Original Article

Disciplinary-based information literacy skills among medical students

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Abstract:

INTRODUCTION: Disciplinary-based information literacy (DIL) or professional-related information literacy has not been widely studied in the academic context, including medical sciences. This study aimed at investigating the status of DIL among medical students in an Iranian medical university.

MATERIALS AND METHODS: This study was a cross-sectional survey. A random sample consisting of 298 students majoring in general medicine at Tehran University of Medical Science, Tehran, Iran, in the academic year of 2018–2019 completed a valid and reliable 20-item questionnaire on DIL. Data were analyzed using SPSS statistical software.

RESULTS: Participants' DIL was less than expected, especially in the skills related to professional information access and evaluation. The majority of them had low DIL level. However, medical students in their last 2 years of study had significantly high scores in DIL than those in their first 2 years of study.

CONCLUSION: Information literacy has not been seriously considered in health-related higher education in Iran. It is needed to consider DIL in the medical curriculum for training students to be proficient specialists in medical practice.

Keywords:

Disciplinary-based information literacy, information literacy, Iran, medical students, Tehran University of Medical Sciences

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Introduction

As an extended concept of traditional literacy,[1] information literacy is necessary in the information age[2] and facilitates our interactions with the information-embedded world. Information literacy necessitates developing critical thinking, knowing information search strategies, familiarity with information resources, effective use of accessed information, and so on.[3] Information literacy skills are needed for lifelong learning.[4]

Educational institutes should aim at teaching their students how to learn independently in order to enhance their educational and career achievements. Information literacy is a tool for such learning. Therefore, the Association of College and Research Libraries (ACRL)

published Information Literacy Competency Standards for Higher Education in 2000. Five main standards (with several performance and output indicators) have been included in these standards. The standards measure students' abilities and skills in determining their information needs, effectively accessing their needed information, critically evaluating accessed information, appropriately using information, and understanding and applying ethical, economic, and social aspects in accessing and using information in different contexts.[5]

These general standards have been subjected to many practical studies in different contexts worldwide, e.g., for determining medical students' information skills in Nigeria[6] and for measuring the information literacy status and the use of information technology among medical students in Iran.[7]

The relationship between information literacy and professional fields can be explained based on the role of education and education-related skills in professional achievement.[8] Therefore, information literacy can be divided into basic or general and disciplinary-based or professional ones. The former considers one's basic and general skills in information-related affairs, and the latter focuses on those of one's special skills relating to his/her educational field and academic profession.[9] However, disciplinary-based information literacy (DIL) has not been well considered in academic fields and scientific disciplines, including medicine.

Information literacy is an urgent need for students to integrate their basic knowledge and acquired information and to interact with information for education, work, and entertainment, as well as improving their research, educational, and professional performance. In addition, training students with innovative, creative, and entrepreneurship skills as factors of a successful education system necessitates information literacy skills.[10]

Medical students need information literacy skills to be innovative and creative in their careers.[11] This can prepare medical learners to do their disciplinary-based duties with high quality. In addition, medical students acquire university education for being trained in lifelong learning as well as serving as health information providers and medical practitioners. Therefore, it is vital for them to be information literate in their profession.[12] DIL can help medical students in acquiring and integrating professional information for solving medical problems and being better in their practices.

In spite of much research on the general or basic information literacy skills, few has been done on the disciplinary-based/professional information literacy skills among students majoring in different scientific fields, including among others, medical students. This study aimed at investigating the status of disciplinary-based information skills among medical students in an Iranian medical university as well as comparing the skills of the first year and the final year medical students.

Research Methods

This study used a cross-sectional descriptive survey method conducted in the academic year of 2018–2019. The study population included all medical students majoring in general medicine in the Tehran University of Medical Sciences, Tehran, Iran. Based on the data delivered by the educational deputy of the university, about 2378 medical students were studying in the university in the academic year of 2018–2019 (*13th Statistical Yearbook 2019*). Out of them, 331 students were selected randomly as the study sample.

A questionnaire was designed based on some related works in the field of information literacy,[13-15] by main focus on the medical disciplinary-based content. The questionnaire included an introduction, asking participants to voluntarily complete the questionnaire. It included twenty multi-option one-choice items on the DIL, in addition to some demographic and background questions. These items were related to the five components of information literacy, as noted by the ACRL (2000) in its five main information literacy standards (i.e., information know, access, evaluation, use, and acknowledgment). Each item had a true response and one or more false ones. True answer for each item was rated 1 and false answer was rated 0. As a result, the minimum and maximum scores of a student could be 0 and 20, respectively. Scores below 7, between 7 and 14, and over 14 were considered as low, moderate, and high DIL levels, respectively. The midpoint score was 10. The reliability of the questionnaire was calculated by Cronbach's alpha coefficient which equaled to 79%, and its validity was confirmed by two medical as well as two library and information science experts.

After gathering and completing data extracted from 298 fully completed questionnaires, data were transferred to SPSS 22, SPSS Inc., Armonk, NY, USA, Descriptive statistics (frequencies, means, and standard deviations) and analytical statistics (*t*-test and Mann–Whitney U-test) were applied in the confidence interval of 0.95 ($P < 0.05$) for data analysis.

Results

Based on the respondents' demographic information, 173 (58%) and 125 (42%) of them were female and male students, respectively. Their mean age was 21.22 ± 3.01 years. Of them, 78 (26%) and 102 (34%) were in their first and last 2 study years, respectively. Of them, 118 (40%) were in their middle study years (the third–fifth study years).

Table 1 shows the mean score of students in DIL. As can be seen, their DIL was estimated as 8.62, which was considered as the moderate level (between 7 and 14).

For studying the possible significant difference between students' DIL mean score and the midpoint score, one-sample *t*-test was used. As Table 2 depicts, students' DIL mean score was significantly lower than expected ($t_{[df = 297]} = -13.719$, $P < 0.01$).

Table 3 shows the number of students based on the level of their DIL scores as well as their mean scores in each

Table 1: Descriptive statistics on students' DIL literacy

Variable	Midpoint	Score range	Mean score±SD
DIL	10	7-14	8.62±3.01

SD=Standard deviation

level. As can be seen, the highest number of students (158, 53%) had the low level in DIL ($M = 6.72$).

Based on Kolmogorov–Smirnov normality test, the distribution of data on DIL scores of the first and last 2 years' students was not a normal distribution ($Z = 0.133$, $P < 0.01$). Therefore, Mann–Whitney U-test was used for comparing data. Table 4 shows the results of Mann–Whitney U-test for comparing students' DIL mean scores in their first and last 2 study years. Students in their last 2 study years had significantly higher mean score than those in their first 2 study years ($U_{[n1 = 36, n2 = 51]} = 6558.00$, $P < 0.05$). It is notable that the difference between the means was low and estimated as 1.23.

The status of students in DIL components was measured for investigating their skills in searching, evaluating, using, and recognizing the needed information. Table 5 depicts the mean scores of the students in the components of DIL in detail. As can be seen, they had the highest (10.38) and lowest (6.84) scores in information know and information evaluation, respectively.

Discussion

Aiming at evaluating the DIL among medical students in an Iranian university, this study found that the status of this literacy was low among the students, and their DIL amount was in the middle level, less than what it was expected. Other studies in Iran on other disciplines and universities, e.g.,[16,17] showed the low level of students' basic information literacy skills. However, they did not study DIL.

In addition, the majority of studied students in our study had low-level DIL. As the studied students were from one of the main medical universities in Iran, this situation

may be the case in other similar universities. These findings show that the higher education in Iran's health system paid no much attention to students' information literacy skills needed for their research, education, and practice. Despite their importance, information literacy concepts are absent from the related curricula.

Considering the significant difference between the DIL mean scores of 1st year and last year students, it can be said that students' continuous encounter with research and scientific information during their study years can improve their DIL. Emde and Emmett emphasized that this improvement is natural due to students' continuous encounter with research and scientific information during their study years.[15] However, the low difference between the mean scores of these two student groups reflects the low effect of university health education on medical students' DIL levels, too.

Considering the components of DIL, it was found that the students had the lowest mean score in evaluating information, followed by accessing information. This finding emphasized the importance of training them in information search and evaluation skills and approaches for reaching the best results needed for satisfying their professional information needs. Evaluative skills need critical thinking as a main acquirement for information literacy.[18]

One of the success factors in higher education and a way to reach an effective and knowledge-based economics is the information literacy.[19] This is true in case of medical sciences as Carroll *et al*.[11] showed. They found that students that received information literacy training on topics related to medical entrepreneurship and health-care economics showed significantly improved performance on some aspects of health-care economics. Our findings, however, reflect the lack of an integrated curriculum related to skills needed for information literate students of the information age. An information literacy-embedded curriculum is needed in medical fields, as done in microbiology field by Brown and Krumholz.[20] They integrated a course on information literacy into the curriculum and found a considerable educational achievement among students. Such an integrated curriculum needs continuous cooperation of responsible individuals and their enough training,[21] as well as considering the requirements of each discipline.[22] In addition, other training programs need to be hold in this case in the absence of such a curriculum. The information literate university is an approach of future successful

Table 2: Results of one sample *t*-test for comparing students DIL mean score and midpoint (*n*=298)

Variable	Mean±SD	df	T	P
DIL	8.62±3.01	297	−13.719	0.000

SD=Standard deviation

Table 3: The frequencies of students based on their DIL levels

DIL level	Frequency (%)	Mean score
Low	158 (53)	6.72
Middle	92 (31)	8.93
High	48 (16)	14.31
Total	298 (100)	8.62

Table 4: Mann-Whitney U test for comparing the first 2 year and last 2 year students' DIL scores (*n*=180)

Variable	Study year	Frequency	Mean	Rank mean	U	Z	P
DIL	First two	78	7.89	117.96	6558.000	−2.347	0.041
	Last two	102	9.12	154.72			

Table 5: Students' mean scores and ranks in DIL components

DIL components	Mean score±SD	Rank
Know	10.38±3.01	1
Acknowledgment	9.92±3.40	2
Use	8.99±3.11	3
Access	6.97±3.31	4
Evaluation	6.84±2.20	5

SD=Standard deviation

university where information literate staff and faculty members interact with information literacy-integrated curriculum for training information literate students. Such a university in the health education is an urgent need.

Conclusion

This study would create awareness among medical students and other ones responsible for their education on the need to involve in information literacy learning in order to be information literate professionals who are able to do effective and efficient use of professional information resources relating to their career development and practice achievement.

As a quantitative survey, this study had limitations related to its methodological approach. Measuring information literacy with a paper-and-pencil approach may reduce some full benefits and findings; however, this study is an exploratory descriptive research that was conducted for studying the DIL for the first time. Further research is necessary for deeply investigating the status of basic and DIL skills among students majoring in other medical-related fields and various educational levels. In addition to its help in informing Iranian medical academic society about the status of DIL skills among medical students, this study can contribute to information literacy literature by introducing the new concept of "disciplinary-based information literacy," a concept that needs to be extended theoretically and practically by other researchers worldwide.

Conflicts of interest
There are no conflicts of interest.

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