Information systems in healthcare - medical students' perspective and knowledge

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Abstract — **In modern-day digital society, computer literacy of students has become crucial. Rapid technological changes make self-assessment of this skill important for recognizing the need for improvement. Research helps understand their confidence in the digital environment and their ability to cope with technological changes, which can inform curriculum adaptation and support development of technological competence. The aim of this research is to assess whether there is a difference in computer literacy between medical students and medical laboratory diagnostics students. The assessment of computer literacy was based on questions related to the students' skills and knowledge of information technologies. Research results showed that almost all subjects are capable of independently using various tools, while a smaller number of subjects require assistance.**

Key words: computer literacy, program, self-assessment, students

I. INTRODUCTION

A. What is computer literacy?

In today's digital society, computer literacy has become an essential skill. Computer literacy is the ability or knowledge required to effectively and efficiently use a computer. It is also defined as a set of skills that include the ability to work with numbers and documents, such as word processing programs and spreadsheets, and use web browsers, e-mail, and internet search engines (1). With access to online courses, educational resources, and interactive platforms, computer literacy empowers individuals to pursue self-directed learning. It opens opportunities for personal growth, acquiring new knowledge, and staying informed in a rapidly evolving digital society (2). This paper explores the importance of this concept and emphasizes the need to understand how students perceive their own computer literacy and how it affects their education and future professional challenges.

B. Importance of computer literacy

The advancement of technology is changing the way we communicate, work, and create, so students have to acquire computer literacy. In this context, self-assessment of computer literacy becomes crucial as it enables an understanding of one's own skills, weaknesses, and the need for improvement.

On the internet, students have access to a wealth of information, which can facilitate independent research and help them better grasp learning concepts. Computer literacy can assist them in conducting research more easily and in drawing independent conclusions (3). Furthermore, computer literacy enhances professional opportunities because it is no longer just a desirable skill but a vital one in today's job market. Computer literacy opens doors to a wide range of professional possibilities and allows individuals to adapt to technological advancements and collaborate effectively in virtual teams (2). In a rapidly changing world, computer literacy serves as a strong foundation for lifelong learning. It enables individuals to adapt to new technologies and continually improve their skills.

C. Computer literacy in medicine

When it comes to medicine, computer literacy holds special significance. A significant portion of medical data today is digital (medical records, images, laboratory test results, and patient histories), making computer literacy essential for healthcare professionals to quickly analyse and efficiently manage this data (4). Medical data is sensitive and requires a high level of protection. Computer literacy enables staff in healthcare institutions to better understand and implement security measures in order to safeguard patient privacy. Additionally, computer literacy plays a significant role in electronic health record management, allowing medical professionals to efficiently utilize patient monitoring systems, manage treatments, and exchange information (4). Analytical methods are crucial in diagnostics, research, and decision-making in medicine. For this reason, computer literacy empowers medical researchers to use various algorithms for analysing large datasets (5). Researchers in medicine are increasingly using information technologies for data collection and analysis. It is essential for students and medical professionals to be familiar with and trained in using information systems and software specific to medicine to perform their tasks effectively. Computer literacy in medicine contributes to improving healthcare, diagnostics, research, and the efficiency of the healthcare system. This, in turn, enhances patient care and addresses medical challenges more effectively (6,7).

II. OBJECTIVES

The objectives of this research are the following:

- To investigate how students assess their computer knowledge, and

- To examine if there are differences in opinions between students in the Integrated Undergraduate and Graduate Study Programme of Medicine and students in the 1st, 2nd, and 3rd years of the Undergraduate Study Program and 1st and 2nd years of the Graduate Study Programme of Medical Laboratory Diagnostics.

III. SUBJECTS AND METHODS

A. Study design

This study was designed as a cross-sectional study.

B. Subjects

The study involved 50 students of the Faculty of Medicine Osijek, 27 of whom attended the Integrated Undergraduate and Graduate Study Programme of Medicine, 20 attended the Undergraduate Study Programme of Medical Laboratory Diagnostics and 3 attended the Graduate Study Programme of Medical Laboratory Diagnostics.

C. Methods

The survey was conducted using an anonymous questionnaire consisting of questions about basic computer skills, word processing, creating spreadsheets and databases, making presentations, and knowledge of the use of the internet and e-mail. The questionnaire also included general questions such as the student's field of study, year of study, and age. The questionnaire was administered in the form of a survey on Google Forms. Subjects were required to answer 5 survey questions with sub-questions and rate their responses on a scale of 1 - 4. In this scale, 1 indicated "no," 2 indicated "only with assistance," 3 indicated "with minor assistance," and 4 indicated "yes."

D. Statistical methods

Categorical data were presented using absolute and relative frequencies. Numerical data were described using the mean and standard deviation in cases where they followed a normal distribution, or the median and interquartile range in cases where they did not follow a normal distribution. The normality of the distribution of numerical variables was tested using the Shapiro-Wilk test. Differences in categorical variables were tested using the Chi-square test and, if necessary, the Fisher's exact test. All p-values are two-tailed. The significance level was set at $\alpha = 0.05$. For statistical analysis, MedCalc® Statistical Software version 20.218 (MedCalc Software Ltd, Ostend, Belgium; https://www.medcalc.org; 2023) was used.

IV. RESULTS

A. General characteristics of the subjects

The research involved 50 subjects, 40 (80%) of whom were female and 10 (20%) were male. The median age of the subjects was 21 (with an interquartile range from 20 to 23 years of age), ranging from a minimum of 19 to a maximum of 29 years of age. In terms of the study programme, 27 (54%) subjects attended the Integrated Undergraduate and Graduate Study Programme of Medicine, while the fewest subjects attended the Graduate Study Programme of Medical Laboratory Diagnostics, namely only 3 (6%) subjects. Subjects in their second and third years of study were more represented. Among the subjects, 40 (80%) reported that they had taken a course related to medical informatics or statistics (Table 1).

TABLE I. DISTRIBUTION OF SUBJECTS BY GENERAL CHARACTERISTICS

		Number of subjects (%)
Gender	Male	10 (20)
	Female	40 (80)
Study programme	Integrated Undergraduate and Graduate Study Programme of Medicine	27 (54)
	Undergraduate Study Programme of MLD	20 (40)
	Graduate Study Programme of MLD	3 (6)
Year of study	1st year	7 (14)
	2nd year	10 (20)
	3rd year	22 (44)
	4th year	4 (8)
	5th year	5 (10)
	6th year	2 (4)
Taken a course related to medical informatics or statistics	Yes	40 (80)
	No	10 (20)

B. Assessment of computer literacy

The assessment of computer literacy was conducted by using 30 questions related to the students' skills and knowledge of information technologies. More than 90 % of the subjects reported that they can use a mouse and a control panel, run a program or manage files (Table 2).

TABLE II. COMPUTER LITERACY SELF-ASSESSMENT

Number (%) of subjects				
	No	Only with assistance	With minor assistance	Yes	Total
I can use a mouse.	0	1 (2)	0	49 (98)	**50 (100)**

	No	Only with assistance	With minor assistance	Yes	Total
I can use a control panel.	0	1 (2)	0	49 (98)	**50 (100)**
I can run a program.	0	0	1 (2)	49 (98)	**50 (100)**
I can manage files.	0	0	2 (4)	48 (96)	**50 (100)**

Nearly all of the subjects are proficient in using word processing tools, with the exception of page numbering and footnote insertion, which is something that 38 (76%) of the subjects can do without assistance (Table 3).

TABLE III. SELF-ASSESSMENT OF KNOWLEDGE RELATED TO WORD PROCESSING

Number (%) of subjects				
	No	Only with assistance	With minor assistance	Yes	Total
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I can create a document in a word processing program.	0	1 (2)	0	49 (98)	**50 (100)**
I can edit a text (change font size, style, colour...)	0	1 (2)	1 (2)	48 (96)	**50 (100)**
I can insert and edit images and tables.	0	0	1 (2)	49 (98)	**50 (100)**
I can insert a link.	0	1 (2)	1 (2)	48 (96)	**50 (100)**
I can number pages and footnotes.	1 (2)	1 (2)	10 (20)	38 (76)	**50 (100)**
I can perform a spell check.	1 (2)	0	9 (18)	40 (80)	**50 (100)**
I can save and print a document.	0	0	1 (2)	49 (98)	**50 (100)**

When it comes to creating tables and databases, 80% or more of the subjects responded that they do not need assistance, while one subject (2%) reported not knowing how to create tables and databases (Table 4).

TABLE IV. SELF-ASSESSMENT OF KNOWLEDGE RELATED TO CREATING SPREADSHEETS AND DATABASES

Number (%) of subjects				
	No	Only with assistance	With minor assistance	Yes	Total
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I can create and save worksheets.	1 (2)	3 (6)	6 (12)	40 (80)	**50 (100)**
I can create a chart.	0	3 (6)	5 (10)	42 (84)	**50 (100)**
I can change and sort data in a worksheet.	1 (2)	6 (12)	6 (12)	37 (74)	**50 (100)**

	1 (2)	3 (6)	6 (12)	40 (80)	**50 (100)**
I can create a spreadsheet and enter data in it.	1 (2)	3 (6)	6 (12)	40 (80)	**50 (100)**
I can save and close a spreadsheet.	1 (2)	0	7 (14)	42 (84)	**50 (100)**
I can enter data in a template/form.	1 (2)	4 (8)	8 (16)	37 (74)	**50 (100)**

All subjects know how to create a presentation, insert images into the presentation, and save it. The area where the least knowledge is reported is in spell-checking the presentation (Table 5).

TABLE V. SELF-ASSESSMENT OF KNOWLEDGE RELATED TO CREATING PRESENTATIONS

Number (%) of subjects				
	No	Only with assistance	With minor assistance	Yes	Total
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I can create a presentation.	0	0	0	50 (100)	**50 (100)**
I can insert an image in the presentation.	0	0	0	50 (100)	**50 (100)**
I can insert a graphic.	0	0	2 (4)	48 (96)	**50 (100)**
I can add transitions and animations in the presentation.	0	0	1 (2)	49 (98)	**50 (100)**
I can spell check the presentation.	1 (2)	2 (4)	7 (14)	40 (80)	**50 (100)**
I can save the presentation.	0	0	0	50 (100)	**50 (100)**

Most of the subjects are familiar with using the internet and e-mail. A smaller number of subjects mention difficulties when scheduling e-mails (Table 6).

TABLE VI. SELF-ASSESSMENT OF KNOWLEDGE RELATED TO THE INTERNET AND E-MAIL

Number (%) of subjects				
	No	Only with assistance	With minor assistance	Yes	Total
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I can access and search the internet.	0	1 (2)	0	49 (98)	**50 (100)**
I can use search engines.	0	0	0	50 (100)	**50 (100)**
I can open an e-mail.	0	0	1 (2)	49 (98)	**50 (100)**

I can forward and reply to an e-mail.	0	0	1 (2)	49 (98)	**50 (100)**
I can delete an e-mail.	0	1 (2)	2 (4)	47 (94)	**50 (100)**
I can schedule an e-mail.	0	4 (8)	5 (10)	41 (82)	**50 (100)**
I can attach a file.	0	0	1 (2)	49 (98)	**50 (100)**

There is no significant difference in the assessment of computer literacy in regard to the study programme (Table 7).

TABLE VII. Computer literacy assessment by study programme

	Median (Interquartile range)		P*
	Medicine	MLD	
I can use a mouse.	4 (4 – 4)	4 (4 – 4)	0.36
I can use a control panel.	4 (4 – 4)	4 (4 – 4)	0.36
I can run a program.	4 (4 – 4)	4 (4 – 4)	0.36
I can close a program.	4 (4 – 4)	4 (4 – 4)	0.19
I can manage files.	4 (4 – 4)	4 (4 – 4)	0.87
I can create a document in a word processing program.	4 (4 – 4)	4 (4 – 4)	0.36
I can edit a text (change font size, style, colour...)	4 (4 – 4)	4 (4 – 4)	0.19
I can insert and edit images and tables.	4 (4 – 4)	4 (4 – 4)	0.36
I can insert a link.	4 (4 – 4)	4 (4 – 4)	0.19
I can number pages and footnotes.	4 (3 – 4)	4 (4 – 4)	0.76
I can perform a spell check.	4 (3 – 4)	4 (4 – 4)	0.25
I can save and print a document.	4 (4 – 4)	4 (4 – 4)	0.36
I can create and save worksheets.	4 (4 – 4)	4 (4 – 4)	0.9
I can create a chart.	4 (4 – 4)	4 (4 – 4)	0.31
I can change and sort data in a worksheet.	4 (3 – 4)	4 (3 – 4)	0.95
I can create a spreadsheet and enter data in it.	4 (4 – 4)	4 (4 – 4)	0.70
I can save and close a spreadsheet.	4 (4 – 4)	4 (4 – 4)	0.85
I can enter data in a template/form.	4 (3 – 4)	4 (3 – 4)	0.95
I can create a presentation.	4 (4 – 4)	4 (4 – 4)	>0.99
I can insert an image in the presentation.	4 (4 – 4)	4 (4 – 4)	>0.99
I can insert a graphic.	4 (4 – 4)	4 (4 – 4)	0.12
I can add transitions and animations in the presentation.	4 (4 – 4)	4 (4 – 4)	0.36
I can spell check the presentation.	4 (4 – 4)	4 (4 – 4)	0.56
I can save the presentation.	4 (4 – 4)	4 (4 – 4)	>0.99
I can access and search the internet.	4 (4 – 4)	4 (4 – 4)	0.36
I can use search engines.	4 (4 – 4)	4 (4 – 4)	>0.99
I can open an e-mail.	4 (4 – 4)	4 (4 – 4)	0.36
I can forward and reply to an e-mail.	4 (4 – 4)	4 (4 – 4)	0.36
I can delete an e-mail.	4 (4 – 4)	4 (4 – 4)	0.69
I can schedule an e-mail.	4 (4 – 4)	4 (4 – 4)	0.54
I can attach a file.	4 (4 – 4)	4 (4 – 4)	0.36

V. Discussion

This study examined the computer literacy self-assessment of the students of the Faculty of Medicine Osijek. A total of 50 subjects participated in the study.

A study of computer literacy conducted in the library of the Faculty of Humanities and Social Sciences in Mostar showed that students have a high level of computer literacy, however many of them struggle with finding and evaluating information (9). Computer use and computer education significantly impact the attitudes of healthcare professionals regarding the computerisation process, which indicates to the importance of medical informatics in educating healthcare professionals at all education levels (10).

Based on the introductory questions regarding the subjects' basic characteristics, it is apparent that there were more female subjects that participated in this questionnaire, which was expected due to the fact that the majority of students at the Faculty of Medicine Osijek are female.

In terms of their study programs, the subjects were divided into students of the Integrated Undergraduate and Graduate Study Programme of Medicine and students of the Undergraduate and the Graduate Study Programme of Medical Laboratory Diagnostics. For both study programs there was an

approximately equal number of subjects, however there were somewhat more students of the Integrated Undergraduate and Graduate Study Programme of Medicine. When it comes to the question regarding the year of study, most of the subjects answered that they were in their 3rd year, regardless of their study programme. The final question on the subjects' basic characteristics concerned the matter of whether or not they had taken a course related to medical informatics or medical statistics, to which almost all subjects answered "Yes".

The anonymous questionnaire for self-assessment of computer literacy started with questions on the skills and knowledge regarding information technology. Basic computer skills include the knowledge of fundamental concepts relating to computers, devices and computer programs making up a computer, and the knowledge of basic terms used in the context of computer networks and the internet (11). It has been established that almost all subjects are familiar with basic computer skills such as using the control panel, running a program and managing files. The second part of the questionnaire concerned the programs most frequently used on the computer, and these are word processing programs, programs for creating databases and for making presentations. When it comes to word processing, almost all subjects assessed themselves as being capable of using word processing tools, but some of them struggle with numbering pages and footnotes. When it comes to self-assessment of knowledge related to creating spreadsheets and databases, the majority of subjects reported that they do not need assistance. The remaining few stated that they require help, and one subject reported not being familiar with the procedures for creating spreadsheets and databases. The reason behind this is that students generally rarely use programs for creating spreadsheets and databases. When it comes to creating presentations, all subjects assessed themselves as being capable of creating a presentation, inserting images, and saving the presentation. Students often use presentation and word processing programs, both in their academic and personal lives, which is why they reported having better skills in this context. Some of the subjects need minor assistance with spell-checking presentations. The final question in the anonymous questionnaire pertained to self-assessment of knowledge related to the internet and e-mail. Most subjects assessed themselves as being familiar with using the internet and e-mail, while some of them experienced difficulties with scheduling emails.

We are all aware of the fact that computer technology is rapidly advancing and becoming a significant part of our daily lives. This anonymous questionnaire provided us with insights into the students' opinions about their own knowledge in this area. It was expected that students, in this case, the subjects, would be familiar with the tools and possess the skills required to manage various computer programs. I believe/The authors believe that this is due to the fact that many educational institutions offer study programmes that enable students to effectively use technology for research and learning, and thus become computer literate. Additionally, students have the opportunity to enrol in numerous study programs that are closely related to computer science and involve the use of computers, the internet, various computer programs, and other tools. As mentioned earlier, computer literacy has become an essential skill in modern-day digital society. This fact encourages students to become more computer literate as it facilitates communication through e-mail, social media, and various other digital platforms. It also aids them in their studies because there are now many programs available for word processing, creating presentations, scheduling, and more. Moreover, computer literacy is often a necessary skill for numerous careers and jobs in today's modern world. Computer literate students have an advantage over many other candidates when it comes to employment. Regarding computer literacy in a healthcare setting, the authors believe that possessing the necessary skills and knowledge of specific tools is a significant advantage. It allows for greater efficiency in performing tasks and facilitates access to information on the internet for the requirements of data collection in research, as computers provide access to information at any time and from anywhere in the world, serving as a complement to the use of libraries, which primarily offer traditional printed literature (11).

VI. CONCLUSION

Based on the conducted research and the obtained results, it can be concluded that students are very familiar with various tools and there is no need for additional training in basic skills. Additionally, there is no significant difference in the assessment of computer literacy in regard to the study program.

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