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Allied medical sciences students' experiences with technology: are they digitally literate?

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Abstract

Objective: The ability to use digital resources is important for medical students. In order to use digital resources, they need the capabilities of digital technology utilizing, which is referred to as "digital literacy. However, how much effectively students can use these facilities is a subject that needs to be addressed. So, the present study intended to investigate the digital literacy level of students of the Allied medical sciences of Shahid Beheshti University of Medical Sciences.

Materials and methods: This cross-sectional study was performed at the Faculty of Allied medical sciences of Shahid Beheshti University of Medical Sciences in academic year of 2016-2017 using a researcher-made questionnaire containing 23 closed questions in four sections. A total of 115 students in three educational grades: bachelor, master and the PhD grade were included in this study. Z-test was used to evaluate the relationship between internet skills and students' academic achievements if any exist.

Results: Almost half of the students (51.3%) have not completed any computer courses regarding basic ICT skills. The findings showed that 41.2% of PhD students are aware of digital literacy concept; meanwhile, only 11% of bachelor students and 20.6% of master ones knew the actual meaning of this concept. The use of public search engines was a favorite alternative for finding specialized terminologies at all grades. Furthermore, there was a significant difference between the level of familiarity with the Internet and the students' grade ($p \leq 0.05$).

Conclusion: Digital literacy training courses can enhance digital literacy skills significantly. Most students agreed with the inclusion of digital literacy courses in their curriculum. Therefore, they should be supported by educators and librarians in order to effectively use the Internet and information technology as well as to overcome the problems of finding and using information to gain academic achievement.

Keywords: Digital Literacy; Information Technology utilization; Computer Literacy

Background:

Recent advancements in information and communication technologies (ICTs) have changed the learning methodologies for everyone. Due to computers and the Internet, the learning process requires people's ability to access, locating, extract, evaluate, organize and provide digital information. Nowadays, the Internet provides access to the various virtual information resources and the ICTs are fundamental instruments for effective learning in educational environments in the 21st century, which plays a key role in effective learning and creative performance in educational environments (Shopova, 2010). Being merely an information transfer medium is not important for the learners, but they should be able to systematically acquire the capabilities required to search and select information resources (Shopova, 2014). In fact, in order to use digital resources, people need the capabilities and skills of utilizing digital technology, which is referred to as "digital literacy"(Argentin, Gui, Pagani, & Stanca, 2014).

There is a close relation between digital literacy and information literacy. Information literacy is referred to as the ability of individuals to access and utilize the information (Frederick & Riesser, 2013). Digital literacy means the individual's ability to find, evaluate, extract, organize and utilize digital information that requires technical and cognitive skills (Steenburgh, 2015). The amount of knowledge and skills which a person possesses to use information technology, and also, identification of the level of ability of individuals to perform various complex tasks is identified by digital literacy (S. Lee, 2014).

Digital literacy expresses the individual's knowledge and skills in using information and communication technologies, and his/her ability to perform complex tasks for effective use of digital environments. This perspective reflects that digital literacy has become a skill that people require to obtain information, achieve success, communicate and interact with others,

find jobs, succeed economically, participate actively in the community, collaborate online and personal development. People who are still digitally illiterate or have insufficient digital literacy cannot engage in today's digital world (S.-H. Lee, 2014).

Skills and capabilities of digital literacy are divided into six categories(Siddike, 2010). The first category, called digital literacy fundamental capabilities, refers to possessing different skills, such as the ability of learning in order to communicating, analyzing and solving problems. The next category is the basic capability of digital literacy, which mainly involves the knowledge of computer and related technologies. The average capability of digital literacy is another category of digital literacy skills, which relates to the knowledge of using various features of the operating system and software applications. Advanced digital literacy capabilities include information organization and knowledge-ability in terms of the use of different tools to achieve the required information. Technical abilities of digital literacy are related to the ICT and generally consist of the ICT economics. Ultimately, there are the specialized digital literacy skills, which allow the individual to not only have sufficient knowledge of information resources, but also of various online databases, search engines, and email. They can also use digital technology to facilitate the evaluation of retrieved information and, in fact, to use digital media and instruments to provide information explicitly(Siddike, 2010).

Bawden(2008) provides a useful and effective concept of digital literacy that involves four components, i.e. underpinnings, background knowledge, central competencies, and attitudes and perspectives (Bawden, 2008). The “underpinnings” represent the basic skills of digital literacy. Background knowledge consists of individuals' knowledge for understanding the nature of information and resources. Central competencies are the individuals' abilities to find, search, combine, and critical analysis of the information. Attitudes and perspectives refer to individuals' ability to learn independently and ethically use of information. The ability to use

digital resources is important for all community members, including students. The ability to use digital resources is an important factor for student progress during their presence in the university and digital literacy is a prerequisite for learning in a student-centered learning culture(Lankshear & Knobel, 2008). Communication technologies allow students to interact with each other for educational purposes (Echenique, Molías, & Bullen, 2015). Digital technologies provide students with a wide range of tools and applications, so that they can store and transfer information in digital formats (Echenique et al., 2015).

Every year, thousands of new students enroll in universities which most of them have an experience in information and communication technologies. But nevertheless after one year, it is clarified that most of their knowledge about ICT is superficial and do not have the skills required to make effective use of digital information resources(Verhoeven, Heerwegh, & Wit, 2012) . It is clear that digital skills of the students are essential for the academic literacy (Guzmán-Simón, García-Jiménez, & López-Cobo, 2017). Simon et al. found that digital skills which is learnt out of formal campus are not sufficient to meet the student's information requirements. Santos and Serpa (2017) pointed out that digital literacy skills of postgraduate students are different, therefore digital literacy training programs should be promoted (Santos & Serpa, 2017).

Currently, students not only need to seek information, but also need to learn how to evaluate, find, access and use information effectively. The ability to master the skills of finding, understanding, evaluating and utilizing the information in effective and ethical manners for meeting individual and academic needs, is fundamental to student learning and leads to better results and more successful learning performance (Shopova, 2014). On the other hand, students with higher levels of education and digital skills can retrieve more useful and relevant information(Shariman, AbdulRazak, & Mohd.Noar, 2012).

One group of students includes medical students. This group of students should increase their capabilities such that they can perform their duties well both at the education period and afterwards. The medical field has a specific status regarding its direct relation with community health due to the speed of creating new medical information on the one hand, and the shortened expiration date of this information on the other, in terms of its direct relation with people's health. Therefore, students of medical sciences universities are among the most important groups of students.

In 1395, Shahid Beheshti University of Medical Sciences was selected as the top university of medical science in terms of educational rating by the Ministry of Health of Iran. Leading in the field of information and communication technology and the establishment of the e-University are taken as 2025 perspectives of the Shahid Beheshti University of Medical Sciences in the framework of fourth National Development Plan. One of the missions of this university is to provide the country with the necessary human resources in the field of medicine. Therefore, in order to achieve these objectives, students need to adapt themselves to the scientific advancements to meet their information requirements more quickly from the wide array of information. The use of smart-phones, Internet, and the University's digital library provide them with great facilities; however, how students are able to use these facilities to better meet their information requirements is an issue that needs to be addressed. So, the present study intended to investigate the capabilities of the students of the Allied medical sciences of Shahid Beheshti University of Medical Sciences in four aspects of digital literacy. The findings of this study can help instructors and policy makers of universities to identify methods of enhancement of the students' digital literacy skills.

Literature review

Abdollahy and Ahmadi (2011) performed a study on the level of digital literacy among undergraduate students at Tehran University of Medical Sciences. The research population included 376 undergraduate students. Findings showed that, generally, the digital literacy of undergraduate students is not desirable. Also, the results showed that there is a direct and significant relationship between the rate of Internet use and digital literacy in the studied population (Abdollahyan, Hamid, 2011).

Another study was performed on 595 undergraduate students at Obafemi Awolowo University, University of Ibadan and University of Lagos. The findings showed that most students believe that they have a high level of technological literacy. They are also able to use resources without committing plagiarism (Adeoye & ADEOYE, 2017).

Wan Ng (2012) studied the knowledge of undergraduate students about the educational technologies used in e-learning in Australia. The results indicated that undergraduate students are easily able to use the technologies they need for education. However, they need to be trained on technologies they can use for education (Ng, 2012).

Valizadeh-Haghi and Rahmatizadeh (2018) studied the information behavior of allied medical sciences' students. The results showed that students did not have the necessary knowledge on how to use the digital library of the university and did not receive the necessary education in this regard. Also, participants in this study stated that lacking knowledge on how to search the Internet and the databases is among the problems they face (Valizadeh-Haghi & Rahmatizadeh, 2018).

Methods:

This cross-sectional study was performed at the Faculty of Allied medical sciences of Shahid Beheshti University of Medical Sciences in academic year of 2016-2017. The population of

the present study consisted of students in three educational grades, bachelor's grade with 471 students, master grade with a total of 260 students and the PhD grade with 120 students. For sampling, the selection method of Quota (Lavrakas, 2008) was used and 64 bachelor students, 34 master students and 17 PhD students, a total of 115, were included in this study

This study was carried out using a researcher-made questionnaire containing 23 closed questions. The questionnaire was designed based on Standards and Guidelines of ALA that were established to enhance the digital and informational capabilities of postgraduate students, as well as the Bawden Digital Literacy Model (Bawden, 2008). The questionnaire included four sections related to four categories of digital literacy based on the Bawden model. The first section of the questionnaire refers to underpinning literacy, basic ICT skills, and the ability to operate a computer. The second section covers student's knowledge of the nature of information resources, and databases. The third section is related to the professional skills of students, such as how to search, find and analyze the information critically. The fourth section relates to the students' view of the ethical use of information and resources. Validity of the questionnaire was confirmed by obtaining experts' opinions in terms of the library and information science and its reliability was confirmed by using Cronbach's alpha 0.86. The questionnaire was distributed in person and by direct referral method among the studied population.

It was assumed in this study that there is a significant relationship between internet skills and students' academic achievements. Z-test was used to evaluate this hypothesis.

Also, the "compare mean test" was used to compare the average level of familiarity of the students with Internet among all groups. In this regard, first the normal distribution of the familiarity level with the Internet should be considered. Considering that the variable of the

familiarity level with the Internet had no normal distribution, Wilcoxon test was used to compare the means. The data were analyzed using SPSS v.16 software.

Results:

The demographic and academic information of the participants is presented in Table 1.

Table 1: students’ demographic and academic information

Variables	Educational degree	n	Percentage
Education degree	Bachelor	64	55.7%
	Master	34	29.6%
	PhD	17	14.8%
Age group	18-22	50	43.5%
	23-27	40	34.8%
	28-32	8	7%
	33-37	10	8.7%
	over 38	7	6.1%
Gender	Female	84	73%
	Male	31	27%
Total	-	115	100

The basic aspect of the digital literacy is basic ICT skills. In this regard, almost half of the students (51.3%) said that they have not completed any computer courses regarding basic ICT skills. Also, the findings indicated that half of the students (50%) use computers every day. Purposes of the students in using computers are listed in Table 2. Personal use was the most sought purpose of the using computers (76%); following by scientific research aims (66%).

Table2. Purposes of using the computer

Purpose	Work		Assignment		Scientific Research		Personal Use		Entertainment		Business	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
N	48	67	74	41	76	39	87	28	56	59	16	99
percentage	42%	58%	64.3%	36%	66%	%34	76%	24.3%	48.7%	51.3%	13%	86 %

The computer skills of students at the three educational grades are shown in Table 3. In terms of the level of computer skills, most PhD students assessed their skill level, good (64.7%) and very good (23.5%). Likewise, most bachelor and master students expressed their skills good and moderate.

Table 3. Computer skills levels

Educational degree	Bachelor				Master				PhD			
	Basic	moderate	good	excellent	Basic	moderate	good	excellent	Basic	moderate	good	excellent
n	13	31	17	3	1	15	17	1	0	2	11	4
percentage	20%	48.4%	26.6%	4.7%	2.9%	44.1%	50%	2.9%	0	11.8%	64.7%	23.5%

The second aspect of digital literacy skills included the students' background knowledge of information resources and technical terms (including cloud processing, Thesaurus, and the concept of digital literacy). Table 4 illustrates, regarding the term "cloud computing or processing", the level of familiarity of students with this term. The findings showed that only 12.5% of bachelor students, 26.5% of master students and 41.2% of PhD students are familiar with this term.

Table 4. Familiarity with the term cloud computing

Educational degree	Bachelor		Master		PhD	
Familiarity	Yes	No	Yes	No	Yes	No
n	8	56	9	24	7	10
percentage	12.5%	87.5%	26.5%	70.6%	41.3%	58.8%

In response to the question "Which of the following resources do you use to help define a specific term in a specialized database?", Table 5 indicates students' familiarity with specialized terminology resources. Bachelor students' awareness of the thesauruses was very low (1.6%). But the level of familiarity was better with the two other academic grades. However, the findings show that the use of public search engines is a favorite alternative for finding specialized terminologies at all grades.

Table 5. Familiarity with specialized terminology resources

Educational degree	Bachelor				Master				PhD					
	Recourse	Dictionary	Thesaurus	Search engine	Don't know	Recourse	Dictionary	Thesaurus	Search engine	Don't know	Recourse	Dictionary	Thesaurus	Search engine
n	21	1	32	16	8	11	19	2	8	6	8	2	8	2
percentage	32.8%	1.6%	50%	25%	23.5%	32.5%	55.9%	5.9%	47.1%	35.3%	47.1%	11.8%		

In terms of familiarity with the concept of digital literacy, the findings showed that 41.2% of PhD students are aware of this concept. Meanwhile, only 11% of bachelor students and 20.6% of master ones knew the actual meaning of this concept (Table 6).

Table 6. Familiarity with the term digital literacy

Educational degree	Conceptual understanding	n	percentage
Bachelor	Don't know the actual meaning of DL	25	39.1%
	Have heard, read but do not understand	6	9.4%
	Have vague concept	16	25%
	Have clear concept	7	10.9%
Master	Don't know the actual meaning of DL	13	38.2%
	Have heard, read but do not understand	5	14.7%
	Have vague concept	7	20.6%
	Have clear concept	7	20.6%
PhD	Don't know the actual meaning of DL	5	29.4%
	Have heard, read but do not understand	1	5.9%
	Have vague concept	3	17.6%
	Have clear concept	7	41.2%

It was found, in response to the question "Which of the social networks are you using?", that students' membership in scientific social networks was not in a favorable situation, since only 7% were registered in Academic.edu, 20% in ResearchGate, and 27.8% in LinkedIn.

In the following, findings of the research on the third aspect of digital literacy skills (student's knowledge of the nature of information resources, and databases) are discussed.

In this aspect of digital literacy, the level of students' skills regarding the Internet were evaluated by questions based on the Likert scale, ranging from lack of skill to excellent skill (Table 7). Most participants in this study expressed their skills as moderate or good. 45.3% at the bachelor grade, 38.2% at the master grade and 23.5% at the PhD grade expressed their skills as moderate (Table 7).

Table 7. Internet skills

Educational degree	Internet level	n	Percentage
Bachelor	Not at all skilled	2	3.1%
	Not very skilled	12	18.8%
	Fairly skilled	29	45.3%
	Very skilled	18	28.1%
	expert	2	1.6%
Master	Not at all skilled	1	2.9%
	Not very skilled	3	8.8%
	Fairly skilled	13	38.2%
	Very skilled	15	44.1%
	expert	2	5.9%
PhD	Not at all skilled	0	0
	Not very skilled	1	5.9%
	Fairly skilled	4	23.5%
	Very skilled	8	47.1%
	expert	4	23.5%

It was assumed in this study that there is an association between the academic grade and the level of internet skills, but the results of the Z-test showed that there was no significant difference between the academic level and the level of Internet skill.

Students were then asked to give their opinions about how to search the information they need in the online environment. Most students (bachelor level 87.5%, master level 88.2%, and PhD level 88.2%) stated that they use public search engines. Findings showed that only 10.9% of bachelor students, 17.6% of master students and 23.5% of PhD students were searching for information in subject portals.

Table 8. The method of looking for information

Educational degree	Information channels	n	Percentage
Bachelor	search engine	56	87.5%
	Browsing websites	16	25%
	Subject portals	7	10.9%
	Take help who knows	9	14.1%
Master	search engine	30	88.2%
	Browsing websites	13	38.2%
	Subject portals	6	17.6%
	Take help who knows	7	20.6%
PhD	search engine	15	88.2%
	Browsing websites	9	52.9%
	Subject portals	4	23.5%
	Take help who knows	0	0

The study participants were asked to express their familiarity level with the Internet-related terminologies (Table 9) by choosing an alternative from 1 to 5, with 1 indicating no familiarity and 5 indicating complete familiarity.

Table 9. Internet related terminologies

Natural language	Advanced search	Spam	Modem
News Group	ISP	Meta search engine	Browser
Flaming	PDF	Cookie	Server
Spider	Preference setting	Remote login	Html
IP address	Meta tag	Refresh/ Reload	'Bcc', option in e-mail

Findings revealed that there is a significant difference between the level of familiarity with the Internet and the students' educational grade at the 95% confidence level ($p \leq 0.05$). this significant difference is shown in Table 10.

Table 10. Incremental value in the mean of the all three group students

Educational degree	Mean	standard deviation
Bachelor	41.67	11.77
Master	54.46	17.49
PhD	68.35	15.77

The fourth aspect of digital literacy is related to the ethical use of information, privacy, and ethical behavior in the area of digital communication. Most students at all three grades (47% of Ph.D. students, 52.9% of master students and 35.9% of bachelor students), thought of intellectual property rights, copyright regulations and ethical use of information as important issues (Table 11).

Table 11. Students' view on Intellectual Property Rights

Educational degree	options	n	percentage
Bachelor	Very important	23	35.9%
	Important	22	34.4%
	Moderately important	15	23.4%
	Not important	1	1.6%
	Don't know	3	4.7%
Master	Very important	18	52.9%
	Important	7	20.6%
	Moderately important	7	20.6%
	Not important	1	2.9%
	Don't know	1	2.9%

PhD	Very important	8	47.1%
	Important	7	41.2%
	Moderately important	2	11.8%
	Not important	0	0
	Don't know	0	0

Finally, the students' views on the inclusion of digital literacy training courses in the curriculum were investigated. Findings showed that most students agreed with the inclusion of digital literacy courses in their curriculum (59.4% of bachelor students, 67.6% of master students and 82.2% of PhD students) (Table 12).

Table 12. Students' view about inclusion of DL courses

Educational degree	Option	n	percentage
Bachelor	Yes	38	59.4%
Master	Yes	23	67.6%
PhD	Yes	15	82.2%

Discussion:

Digital literacy skills are important for students and have an amazing effect on students' information behavior as well as their performance during the learning process(Shopova, 2010). The present paper examined the digital literacy skills of allied medical science students. The results showed that students have low levels of skills in all aspects of digital literacy.

Findings regarding the first aspect of the digital literacy(ICT underpinning skills) revealed that half of the students (51.3%) have not yet completed any courses on computer education which is consistent with the research carried out in the University of Punjab(Bashir, Mahmood, & Shafique, 2008) . Thus, it can be said that the level of students' computer skills seems to be insufficient because they have acquired these skills without attending formal training courses. Similarly, Valizadeh-Haghi and Rahmatizadeh(2018) in a study on allied medical science

students' information seeking behavior, showed that students did not have the necessary knowledge about how to use the digital information resources provided by university. Furthermore, they considered the lack of knowledge on how to search the Internet and the databases as problems facing while searching their needed information (Valizadeh-Haghi & Rahmatizadeh, 2018).

In addition, more than half of the students (66%) at all degree programs demonstrated that they use computers to complete their scientific research. Since the study participants have never completed a course on computer training, they may not be able to find the accurate information they need to conduct their scientific researches, and this has a negative effect on their educational and research performance. That is due to the fact that academic achievement of students, especially bachelor ones, is associated with their digital literacy skills in finding reliable information on the Internet (Adeoye & ADEOYE, 2017).

Also, in the first year of education, the performance of students with digital literacy skills is better than those who do not have these skills. The lack of adequate digital skills and factors such as social and economic affects their educational performance (Westhuizen & Park, 2011).

The second aspect of digital literacy skills was about the students' knowledge of information resources and familiarity with technical terminologies (including cloud computing, thesaurus, and the concept of digital literacy). The results showed that at all academic levels (12.5% of bachelor students, 26.5% of master students and 41.2% of PhD students), the familiarity with these terminologies was low. Meanwhile, Cloud computing is one of the new concepts that play an important role in ICT today. Therefore, awareness of cloud computing will help students to better understand ICT-related concepts. Furthermore, the findings showed that most of the students in all academic grades had very little knowledge about thesaurus. Since most academic databases use controlled terminologies and Thesaurus, the low level of students'

awareness of this resource leads to find inaccurate information or even making mistake in information retrieval.

In the present study, the participants' familiarity with the concept of digital literacy does not have optimal level. Moreover, the findings showed that there was no significant relationship between academic level and familiarity with the concept of digital literacy; however, there is a positive increasing flow towards students' familiarity with the concept of digital literacy, bachelor (10.9%) master (20.6%) and PhD (41.2%).

In this regard, it can be stated that as their academic level rises, skills which students have is due to the experiences they have already gained. Appropriate training courses are needs to increase the level of digital literacy skills as well as the familiarity of students with the concept of digital literacy. Most students (75.2%) agreed with the inclusion of digital literacy courses in educational curriculum. This will certainly lead to a positive impact on their digital literacy skills as well as their scientific achievements, because having the appropriate knowledge during the learning process can be achieved by increasing the level of digital literacy among students to meet the information requirements(Shopova, 2010). The findings showed that most students are not registered in scientific social networks. That is despite the fact that social networks are one of the most important instruments for the students to connect with faculty members and people related to their field of study. Therefore, the importance of scientific social networks could be highlighted for students by giving them the necessary knowledge and training. subsequently, the universities can also use the capabilities of these networks to enhance students' digital literacy skills (Echenique et al., 2015).

In the third aspect of digital literacy, the level of student skills was evaluated in terms of the use of the Internet. The results indicated that the level of Internet skills of students is relatively acceptable regardless of their academic level (Table 7). In addition, at all levels of study, the

use of public search engines is favorite tool for students to find digital information. While search engines have deficiencies in upgrading their databases (Lewandowski, 2008), and thus they may not provide the students with updated information. The findings showed that some bachelor and master students also get others' assistance to find information in the online environment – what PhD students never mentioned. Moreover, it is very helpful to search and access information via subject portals, but the students indicated that they made very little use of these portals.

The fourth aspect of digital literacy is the ethical use of information, privacy, and ethical manner regarding of digital communication. At all academic levels, most students have considered intellectual property rights, copyright regulations and ethical use of information as a critical issue. Nevertheless, it is important to train the students more in terms of the ethical use of information and the prevention of plagiarism.

Generally, the results of the present study showed that most of the students do not have sufficient digital literacy skills and this will negatively affect their digital information searching. Nowadays students use digital devices and digital content and interact with digital information. They make use of web browsers, search engines and social networks, and they are partially skilled in using the Internet. Meanwhile, they still lack adequate skills in all four aspects of digital literacy. A study performed by Shapova on students' digital literacy also showed that most students have enough skills to use social networks and email, to work with the Internet, online games and subscription to online groups, but their skills in appropriate and effective using of novel technologies for meeting their information requirements are very superficial(Shopova, 2014). Today's students are different from the previous generations in using digital technology, interactions, and learning methods. These differences are due to the widespread use of tools, devices, applications and resources that can storage and transfer data

in digital forms, such as computers, the Internet, email, smart-phones, as well as Web 2.0 technologies, weblogs and social networks(Echenique et al., 2015) .It should be noted, however, that the results of this study were based on the students' self-reports and that their digital literacy skills need to be assessed and evaluated practically.

It is necessary for the students to have the knowledge and skills in digital technologies that enable them to effectively use information in a variety of digital formats (electronic publishing, online videos, stored audio files, digital libraries, databases, etc.). In addition, students should have the ability to interact with the information resources they use to learn, and to use them independently to solve scientific problems in their projects and studies.

Conclusions:

Digital literacy training courses can enhance digital literacy skills significantly. Bachelor students have more problems in the information searching processes than other levels. They need to be supported by educators and librarians in order to effectively use the Internet and information technology as well as to overcome the problems of finding and using information to gain academic achievement.

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