. Four main topics were identified with the factors influencing digital competence: “personal factors”, “learning structure”, “external conditions”, and “teacher’s digital competence” shown in Table 2.

**Table 2.** Themes, Codes and Examples of Opinions Expressed in Response to the Discussion Question: Which factors influence digital competence?

Themes	Codes	Examples (transcript text)	
personal factors	self-confidence in using Information and Communication Technologies (ICTs);	<p><i>“I have never had any contact with digital things or anything like that before. I graduated from high school thirteen years ago and started learning digital skills again”</i></p> <p><i>“I started my studies immediately after graduating from high school, and I had no problems adjusting to the study process, including using a variety of digital tools or platforms”</i></p>	
	attitudes towards ICTs;	<p><i>“I have been using computers since 1998, so I started learning digital skills pretty quickly, so right now, I’m not afraid to work with something new”</i></p> <p><i>“I do not own a PC and I do not like all those digital things, which made coming back to studies after a break difficult, because a lot of things happened remotely”</i></p> <p><i>“One should know where to find the information, how to use it and show to others, the technology helps me a lot”</i></p>	
	prior training on ICTs;	<i>“I participated in the RigaTech Girl project, and it was an excellent opportunity to learn and improve ladies programming skills”</i>	
	motivation	<p><i>“Motivation is essential; you have to learn to do something because no lecturer will do it for you”</i></p> <p><i>“The desire to develop and motivation to continuously educate myself”</i></p> <p><i>“One needs willpower to learn something new”</i></p>	
	learning design	online learning;	<p><i>“As I switched to remote learning, I began to take notes online, export files, and use the GoodNotes application”</i></p> <p><i>“For me, it was something new that could listen to lectures differently”</i></p> <p><i>“Remote studies make you learn how to use technologies”</i></p>
		blended learning	<i>“The lecturer posted an audio lecture in Loom, and I had to search for information to learn how to open, use, and perform the functions needed to listen to the e-lecture”</i>



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Themes	Codes	Examples (transcript text)
external aspects	family support;	<i>“While I was studying and my husband was very supportive, it was very motivating, really very motivated me”</i>
		<i>“I have three children who supported me during my studies when I began to use different technologies and platforms, because the beginning of my studies was not easy”</i>
	Covid-19 pandemic	<i>“Thanks to the Covid19 pandemic, more information was sought and processed, learning new platforms such as Zoom and MS Team”</i>
		<i>“The pandemic promoted inequality, because not everyone has a high speed Internet access at home, and not everyone can properly connect to classes”</i>
lecturers’ digital competence	lecturers’ attitudes towards ICTs	<i>“Much depends on the lecturer; if he uses the word, then us too, if Zoom – then we too. We adapt to lecturers”</i>
		<i>“As for the digital skills of the lecturers, it is interesting when you have to log in to the lecture on Zoom platform, then one puts the link in Moodle system and goes straight in; the other only gives the codes. Therefore you have to log in to Zoom system and enter everything yourself”</i>
	utilising digital technology in teaching	<i>“It is precious that the lecturers record the lectures and place them in Moodle. We have the opportunity to listen again and learn the teaching materials more thoroughly. At the same time, some lecturers disagree and even admit that they do not know how to do it”</i>

Within the framework of the thematic analysis, the themes were identified based on the codes, which in turn were made based on the transcripts. During this research, students emphasized the impact of personal factors, such as their personal motivation, attitude towards digital technologies, and previous experience in working with IT technologies. Examples from Table 2 show both positive and negative attitudes of students towards ICTs. Motivation is particularly highlighted as a key factor in developing digital competence. One student admitted it was due to studying in the medical college that they started to learn digital skills again. Another student mentioned that prior training on ICTs helped them to improve digital competence. During the discussion, students also mentioned learning design as

one of the factors influencing digital competence. Transition to online and hybrid study process during Covid-19 pandemic was one of the key factors in developing digital competence. Giving personal experience examples, the participants explained that they had to learn how to use new platforms and adapt to the online study process. Students also mentioned lecturers' digital competence as the factor influencing digital competence of the students. One student stated that the type of a platform or technology used for studies had a direct impact as well, since the students then had to learn those specific tools. During the discussion, the students also said that external factors such as family support or the Covid-19 pandemic could influence the development of digital skills in individuals. Students were happy to share their personal experience in regards to this question and told about their family and children support in mastering digital technologies, which helped them to successfully participate in the studies.

Opinions about the influence of Covid-19 pandemic on developing digital competence, however, were divided. One participant highlighted that Covid-19 pandemic promoted inequality in terms of access to technology. They noted that not everyone, including school pupils, was able to have a quality connection to join the studies. Another participant, in turn, said that it was the pandemic that encouraged them to master new digital tools and platforms.

## Discussion

University students are expected to have the appropriate digital competence to face the demands of the changing educational model and to meet the challenges of the future work (Zhao et al., 2021). Healthcare is one of the areas that is rapidly undergoing digital transformation nowadays. Consequently, the development of digital competence of medical students is especially important, as digital technologies change the healthcare services design, communication with patients, diagnostics and treatment tactics. In order to be able to provide the necessary support in development of the digital competence, the opinion of medical college students on the factors influencing digital competence was clarified in the framework of this study. According to the completed thematic analysis, there were 4 main topics identified in relation to the factors influencing digital competence: "personal factors", "learning structure", "external conditions", "teacher's digital competence".

Based on the answers provided by the students in the focus group during the discussion, "personal factors" was identified as the first topic. Students acknowledged that it is self-confidence using information and communication technologies (ICT), attitude towards ICT, prior learning

in the field of ICT and motivation that are the most important personal factors that can influence their digital competence. Studies by other authors have also revealed that attitude towards ICT can affect the level of digital competence (Ryder & Machajewski, 2017; Kim et al., 2018). For example, researcher Kim and his colleagues found in their research that students' positive attitude towards ICT contributed to a higher level of digital competence in the study process at the university (Kim et al., 2018). In turn, a study in Spain has revealed that, although university students had a positive attitude towards ICT, their level of digital competence was just average (Guillen-Gamez et al., 2020). The results of these studies demonstrate that there is no unambiguous opinion that a positive attitude towards ICT contributes to the development of digital competence.

As part of the focus group discussion, medical students stated that prior learning experience could affect the level of digital competence; specifically, self-evaluation of digital competence is increasing. Studies conducted by several authors also confirm this conclusion. (Sánchez-Caballé et al., 2020; Romero-Tena et al., 2020).

The learning structure was identified as the second topic for this study. The results of a study conducted by Buluma and colleagues show that the mixed learning approach has improved the level of digital competence in line with navigation in the Internet environment, operating mobile Internet, operating Internet-based search engines, and formal Internet skills among teacher trainees (Buluma & Walimbwa, 2021).

The students stated that Covid-19 pandemic also contributed to the development of their digital competence, thus identifying the third topic as "external conditions". The results of a study conducted by researchers Sari and Yoni also confirm that the Covid-19 pandemic promoted students' digital literacy due to the transformation of the learning environment into the e-environment; as a result, students were forced to learn various online platforms in order to successfully engage in the learning process (Sari & Yoni, 2021).

Discussion participants also stated that family support could encourage development of digital competence. No scientific articles supporting this connection were found, but the influence of family background on the digital competence has been studied. Hatlevik and colleagues found out in their research that family background plays a role when explaining variations in digital competence (Hatlevik et al., 2015).

The teacher's digital competence was identified as the fourth topic for studying the factors influencing digital competence. Researchers conducted by other authors also confirm that teachers' digital competence is one of the keys to success in promoting not only students' own digital literacy, but also academic achievements (Maini et al., 2021; Sillat et al., 2021).

This study is not exhaustive. Probably not all influencing factors were identified in this study, as individuals were not always able to clearly reflect and understand what could specifically affect the digital competence of healthcare students in this case. The majority of the focus group participants were women; there were 24 women only two men. It is hence possible that certain factors influencing digital competence were not discovered due to unequal sex ratio of participants in this research.

This research identified factors influencing digital competence from the perspective of medical students, but deeper research is required in the future to learn the direction of this influence: for example, whether it promotes or slows down the development of digital competence. Another possible direction for future research is analysis that could study differences between various study programs and people with different level of prior (?) digital competence.

Despite these limitations, the results obtained in this study provide important data on the factors influencing the digital competence of medical students.

## Conclusions

In order to promote the development of digital competence in the study process in the future, a focus group discussion with medical students was conducted within the framework of this study to find out their opinion on the factors influencing digital competence. The focus group interview questions provided the medical students with an opportunity to express their views on digital competence and the factors that could influence it. The obtained results revealed that digital skills are influenced by the following important factors: 1) personal factors (self-confidence in using information and communication technologies (ICT), attitude towards ICT, prior learning about ICT, motivation); 2) learning structure (online, mixed learning); 3) teachers' digital competence and 4) external conditions (family support, Covid-19 pandemic). More studies are needed in order to find out other potential factors influencing digital competence that were not mentioned in this research. Obtained results of the research cannot be generalized and applied to other groups of students, because it carries some risk stemming from the limitations of the research. Nevertheless, this study presented results that could also be helpful for other universities to promote targeted development and improvement of digital competence of their students.

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