Perception of Medical Students Regarding TU-IOM MBBS Curriculum and Teaching Learning Methods in Nepal

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ABSTRACT

Background

The present Bachelor of Medicine and Bachelor of Surgery (MBBS) curriculum under Tribhuvan University - Institute of Medicine (TU-IOM) was last revised twelve-years back. Though the curriculum was built upon internationally approved recommendations on curriculum design, it is ineffectively practiced in most medical schools of Nepal with major focus on didactic teaching-learning. The curriculum, hence, needs effective implementation and revision.

Objective

To identify the strengths, weaknesses, and areas of improvement in the medical curriculum through student-based feedback and outline the possibility of incorporating newer evidence-based teaching-learning methodologies in Nepal.

Method

This is a descriptive and cross-sectional study. With appropriate ethical approval, a questionnaire was developed and disseminated virtually to all medical students of Nepal under TU from MBBS fourth year onwards. The questionnaire comprised of Likert and close-ended questions. The data analysis was followed after receiving the filled questionnaire through Google forms.

Result

A total of 337 respondents participated in the study. The most effectively implemented components out of the SPICES model were Integrated learning (I) and Community-based learning (C), with 73.89% and 68.84% responses. There were 94.7% (319) students who favored the incorporation of research in the core curriculum. Only 34.2% (115) students found PowerPoint lectures, the most utilized form of teaching-learning in Nepal, as engaging. The respondents (84.6%) showed a high degree of readiness to incorporate newer evidence-based teaching-learning tools such as flipped learning, blended learning, and peer-to-peer learning.

Conclusion

This study shows that effective interventions must be rethought on various aspects of the curriculum, taking students' feedback on the table while considering curricular revision.

KEY WORDS

Bachelor of Medicine and Bachelor of Surgery (MBBS) curriculum, Medical students, Problem based learning, Teaching learning methods

INTRODUCTION

The TU-IOM MBBS curriculum, since its establishment in 1978 has undergone two revisions, in 1994 and 2008. It is structured into basic and clinical period for a duration of 4 and a half years. It adopts the SPICES model of teaching-learning instructions given by Harden which stands for Student-centered (S), Problem-based (P), Integrated (I), Community-oriented (C), Elective featured (E) and Systematic (S).[1] There are also provisions of bedside learning, supervised simulation learning, and periodic teachers' training. The curriculum, however, doesn't mention the acquisition of research skills in the undergraduate level as mandatory.

The teaching-learning system practiced in Nepal is traditional and incorporates didactic learning at its core.[2] Out of the many approaches adopted for teaching and learning, the most popular one is through Power Point based lectures. But with the increasing reputation of such lectures being uninteresting and causing attention deficit (10 to 15 minutes), the efficacy of such lectures come questionable.[3,4] So far, there has been no research dissecting the intricacies of curricular components and suggested newer teaching learning modalities in Nepal. These methodologies include Problem Based Learning (PBL), peer to peer learning, "flipped classroom", and blended learning, all of which have proven effective in various teaching learning scenario in the world.[5-11]

This study aims to identify the strengths, efficacies, and deficiencies of the 12-year-old TU-IOM MBBS curriculum through student-based feedback and to ascertain whether the inclusion of newer active teaching-learning strategies will prove more advantageous in the existing context or not.

METHODS

This is a descriptive cross-sectional study conducted from May to October 2020 by using a self-administered questionnaire. Validated questionnaire similar to the domains covered in our research was not available in other literature. An expert in Community Medicine (CM) familiar to the content was consulted to test the dimensionality, format, validity, and reliability of the questionnaire. Forty students from MBBS fourth year, final year and internship were selected using convenient sampling. Their responses were recorded along with their ease in understanding the components in the questions via a separate Google Form. The first three questions were positively framed "yes-no" styled while the last question was negatively framed. They included "Are the questions clear and easy?", "Do the questions cover general elements of TU-IOM MBBS curriculum?", "Are the questions relevant to the current medical education scenario?", and "Do the questions violate your privacy?" More than 80% responses on the positively framed questions were affirmative while less than 10% responses on the negatively framed question were "Yes". This result together with expert consultation made us assume the questionnaire to be validated.

Students' perception towards the effectiveness of the curricular components and teaching-learning methodologies used in their medical schools was assessed. They were asked to grade the effectiveness of eight curricular components in a 4-point Likert scale as 'Effective,' 'Less Effective,' 'Not Effective' or "Not covered," which helped assess the effectiveness of the current curriculum. Among the eight curricular components that were evaluated, six of them aided in analyzing the implementation of the SPICES model proposed by Harden. These six components were: 'Student-Centeredness,' 'Problem-based Learning,' 'Integrated Curriculum,' 'Community-based Learning,' 'Elective-program,' and 'Systematic Approach.' The other two curricular components whose implementation was analyzed included 'History Taking and Clinical Examination in Basic Science Years' and 'Bedside Learning.'

The students' perception about incorporating the research component in the curriculum was assessed using three questions that helped analyze the importance, efficacy, and possible burden of adding another element in the curriculum.

The importance of incorporating newer active teaching-learning tools viz. "Flipped Learning," "Peer to peer learning," and "Blended Learning" were studied using Likert's 4-point scale as "Very effective," "Effective," "Less effective," and "Should not be included." These newer teaching learning modalities were relatively novel to the students, therefore their respective terminologies were included alongside the questions in Google Form.

Questions on the quality and efficacy of the PowerPoint lectures were framed in terms of duration of concentration and health issues experienced by students during the lectures. And the last section in the questionnaire included sets of questions identified as probable shortcomings by the researchers and was categorized into binary variables "Yes" or "No".

The questionnaire was distributed via Google forms to all the medical students from fourth year, final year, and internship in all eight medical colleges of Nepal under TU-IOM. The link to the questionnaire was sent via email and social-messaging apps to 2172 medical students. Ethical approval was obtained from Institutional Review Board (IRB), Institute of Medicine, Kathmandu. The confidentiality of the respondents was maintained as the students were not required to reveal their names at any time during the course of the study. Further, the respondents were allowed to leave the research at any time without any explanation and were proceeded towards the questions in the Google form only after agreeing to the terms and conditions. The students from the first three years were not included

because of their limited clinical exposure and lack of orientation to teaching modalities like bedside learning and problem-based learning.

After collecting responses, the spreadsheet and graphs in Google form were used as the raw data source. The spurious and blank findings were manually removed, and the analysis was done using Microsoft Excel 2019 in relevant tables and figures.

RESULTS

A total of 337 respondents participated in the study. The age of the participants ranged from 18 to 27 years, while the mean age of the participants was 23.03 years. The proportion of males in the study was 62.61% (211), with 36.49% (123) as females and the rest 0.89% (3) grouped under categories 'others' or 'prefer not to say.'

The responses for the student's perception on the effectiveness of the current implementation of curricular components are elucidated in the graph (fig. 1) below.

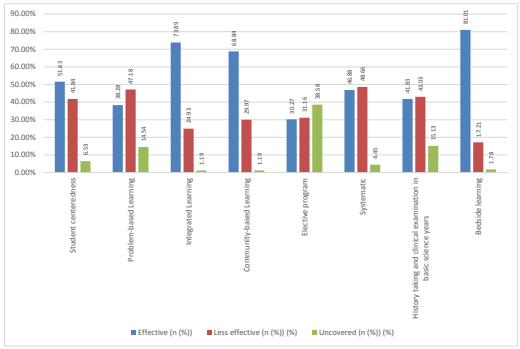

Figure 1. Students' perceptions regarding implementation of curricular components (n=337)

As seen above, the most effectively implemented components were bedside learning, integrated learning, and community-based learning, with 81.01%, 73.89%, and 68.84% responses, respectively. Similarly, the responses show that the provision of electives was not duly implemented in the curriculum, with about 69.73% responding to either be less effective or uncovered (with 38.58% responses on it remaining fully uncovered) and only 30.27% affirming about its efficacy.

We also surveyed the participants on their attitude towards the incorporation of research in the curriculum. Surprisingly, 94.7% (319 students) revealed that they would prefer if research methodologies were covered in the curriculum, and 80.7% of participants wanted research to be made compulsory in their course. However, 41.8% of them still believed that incorporating research in the core MBBS curriculum is likely to increase their course load. This shows that despite wanting to learn research and conduct research activities during their MBBS, students are also aware of the burden it could add to their already bulky course-load.

Since PowerPoint lectures are the widely used teaching-learning modality in medical schools of Nepal, we considered it important to assess the effectiveness of such lectures. Regarding the engagement of PowerPoint-based lectures, only 34.2% (115 students) found such lectures engaging. Similarly, 55.5% (187 students) stated such lectures to be less engaging, and 10.4% (35 students) found them not engaging at all. Also, we assessed the duration of concentration students could focus on during the PowerPoint-based lectures. The responses we obtained are shown in table 1 below:

Table 1. Duration of concentration in PowerPoint-based lectures in classes (n=337)

Duration of concentration	Frequency (n (%))
Less than 10 minutes (%)	70 (20.77%)
10 to 30 minutes (%)	226 (67.06%)
30 to 50 minutes (%)	38 (11.28%)
Throughout the lecture (%)	3 (0.89%)

As we can see, a total of 296 students (87. 83%) reported having a concentration span of fewer than 30 minutes during a PowerPoint lecture. This means that a vast majority could not concentrate for more than half the duration of the lecture. Similarly, we asked the students if they faced health issues like headaches and eye strain during power-point lectures. The responses we obtained are shown in table 2.

Table 2. Health-related issues faced by students during PowerPoint lectures (n=337)

Problems faced (headache and eye strain) during power point lectures	Frequency n (%)
Often (%)	118 (35.01%)
Sometimes (%)	180 (53.41%)
Never (%)	39 (11.57%)

As shown above, 35.01% of students responded to having frequent health issues during PowerPoint lectures.

To suggest changes in the teaching-learning modalities- we considered it essential to know students' willingness to incorporate newer teaching-learning modalities. The majority of respondents were in favor of the incorporation of newer teaching-learning methodologies in the MBBS curriculum. The details of their responses are elucidated in the table 3.

We further interrogated the students about what they felt were the significant shortcomings of the current curriculum. The major shortcoming identified was uneven examination pattern during clinical years, as agreed by 90.8% of the students. The uneven examination pattern requires students to appear for 2 subjects (Forensic medicine and Community medicine) in MBBS third year, 3

Table 3. Students' perception regarding probable effectiveness of newer teaching-learning methods

Teaching-Learning Methods	Would be effective (%)	Would be less effective (%)	Should not be included (%)
Peer to peer learning	302(89.61%)	33 (9.79%)	2 (0.59%)
Blended learning	309(91.69%)	25 (7.41%)	3 (0.89%)
Flipped learning	244(72.40%)	73 (21.66%)	20 (5.93%)

subjects in the fourth year (Ophthalmology, Orthopedics and Otorhinolaryngology), while 6 subjects in the final year (Medicine, Surgery, Pediatrics, Gynecology, Obstetrics, Dentistry, Psychiatry, Dermatology, Anesthesiology, and Radiology). Similarly, 77.74% (262 students) felt that the inability to complete the syllabus in the allocated time was a shortcoming. More than 3/4th students (76.85%, 259 students) responded that undue prolongation of MBBS duration for more than four and a half years was a shortcoming. Likewise, 74.18% (250 students) felt that equal emphasis to clinically and practically less relevant topics has led to inconsistencies in the current curriculum.

DISCUSSION

The students' accreditation in the medical curriculum is crucial to optimize teaching and learning methods in medical schools.[12] The medical education curriculum in Nepal is structured, designed, and implemented by pertinent educationists, bureaucrats, and politicians, but students' role in its formulation is largely shaded.[13] The current curricular scenario of Nepal is thus, insufficiently student-feedback-based. The teaching and learning system in medical schools is traditional and is based upon a twelve-year-old curriculum. Although the TU-IOM MBBS curriculum incorporates Harden's SPICES model in its core, the implementation of all its components in medical schools is still not studied. In this context, there are two big challenges in front of the stakeholders, one of effective implementation of the last curricular components and the other of an efficient upgrade that can help cater to the emerging societal and scientific healthcare needs.[14]

Our study tried to critically appraise the strengths, efficacies, opportunities, and areas of improvement of the current TU-IOM MBBS curriculum taking student feedback as reference. We also tried to evaluate the possibility of the inclusion of other teaching-learning strategies in the curriculum to make it more diverse, engaging, and learner-centered.

The research assessed the effectiveness of each component of the SPICES model. Literatures describe the SPICES model as an effective educational strategy that, if implemented, can improve the teaching standards in medical education.[15,16] Our survey demonstrates that implementing the six components of the SPICES model, which forms the very foundation of our curriculum, was very poor, except for three components viz. Integrated (I) (73.89% responded as effective) and Community-based (C) (68.84%) and Student centeredness (S) (51.63%). The results showed that the implementation of the remaining components viz. Problem-based learning (P), Elective provision (E), and Systematic approach to learning (S) in the curriculum were ineffective. Ghosh et al., in their study, demonstrated how integrating PBL with didactic teaching methodology significantly benefitted students in Physiology classes.[17] Although there was no similar research conducted earlier in Nepal that reflected the student feedback on these components, it can be indicated that efficient integration of these components can enhance the quality of our curriculum overall.

We studied the efficacy of various teaching and learning methodologies elucidated in the curriculum, such as Community Based Learning (CBL), Structured Interactive Sessions (SIS), clinical exposure in basic sciences, bedside learning, etc. The responses so analyzed showed that the component- acquisition of history taking and clinical examination skills in basic sciences was ineffective or not implemented (58.16% responded so) in medical schools. The implementation of the other components, however, was satisfactory. Although no similar research was conducted in Nepal before to measure these indicators, the result calls for appropriate intervention for this component.

TU-MBBS curriculum has given little to no importance to research content in medical schools. Our survey showed that incorporating research in the curriculum was of great interest to a majority (94.7%). Several papers outline that incorporating research in an undergraduate medical course increases creative and critical domains of teaching and learning and is given utmost value.[18-22] Although it sounds interesting, incorporating research in the MBBS course may also pose an undue course burden among the students. Our survey showed that although many students favor incorporating research, 41.8% of them still think that it may increase the course load. So, it may be important to balance the various variables that come into play with the addition of a new component in the curriculum, such as time, duration, priority, and relevance.

Likewise, our study shows that more than 65% of the students consider PowerPoint lectures, the most utilized form of education strategy in medical schools of Nepal, as little to no engaging. This is similar to a study conducted by Banerjee et al., where 60% of students preferred the "chalk and board" method instead of LCD-based presentations.[23] There are varying responses on the preferred mode of lecture delivery in different parts of the world.[3] This difference could have arisen because of the variable and subjective nature of content, manner, and method of presentation and delivery. Probable reasons such as attention span, eye strain and headache were presented

to the respondents to identify the probable causes behind this inefficacy. The results show that 87.83% of the students could only sustain their focus on the presentation for less than 30 minutes, with 53.41% students facing some form of eye strain or headache. This is in line with many research conducted worldwide.[4,24]

While the duration of the medical PowerPoint lecture typically ranges from 45 minutes to an hour, this dwindled attention perhaps has also contributed to the inefficacy. Stuart et al., in their study, also suggest that the optimal duration of a lecture should be limited to 30 mins instead of an hour because of the down-sloping time-attention span graph.[4] In the race of completing the syllabus on time, the quantity, quality, and duration of such lectures are largely compromised. Under this scenario, it might be essential to modify, transform or combine this learning approach with other creative ways such as the incorporation of media (images and videos), animations, minimal texts and bullet points, etc.[25,26] Isha et al., in their research, stated that the implementation of assertion evidence structured design where visual elements were used instead of bullet points significantly raised the quality of the lectures.[27]

PowerPoint was once regarded as the "way" of teaching-learning in the future, but its recent implementation turned out to be quite the opposite. Research has been pointing out how the excessive use of PowerPoint presentations has been fundamentally degrading the process of thinking and communicating.[28,29] Despite so, PowerPoint-based lectures have their own sets of merits and, thus, cannot be completely disregarded.

As the roles and responsibilities of a doctor have changed over time, so have the tools used in medical education. Literatures have stated how medical education has "shifted" from the teacher-centric transfer of medical knowledge to a more competency-based, skills-oriented, student-centered, and active learning approach.[30] Further, based on the responses, it can also be stated that amalgamation of newer active teaching-learning approaches like peer-to-peer learning (89.61%), blended learning (91.69%), and flipped learning (72.4%) in the teaching-learning process can greatly improve the learning experience in medical schools.[31] The responses are in conformance with various researches conducted worldwide.[32,33] Hence, it can be said that the use of newer teaching-learning approaches such as PBLs, peer-to-peer learning, flipped learning, blended learning, etc., together with a lecture-based approach, can prove more effective in imparting essential medical knowledge and skills to the students.[34]

Besides the curricular structure and the teaching-learning processes, some possible shortcomings of the TU-IOM curriculum were also studied. The curriculum mentions that the objectives so set for completing the undergraduate MBBS course require to be completed in 4 and a half years. 76.9% of the students responded that the undue prolongation of the total MBBS course (to more than the stated duration) has seriously affected their learning experience. At the same time, the uneven examination pattern (90.8% response), and the inability to complete the syllabus on time (77.7% response), and less importance to clinically significant topics (74.18%) have been some identified shortcomings of the curriculum. The possible reasons for these shortcomings are inefficient internal management, inadequate logistics, unformed academic calendar, etc. This research could only assess selected domains of the present curriculum, which is a major limitation of this research. Also, since most of the questions required students to retrospectively analyze the questions, recall bias could not be avoided.

Therefore, to correct the curricular deficits and improve the standard of our curriculum, effective interventions must be rethought on the discussed components taking student-based feedbacks on the table while considering curricular revision. Medical education is a forever evolving field. The medical curriculum in Nepal was last revised 12 years back. There seems to have been a halt in the process of evolution in the context of Nepal. Through this research serving as an essential student-feedback-based reference, we appeal to the authority to take appropriate interventions and resume the evolution of medical education in Nepal.

CONCLUSION

We tried to identify the strengths, challenges, and possible areas of improvement in the current TU-IOM MBBS curriculum through this research. A balanced implementation of the declared SPICES model, amalgamation of research component in the curriculum, transformations in the PowerPoint lecture content and delivery, incorporation of evidence-based newer teaching-learning strategies, wise management of the inconsistencies, and working on the identified curricular shortcomings are ways which can significantly improve the quality and standard of the medical education in Nepal.

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REFERENCES

1. Curriculum for MBBS by National Centre for Health Professions Education.
2. Shankar PR. Self-directed learning in undergraduate medical education. *Janaki Med Coll J Med Sci*. 2018;6(1):1-4. doi:10.3126/jmcjms.v6i1.20567
3. Bartsch R, Cobern K. Effectiveness of PowerPoint Presentations in Lectures. *Comput Educ*. 2003;41. doi:10.1016/S0360-1315(03)00027-7
4. Stuart J, Rutherford RJD. Medical student concentration during lectures. *Lancet*. 1978;312(8088):514-516. doi:10.1016/S0140-6736(78)92233-X
5. Charlin B, Mann K, Hansen P. The many faces of problem-based learning: A framework for understanding and comparison. *Med Teach.* 1998;20(4):323-330. doi:10.1080/01421599880742
6. Hmelo CE. Problem-Based Learning: Effects on the Early Acquisition of Cognitive Skill in Medicine. J Learn Sci. 1998;7(2):173-208. doi:10.1207/s15327809jls0702_2
7. Shankar PR. Education in Medicine Journal Student Perception About Peer-Assisted Learning Sessions in a Medical School in Nepal Student Perception About Peer-Assisted Learning Sessions in a Medical School in Nepal. *Educ Med J.* 2011;2(11):1-6.
8. Mansur C, Kayastha DI, Makaju SR, Dongol R. Problem Based Learning in Medical Education. Vol 10.; 2012.
9. Park KH, Park KH, Chae SJ. Experiences of medical teachers in flipped learning for medical students: a phenomenological study. *Korean J Med Educ.* 2018;30(2):91-100. doi:10.3946/kjme.2018.84
10. Lew EK, Nordquist EK. Asynchronous learning: Student utilization out of sync with their preference. *Med Educ Online*. 2016;21(1):30587. doi:10.3402/meo.v21.30587
11. Liu Q, Peng W, Zhang F, Hu R, Li Y, Yan W. The Effectiveness of Blended Learning in Health Professions: Systematic Review and Meta-Analysis. *J Med Internet Res*. 2016;18(1):e2. doi:10.2196/jmir.4807
12. Force WT. Accreditation of medical education institutions Report of a technical meeting WHO-WFME Task Force on Accreditation. *World Health*. 2004;(October):4-6.
13. Banerjee I, Jauhari AC, Johorey AC, Bista D, Roy B, Sathian B. Medical Students View about the Integrated MBBS Course: A Questionnaire Based Cross-sectional Survey from a Medical College of Kathmandu Valley. *Nepal J Epidemiol*. 1970;1(3):95-100. doi:10.3126/nje.v1i3.5575
14. Dent JA. Using the SPICES model to develop innovative teaching opportunities in ambulatory care venues. *Korean J Med Educ*. 2014;26(1):3-7. doi:10.3946/kjme.2014.26.1.3
15. Ayub Khan U. EVALUATION OF MBBS CURRICULUM USING SPICES MODEL. Vol 23.; 2015. Accessed April 7, 2021. https://www.jmedsci.com/index.php/Jmedsci/article/view/229
16. Harden RM, Sowden S, Dunn WR. Educational strategies in curriculum development: the SPICES model. *Med Educ*. 1984;18(4):284-297. doi:10.1111/j.1365-2923.1984.tb01024.x
17. Ghosh S, Dawka V. Combination of didactic lecture with problem-based learning sessions in physiology teaching in a developing medical college in Nepal. *Adv Physiol Educ*. 2001;24:8-12. doi:10.1152/advances. 2000.24.1.8
18. Shrestha A, Shrestha A. The importance of doing research as a medical student. *Kathmandu Univ Med J*. 2007;5(17):138.
19. Metcalfe D. Involving medical students in research. *J R Soc Med*. 2008;101(3):102-103. doi:10.1258/jrsm.2008.070393
20. Pathipati AS, Taleghani N. Research in Medical School: A Survey Evaluating Why Medical Students Take Research Years. *Cureus*. 2016;8(8). doi:10.7759/cureus.741
21. DeFranco DB, Sowa G. The importance of basic science and research training for the next generation of physicians and physician scientists. *Mol Endocrinol*. 2014;28(12):1919-1921. doi:10.1210/me.2014-1343
22. Boyle SE, Cotton SC, Myint PK, Hold GL. The influence of early research experience in medical school on the decision to intercalate and future career in clinical academia: a questionnaire study. *BMC Med Educ*. 2017;17(1):245. doi:10.1186/s12909-017-1066-1
23. Seth V, Upadhyaya P, Ahmad M, Moghe V. Powerpoint or chalk and talk: Perceptions of medical students versus dental students in a medical college in india. *Adv Med Educ Pract*. 2010;1:11-16. doi:10.2147/AMEP.S12154
24. Bradbury NA. Attention span during lectures: 8 seconds, 10 minutes, or more? *Adv Physiol Educ*. 2016;40(4):509-513. doi:10.1152/advan.00109.2016
25. Mayer R, Gallini JK. When Is an Illustration Worth Ten Thousand Words? *J Educ Psychol*. 1990;82:715-726. doi:10.1037//0022-0663.82.4.715
26. Schmaltz RM, Enström R. Death to weak PowerPoint: Strategies to create effective visual presentations. *Front Psychol*. 2014;5(OCT). doi:10.3389/fpsyg.2014.01138
27. Issa N, Schuller M, Santacaterina S, Shapiro M, Wang E. Mayer R, et al. Applying multimedia design principles enhances learning in medical education. Med Educ. 2011;45(8):818-26. doi:10.1111/j.1365-2923.2011.03988.x
28. Edward Tufte: Books - Essay: The Cognitive Style of Powerpoint. Accessed April 7, 2021. https://www.edwardtufte.com/tufte/powerpoint
29. Kosslyn SM, Kievit RA, Russell AG, Shephard JM. PowerPoint® presentation flaws and failures: A psychological analysis. *Front Psychol*. 2012;3(JUL). doi:10.3389/fpsyg.2012.00230
30. Gukas I. Global paradigm shift in medical education: Issues of concern for Africa. *Med Teach*. 2007;29:887-892. doi:10.1080/01421590701814286
31. Luscombe C, Montgomery J. Exploring medical student learning in the large group teaching environment: Examining current practice to inform curricular development. *BMC Med Educ*. 2016;16(1):1-9. doi:10.1186/s12909-016-0698-x
32. Yu T-C, Wilson N, Singh P (Parry), Lemanu D, Hawken S, Hill A. Medical students-as-teachers: A systematic review of peer-assisted teaching during medical school. *Adv Med Educ Pract*. 2011;2:157-172. doi:10.2147/AMEP.S14383
33. Williams DE. The future of medical education: Flipping the classroom and education technology. *Ochsner J*. 2016;16(1):14-15. Accessed April 7, 2021. http://www.lcme.org/
34. Sajid MR, Laheji AF, Abothenain F, Salam Y, AlJayar D, Obeidat A. Can blended learning and the flipped classroom improve student learning and satisfaction in Saudi Arabia? *Int J Med Educ*. 2016;7:281-285. doi:10.5116/ijme.57a7.83d4