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ORIGINAL ARTICLE

Self-directed learning readiness among Saudi undergraduate medical students in the pre-clinical versus clinical years

Eman R. Mohamed[1], Bashair Khalid Alotaibi[2], Fatimah Mohammed Alhaddad[2], Raghad Ibrahim Aljohani[2], Fatimah Mohammed Alhussain[2], Sadeem Abdullah Albulaihed[3*], Mohammad ZeeShan[1], Abdulmohsen Alelq[1], Sharon C. Orcajo[4]

ABSTRACT

Background: This study aimed to assess the self-directed learning readiness (SDLR) level among the pre-clinical versus clinical years and identify the factors influencing this level.

Methods: A validated, cross-sectional questionnaire-based study. SDL Instrument was sent to medical students at Imam Abdulrahman Bin Faisal University using an online survey tool. Participants were asked to rate their learning motivation, planning, implementation, self-monitoring, and interpersonal motivation. Data were analyzed using descriptive statistics.

Results: The findings demonstrate that more than half of the study participants had an above-average level of SDL. Pre-clinical students (80.1 ± 11.1) reported higher total mean scores compared with clinical students (75.3 ± 12.6). The highest scores were for the learning motivation and planning/implementation domains. Female students scored higher (79.3 ± 11.4) than male students (75.1 ± 12.7). A negative correlation in age was observed; however, the grade point average showed a positive correlation with the mean SDL score.

Conclusion: Undergraduate pre-clinical medical students felt adequately prepared and motivated in planning and implementing SDL. However, a decreased level of SDLR was observed among students in their clinical years. Further longitudinal studies are recommended to assess the causes of deterioration in SDLR levels among clinical students.

Keywords: Clinical years, medical students, pre-clinical, readiness, self-directed learning.

Background

Self-directed learning (SDL) is an essential and effective skill for medical students as they prepare for greater responsibilities in their future careers, especially with the rapid transitions in curricula and technological advances [1,2]. It assists students with decision-making in the learning process, time management skills, and choosing topics and sources [3]. SDL is a well-structured educational method frequently used as a key competency in the current century. It has been shown that SDL can surpass traditional teaching in improving medical students' performance [4]. Therefore, an early assessment of medical students' SDL readiness (SDLR) is crucial [5].

Problem-based learning (PBL) is used to identify students' evolving needs by estimating their abilities and cognitive capabilities so that they can be placed in an active and

Correspondence to: Sadeem Abdullah Albulaihed
*College of Medicine, Al Faisal University, Al-Riyadh, Saudi Arabia.
Email: Sadeembu@gmail.com
Full list of author information is available at the end of this article.
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dynamic teaching environment in which understanding occurs through exercises and practical experiences [6]. In this respect, multiple studies have compared SDL levels among different school-age groups, and some studies have suggested that students' SDL ability increases as they progress in their academics. A study at the University of Bisha, Saudi Arabia, found that SDLR scores were significantly higher among medical students in their fourth year compared to those in their first through third years [7]. In another study, students who studied the PBL curriculum had a progressively better SDLR score [8]. A study of graduates' competencies in relation to problem-based versus conventional medical schooling reported the positive impact of PBL on their problem-solving and SDL, whereas the conventional strict curriculum was shown to inhibit SDLR [9]. No studies from this region have yet determined the implications of reformed curricula on students' SDLR, which necessitates assessing medical students in their pre-clinical and clinical years as a crucial step to monitor their progression and ensure that they are on the right track to becoming self-directed learners.

Recently, the College of Medicine at Imam Abdulrahman bin Faisal University (IAU) has started to shift its traditional curricula to innovative curricula utilizing PBL as one of the teaching strategies used to improve its students' competencies [10]. The input students are generally more dependent on family and teachers, less trained for SDL during their school years, and more adapted to a rote learning style. This means that classroom dynamics would be entirely different from what students have learned from traditional instruction. Students' readiness is therefore a challenge in this educational paradigm shift. The aim of this study was to assess the level of SDLR among medical students at IAU in the pre-clinical versus clinical years and to identify the factors influencing this level.

Materials and Methods

This study utilized a descriptive questionnaire-based cross-sectional conducted at the College of Medicine, IAU wherein, the questionnaires have been distributed to 1,286 medical students in their pre-clinical and clinical years. A total of 765 (59.5%) responded from December 2020 to February 2021. The sample size is drawn into 385 participants with a non-response rate of 20% using the following formula:

$$n = \frac{\left[\mathrm{DE}^{*}Np\left(1-p\right)\right]}{\left[\frac{d2}{Z21}-\frac{\alpha}{2}*\left(N-1\right)+p*\left(1-p\right)\right]} \quad (1)$$

where n is the required sample size, DE = 1% is the design effect for cluster surveys, p = 50% is the hypothesized percent of outcome factor in the population, N = 1,286 is the population size, d = 5% is the absolute precision, and Z = 1.96 is the probability of the standard normal distribution.

A self-administered structured questionnaire was used for this study. The first section referred to the socio-demographic data in terms of age, gender, marital status, residence, monthly family income, and education level of the father and mother. The second section concerned the students' academic information in terms of grade point average (GPA) and high school type. These two sections were developed by the researchers after reviewing the related literature regarding data collection.

To evaluate the students' self-perceived SDL skills, the study used the validated and shortened English version of the Self-Directed Learning Instrument (SDLI) scale. The questionnaire comprises 20 questions across 4 sections: learning motivation (Questions 1–6), planning and implementation (Questions 7–12), self-monitoring (Questions 13–16), and interpersonal motivation (Questions 17–20). Regarding the reliability and internal consistency for the sections, Cronbach's alpha scores were 0.801, 0.861, 0.785, and 0.765, respectively, which signified that the SDLI scale is valid and reliable for identifying students' SDL abilities. The respondents were requested to score each item on a 5-point Likert scale ranging from 1 to 5 (1 = strongly disagree and 5 = strongly agree). Thus, the total possible score on the SDLI varied from 20 to 100, with a higher score indicating a higher level of SDL [11].

Statistical analysis

The data were collected through an online survey tool using a Google form (Google), which included the informed consent form. Designated data collectors were in charge of explaining the purpose of the study to participants and that their information would be used only for study purposes.

Data were coded and tabulated, and statistical analysis was carried out using Statistical Package for the Social Sciences version 23 (IBM Inc., Chicago, IL). Categorical variables are represented as numbers and percentages. Continuous variables are displayed as means and standard deviations. The chi-squared test was used to establish an association between two categorical variables. A *t*-test was used to find the association between categorical and continuous variables. Pearson's correlation (r) was used as a parametric correlation test. A p-value less than 0.05 was considered statistically significant, and the confidence interval was set at 95%.

Ethical approval for this study was obtained from the Institutional Review Board (IRB) of IAU (IRB-UGS-2020-01-345). Furthermore, data confidentiality was ensured following the Declaration of Helsinki principles.

Result

Of the 1,286 total medical students, 765 (59.5%) participated in this study. Of these, 320 participants (41.8%) were in the pre-clinical group and 445 (58.2%) were in the clinical group. The demographic data

distribution of undergraduate medical students in terms of age, GPA, gender, marital status, monthly income, mother's education, and school type are shown in Table 1.

The mean scores were above average (74–100) for 52.29% of medical students and below average (26–73) for 47.71% of students (Table 2).

The total SDLI mean score was higher for the pre-clinical group (80.1 ± 11.1) than for the clinical group (75.3 ± 12.6). Differences were observed between the pre-clinical group and clinical group for all four sections of the SDLI. The pre-clinical group performed better than the clinical group for learning motivation (25.9 ± 3.4 *vs.* 24.4 ± 4.6), planning and implementation (22.1 ± 4.8 *vs.* 21.2 ± 5.0), self-monitoring (16.1 ± 2.9 *vs.* 14.2 ± 3.8), and interpersonal communication (16.1 ± 2.8 *vs.* 15.6 ± 2.9) (Table 3).

The correlation of SDL mean score with mean age and GPA was observed in both the pre-clinical and clinical groups. The correlation coefficient for age and SDL score was -0.35 for the combined pre-clinical and clinical groups ($p < 0.001$), whereas the coefficient for GPA and SDL was 0.102 ($p < 0.005$) (Table 4).

The mean SDLI score for all medical students in the pre-clinical and clinical years is presented in Figure 1.

Female students had a higher mean SDLI score (79.3 ± 11.4) than male students (75.1 ± 12.7) in Figure 2.

Figure 3 presents the mean SDLI score for the pre-clinical and clinical students.

Discussion

The purpose of this study was to assess the level of SDLR and the factors influencing the SDLR among medical students in the pre-clinical versus clinical years using

Table 1. *Demographic data distribution of undergraduate medical students.*

Factors	Pre-clinical (*n* = 320)	Clinical (*n* = 445)	*p*-values
	Mean ± SD		
Age (years)	**20.9 ± 1.4**	**22.0 ± 2.4**	**<0.001**
GPA (score)	**4.54 ± 0.39**	**4.39 ± .46**	**<0.0001**
	Percentage		
Gender • Male • Female	184 (57.5%) 136 (42.5%)	172 (38.7%) 273 (61.3%)	<0.0001
Marital status • Single • Married	317 (99.1%) 3 (0.9%)	393 (88.3%) 52 (11.7%)	<0.0001
Monthly income (SR) • <5,000 • 5,000–10,000 • >10,000	36 (11.3%) 64 (20.0%) 220 (68.8%)	25 (5.6%) 74 (16.6%) 346 (77.8%)	0.005
Father's education • PGs and above • University • Up to 12 standards • Up to primary	146 (45.6%) 113 (35.3%) 42 (13.1%) 19 (5.9%)	189 (42.5%) 161 (36.2%) 63 (14.2%) 32 (7.2%)	0.79
Mother's education • PGs and above • University • Up to 12 standards • Up to primary	103 (32.2%) 111 (34.7%) 79 (24.7%) 27 (8.4%)	103 (23.1%) 213 (47.9%) 89 (20.0%) 40 (9.0%)	0.002
School type • Public • Private • International	215 (67.2%) 99 (30.9%) 6 (1.9%)	320 (71.9%) 105 (23.6%) 20 (4.5%)	0.017

Table 2. *Below versus above average mean scores among the medical students.*

Range	Frequency	Percent
Overall Mean of SDI	**77.3 ± 12.2**	
Below average (26–73)	365	47.71
Above average (74–100)	400	52.29

Table 3. *Mean scores on individual SDLI items among the medical students.*

Items	Mean ± SD		*p*-values
	Pre-clinical	Clinical	
Learning motivation	25.9 ± 3.4	24.4 ± 4.6	<0.001
I know what I need to learn.	4.0 ± 1.0	3.4 ± 1.2	<0.001
Regardless of the results or effectiveness of my learning, I still like learning.	4.1 ± 1.0	3.7 ± 1.3	<0.001
I strongly hope to constantly improve and excel in my learning.	4.7 ± .8	4.6 ± .9	0.231
My successes and failures inspire me to continue learning.	4.2 ± 1.0	4.0 ± 1.2	0.011
I enjoy finding answers to questions.	4.6 ± .7	4.5 ± .9	0.073
I will not give up learning because I face some difficulties.	4.4 ± .9	4.2 ± 1.2	0.045
Planning and implementation	22.1 ± 4.8	21.2 ± 5.0	0.012
I can proactively establish my learning goals.	3.9 ± .9	3.5 ± 1.2	<0.001
I know what learning strategies are appropriate for me in reaching my learning goals.	3.5 ± 1.2	3.6 ± 1.2	0.168
I set the priorities of my learning.	4.0 ± 1.1	4.0 ± 1.0	0.904
Whether in the clinical practicum, classroom, or on my own, I am able to follow my own plan of learning.	3.6 ± 1.1	3.5 ± 1.1	0.235
I am good at arranging and controlling my learning time.	3.3 ± 1.4	3 ± 1.3	0.006
I know how to find resources for my learning.	3.9 ± 1.1	3.6 ± 1.2	<0.001
Self-monitoring	16.1 ± 2.9	14.2 ± 3.8	<0.001
I can connect new knowledge with my own personal experiences.	4.2 ± .9	3.9 ± 1.2	<0.001
I understand the strengths and weaknesses of my learning.	4.0 ± 1.0	3.6 ± 1.3	<0.001
I can monitor my learning progress.	3.9 ± 1.0	3.4 ± 1.3	<0.001
I can evaluate my learning outcomes on my own.	4.0 ± 1.1	3.4 ± 1.4	<0.001
Interpersonal communication	16.1 ± 2.8	15.6 ± 2.9	0.011
My interaction with others helps me plan for further learning.	4.1 ± 1.1	4.0 ± 1.1	0.423
I would like to learn the language and culture of those whom I frequently interact with.	4.0 ± 1.2	3.9 ± 1.2	0.034
I am able to express messages effectively in oral presentations.	4.0 ± 1.1	3.8 ± 1.1	0.09
I am able to communicate messages effectively in writing.	4.1 ± 1.1	3.9 ± 1.1	0.05
Total mean score	80.1 ± 11.1	75.3 ± 12.6	<0.001

Table 4. *Correlation of the mean age and GPA with mean SDL score among the study subjects.*

Characteristics	Pre-clinical students' scores (*r*)	Clinical students' scores (*r*)	Overall
Age	-0.18 ($p < 0.001$)	-0.38 ($p < 0.001$)	-0.35 ($p < 0.001$)*
GPA	0.08 ($p = 0.1$)	0.07 ($p = 0.2$)	0.102 ($p < 0.005$)*

* Correlation is significant at the 0.05 level.

the SDLI. For medical students to adapt to the curricula transition, they need an intimate understanding and self-realization of their learning process and how this process influences their learning development to become lifelong learners throughout their careers [12]. A study conducted at King Abdulaziz University in the Western Region of Saudi Arabia revealed that 99% of medical students had a below-average readiness [13].

The results of this study identified that 52.29% of IAU medical students scored above average for SDL. Studies have shown that students in their clinical years had significantly higher SDL scores than those in their pre-clinical years indicating that the further they progress in their academic program, the higher their SDLR score [14]. However, our study shows a significant deterioration in SDL scores as the students progressed to their clinical years. In this respect, our results are in line with the study conducted by Premkumar et al. [9], who found that medical students become less self-directed with progressing years of medical training.

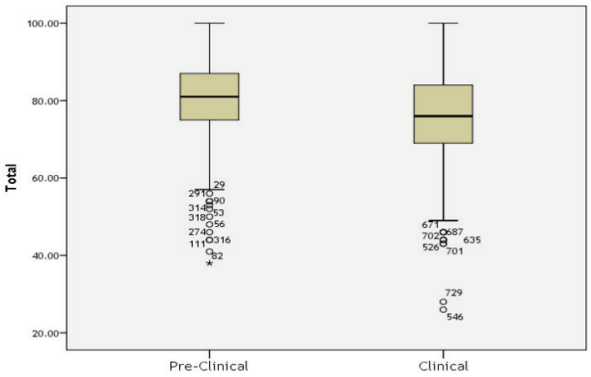

Figure 1. *The mean SDLI score of all medical students.*

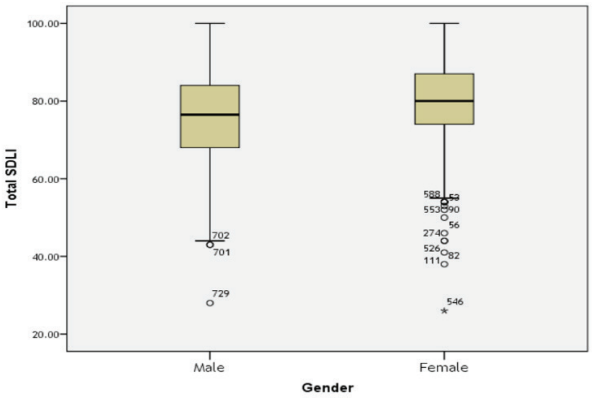

Figure 2. *The mean SDLI score of the undergraduate medical students by gender.*

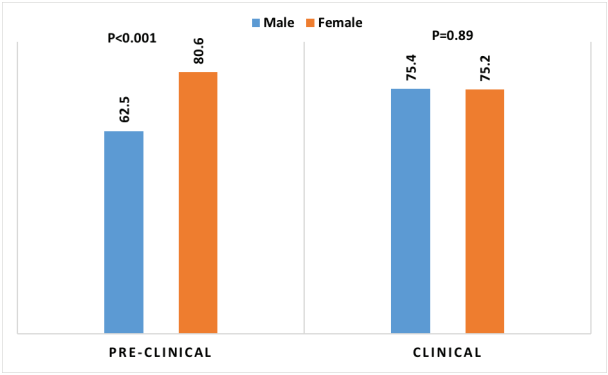

Figure 3. *The mean SDLI score of the pre-clinical and clinical students.*

The plausible reason for this finding could be that PBL is mainly implemented only in the pre-clinical years, requiring the students to take initiative to determine their learning objectives. This finding is in agreement with an Ethiopian study that showed that the practice of PBL in the pre-clinical years resulted in a significant increase in SDLR scores [1].

In addition, the higher SDL scores among females in their pre-clinical years indicate that women in Arabian culture are future-oriented, creative, and effective learners [15]. This is similar to an Egyptian study that found higher SDLR scores in females [16]. However, this finding is the opposite of the study conducted by Kar et al. [17], which found that males had higher SDLR. Other studies have shown no significant differences between genders [18,19].

Medical students have excellent planning implementation and learning motivation; thus, they prioritized learning as a key to achieving their goals. However, self-monitoring and interpersonal communication received low scores, which indicates the need for additional practical knowledge and skills in the curricula to improve the teaching strategies and assessment tools and augment the students' readiness for learning.

Our results showed that age had a significant negative correlation with the SDLR score. This was the opposite of the finding of Slater and Cusick [14], who reported that age had a positive influence on the SDLR score. Other studies did not find any association between SDLR score and age [1,7,20]. Kar et al.'s [17] study of SDLR among Indian medical students found that age and maturity were defining factors of SDL. The Egyptian study revealed that students with higher GPAs scored higher for SDLR [15]. This study found that GPA had a significant positive correlation with SDLR level. Therefore, this study reports that SDLR among pre-clinical and clinical students differs according to their age, gender, and GPA.

This study has some limitations. Since the study utilized a cross-sectional design, making causal inferences is not possible. Eliminating bias was a challenge since the questionnaire survey responses were self-reported. Furthermore, due to time constraints, which hindered following formal channels of communication to verify reported GPA results, all data were self-reported. This time constraint also prevented us from collecting a wide range of samples from other universities. It is recommended that future studies include diverse students from different universities. A future longitudinal study is needed to compare the actual readiness of medical students for SDL as they progress in their curriculum.

Conclusion

Our study revealed that SDLR is vital for medical students to become life-long learners. The higher level of SDLR among the undergraduate IAU medical students in their pre-clinical years than in their clinical years could be due to the adaptation of the innovative curriculum using PBL, which is mainly implemented in the pre-clinical years. Therefore, further studies are needed to determine the reasons for SDLR deterioration among medical students during their clinical years.

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Conflict of interest
The authors declare that they have no conflict of interest regarding the publication of this manuscript.

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Ethical approval and consent to participate
Approval was obtained from the IRB of IAU (IRB-UGS-2020-01-345). This study was performed in accordance with the ethical standards of the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards. Thursday, November 12, 2020.

Consent to publish
Not applicable.

Authors' contributions
Eman R. Mohamed conceived the idea, designed the tools, and wrote the initial draft. Bashair Khalid Alotaibi, Fatimah Mohammed Alhaddad, and Fatimah Mohammed Alhussain searched the literature and defined the intellectual content. Raghad Ibrahim Aljohani and Sadeem Abdullah Albulaihed collected the data and revised the initial draft of the manuscript. Mohammad Zeeshan analyzed and interpreted the data and finalized the manuscript. Abdul Mohsen Al-Eleq revised the whole manuscript and edit it. All authors critically reviewed and approved the final draft and are responsible for the content and similarity index of the manuscript. Sharon C. Orcajo contributed to final review and editing of the manuscript.

Author details
Eman R. Mohamed[1], Bashair Khalid Alotaibi[2], Fatimah Mohammed Alhaddad[2], Raghad Ibrahim Aljohani[2], Fatimah Mohammed Alhussain[2], Sadeem Abdullah Albulaihed[3], Mohammad ZeeShan[1], Abdulmohsen Alelq[1], Sharon C. Orcajo[4]

1. Department of Medical Education, College of Medicine, Imam Abdulrahman Bin Faisal University, Al-Khobar, Saudi Arabia
2. Intern at College of Medicine, Imam Abdulrahman Bin Faisal University, Al-Khobar, Saudi Arabia
3. Intern at College of Medicine, Al Faisal University, Al-Riyadh, Saudi Arabia
4. Research & Bioethics Coordinator, Department of Medical Education, College of Medicine, Imam Abdulrahman Bin Faisal University, Al-Khobar, Saudi Arabia

References

1. Kidane HH, Roebertsen H, van der Vleuten CPM. Students' perceptions towards self-directed learning in Ethiopian medical schools with new innovative curriculum: a mixed-method study. BMC Med Educ. 2020;20(1):7. https://doi.org/10.1186/s12909-019-1924-0
2. Knowles MS. Self-directed learning: a guide for learners and teachers. New York, NY: Association Press.
3. Al Kindy S, Al Kindy F, Al Kindy A. The advantages and disadvantages of self directed learning: a survey study of Saudi medical students. MedEd Publish. 2018;7(58):58. https://doi.org/10.15694/mep.2018.0000058.1
4. Peine A, Kabino K, Spreckelsen C. Self-directed learning can outperform direct instruction in the course of a modern German medical curriculum - results of a mixed methods trial. BMC Med Educ. 2016;16:158. https://doi.org/10.1186/s12909-016-0679-0
5. Sullivan SA, Anderson BM, Pugh CM. Development of technical skills: education, simulation, and maintenance of certification. J Craniofac Surg. 2015;26(8):2270–4. Available from: https://journals.lww.com/jcraniofacialsurgery/Abstract/2015/11000/Development_of_Technical_Skills__Education,.10.aspx; https://doi.org/10.1097/SCS.0000000000002213
6. Giddings, Sharron. (2015). Self-Directed Learning (SDL) in Higher Education: A Necessity for 21st Century Teaching and Learning. Available from: https://www.researchgate.net/publication/277009137_SelfDirected_Learning_SDL_in_Higher_Education_A_Necessity_for_21st_Century_Tea ching_and_Learning
7. Elamin BE. Readiness for self-directed learning of students of the University of Bisha at College of Medicine in Bisha Province, Kingdom of Saudi Arabia. Doctoral dissertation, University of Gezira, Sudan. Available from: http://repo.uofg.edu.sd/handle/123456789/3420
8. Schmidt HG, Vermeulen L, van der Molen HT. Longterm effects of problem-based learning: a comparison of competencies acquired by graduates of a problem-based and a conventional medical school. Med Educ. 2006;40(6):562–7. https://doi.org/10.1111/j.1365-2929.2006.02483.x
9. Premkumar K, Pahwa P, Banerjee A, Baptiste K, Bhatt H, Lim HJ. Does medical training promote or deter self-directed learning? A longitudinal mixed-methods study. Acad Med. 2013;88(11):1754–64. https://doi.org/10.1097/ACM.0b013e3182a9262d
10. Bachelor of Medicine and Bachelor of Surgery (MBBS) Revised study plan (2014–2015). Dammam, Kingdom of Saudi Arabia: University of Dammam. Available from: https://www.iau.edu.sa/sites/default/files/resources/5039862471.pdf
11. Cheng SF, Kuo CL, Lin KC, Lee-Hsieh J. Development and preliminary testing of a self-rating instrument to measure self-directed learning ability of nursing students. Int J Nurs Stud. 2010;47(9):1152–8. https://doi.org/10.1016/j.ijnurstu.2010.02.002
12. Soliman M, Al-Shaikh G. readiness for self-directed learning among first year Saudi medical students: a descriptive study. Pak J Med Sci. 2015;31(4):799–802. https://doi.org/10.12669/pjms.314.7057
13. Al-Basri SF, Al-Afari R, AlHibshi AM, Al-Sayes F, Soo PY, Tekian A. Readiness for self-directed learning among King Abdulaziz University medical students. Int J Res

Med Sci. 2017;5. https://doi.org/10.18203/2320-6012.ijrms20164565

14. Slater CE, Cusick A. Factors related to self-directed learning readiness of students in health professional programs: a scoping review. Nurse Educ Today. 2017;52:28–33. https://doi.org/10.1016/j.nedt.2017.02.011
15. Salih M, Sembawa H, Baradwan S, Nuqali A. Self-directed learning readiness among medical students at Umm Al-Qura University, Saudi Arabia: a cross sectional study. Sch Bull. 2016;2(1):20–6. Available from: http://scholarsbulletin.com/
16. Atwa HS. Assessment of medical students' readiness for self-directed learning. Egypt J Community Med. 2018;36(1). https://doi.org/10.21608/ejcm.2018.6866
17. Kar SS, Premarajan KC, Ramalingam A, Iswarya S, Sujiv A, Subitha L. Self-directed learning readiness among fifth semester MBBS students in a teaching institution of South India. Educ Health (Abingdon). 2014;27(3):289–92. https://doi.org/10.4103/1357-6283.152193
18. Premkumar K, Vinod E, Sathishkumar S, Pulimood AB, Umaefulam V, Prasanna Samuel P, et al. Self-directed learning readiness of Indian medical students: a mixed method study. BMC Med Educ. 2018;18(1):134. https://doi.org/10.1186/s12909-018-1244-9
19. Zeb S, Yusuf S, Mahmood RA, Zeb R. Gender based differences in self-directed learning readiness amongst medical students of Pakistan. Rawal Med J. 2018;43(4):754–64. http://www.rmj.org.pk/fulltext/27-1513249793.pdf
20. Gyawali S, Jauhari AC, Shankar PR, Saha A, Ahmad M. Readiness for self directed learning among first semester students of a medical school in Nepal. J Clin Diagn Res. 2011;5(1):20–3. Available from: https://www.researchgate.net/profile/P_Ravi_Shankar/publication/271529743_Readiness_for_self_directed_learning_among_first_semester_students_of_a_medical_school_in_Nepal/links/58333af108ae004f74c5a696/Readiness-for-self-directed-learning-among-first-semester-students-of-a-medical-school-in-Nepal.pdf