Students Insight of Formative Assessment via the Learning Management System (LMS) in Forensic Medicine

Syed Zubair Ahmed Tirmizi, Muhammad Adil, Muhammad Faisal Rahim, Hadiqa Sahar, Asghar Mehdi

ABSTRACT

Objective: This study aims to assess students' perceptions of an online formative assessment conducted via the LMS Moodle platform in the subject of Forensic Medicine.

Study Design and Setting: This descriptive cross-sectional study was conducted at FRPMC in Karachi, involving 183 MBBS students from the 3rd and 4th years.

Methodology: A 13-item structured questionnaire with a 5-point Likert scale was used to collect students' opinions on online formative assessments, following their consent and ethical approval from the institutional review board. Only fully completed responses were analyzed. Data was processed using SPSS (version 26), and descriptive statistics, along with Cronbach's alpha, were used to assess reliability.

Results: The findings revealed that most respondents had a positive view of the online formative assessments. Approximately 68.8% found the assessments to be well-organized and relevant, while 60% felt that the learning objectives were aligned. Around 65% believed the exam helped in recalling forensic medicine knowledge, and 70% found the questions challenging. However, 41% reported technical issues, and 69-70% felt the exam's duration and difficulty were insufficient. The Cronbach's alpha of 0.893 indicated strong internal consistency, although the Kaiser-Meyer-Olkin test suggested insufficient sampling for certain items.

Conclusion: FRPMC students responded positively to online formative assessments using LMS-Moodle quiz. Rectification of technical issues and appropriate assessment conditions are crucial for future improvements.

MeSH Keywords: Assessment, Formative, Forensic Medicine, learning, Perception

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INTRODUCTION:

Teaching and learning in medical education involve various activities for students, among which assessment plays a pivotal role for both students and teachers, especially in the subject of Forensic Medicine.[1] Forensic Medicine holds significant importance in the medical curriculum of 3rd-year MBBS students, as contact hours must be covered according to PMDC guidelines. In this modern era of science and technology, our teaching and learning methods have evolved significantly, utilizing available resources to modernize the quality of education. The specialty of Forensic Medicine has also incorporated E-learning methods alongside traditional classroom teaching to keep pace with the changing environment of learning and teaching.[2] Among the use of digital technologies into higher education, Learning Management Systems (LMS) such as Moodle have become central to delivering course content, facilitating communication, and assessing student performance. One widely used feature of LMS platforms is the online formative assessment quiz, which serves as a tool to promote active learning, provide timely feedback, and gauge students' understanding of course material.

Formative assessment has become an essential component of assessment methodologies used in the integrated curriculum. Unlike summative assessment, which focuses on final evaluations, formative assessment promotes student learning by providing feedback that enables students to

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improve and further enhance their learning process. This method of assessment allow teachers to frequently monitor their students' progress and evaluate the effectiveness of their own teaching practices.[3] It helps teachers identify areas of the curriculum where instructional strategies may need modification and where additional academic support may be necessary for students. Moreover, it has emerged as a crucial pedagogical tool in medical education particularly in Forensic Medicine align with the constructivist approach to learning, enabling students to build new knowledge based on their existing understanding through active engagement.[4] Formative assessment also fosters self-regulation in learning, encouraging students to become more independent and reflective in their approach to studying.[5]

Feedback mechanisms in formative quizzes contribute to the development of a growth mindset. When students receive feedback on their mistakes, particularly when the feedback emphasizes effort, strategy, and improvement rather than innate ability, they are more likely to believe that their intelligence can grow with practice and perseverance. Moreover, personalized feedback enables teachers to adjust teaching methods and materials to accommodate the varying needs of students within a classroom. For example, a teacher might provide additional resources or suggest alternative learning strategies to a student who struggles with a particular concept.

Effective feedback fosters a positive and supportive teacher-student relationship. When students receive timely and constructive feedback, they feel that their teachers are actively involved in their learning and care about their progress. One of the key principles of formative assessment is its focus on continuous improvement rather than final judgment.

As education continues to evolve, the integration of effective feedback mechanisms in formative assessment will remain a cornerstone of high-quality teaching and learning. Educators and institutions should prioritize the development of feedback systems that are timely, clear, constructive, and supportive, ensuring that all students can maximize their potential and achieve long-term success in their academic pursuits.

Several studies have emphasized the beneficial and long-lasting effects of formative assessment in medical education.[6-8] Formative assessment is instrumental in facilitating self-directed learning and enhancing students' ability to apply theoretical knowledge in clinical settings.[9] This is especially relevant in Forensic Medicine, where students must integrate knowledge from various medical and legal disciplines to understand and solve complex cases involving criminal investigations, autopsies, and the determination of cause of death.

Furthermore, the dynamic nature of Forensic Medicine, with its reliance on evolving legal and medical standards, makes formative assessment an ideal tool for keeping students updated with the latest developments in the field. Shumway and Harden highlight the role of formative assessment in promoting lifelong learning for medical professionals, who must continually update their knowledge and skills throughout their careers.[10] The multidisciplinary and dynamic nature of Forensic Medicine demands not only theoretical knowledge but also practical skills in areas such as pathology, toxicology, and legal procedures

The curricula of many medical schools focus primarily on final exams or practical assessments, which may create gaps in the ongoing evaluation of students' understanding and skills development. Moodle quiz used for formative assessment can address this gap by evaluation of student's performance during the ongoing academic activities in the curriculum.[11] It also encourages student's active learning by engaging students in regular assessments and feedback. Instead of passively absorbing information, students are prompted to critically evaluate their own work, question their assumptions, and engage in self-reflection.[12]

The significance of studying students' perceptions of formative assessment using LMS-Moodle quiz in forensic medicine lies in its potential to improve both teaching practices and learning outcomes. Understanding how students feel about and respond to these assessments can help instructors refine their methods, provide more meaningful feedback, and ensure that students are better prepared for the challenges they will face in their professional careers. Ultimately, this research offers a pathway to more effective, student-centered education in a crucial and specialized field.

Despite the widespread adoption of Moodle quizzes, there remains a need to understand students' perceptions of their effectiveness, usability, and impact on learning outcomes—especially in the context of Forensic Medicine. Students' attitudes toward online assessments significantly influence their engagement and academic performance, and exploring these perceptions can guide educators in optimizing assessment strategies for better educational outcomes. Although the importance of formative assessment Moodle quiz in medical education is clear, its specific application in forensic medicine course has been underutilized and few studies have explored their specific impact in Forensic Medicine. This study, therefore, aims to assess the medical students' perception of online formative assessment conducted via the LMS Moodle platform in the subject of forensic medicine at FRPMC.

METHODOLOGY

Formative assessment of 3rd- year MBBS students in forensic medicine at Fazaia Ruth Pfau Medical College is conducted every 3rd Friday of the month after pharmacology and pathology respectively. It is conducted 3-4 times in a 12 week block of two modules and there are three blocks in a year, so covering the whole subject. Each assessment covers all topics taught in the last two weeks and we have used assessment quizzes of one block. The online formative

assessment quiz was administered through Moodle quiz. Feedback of quiz is embedded in the grade section in which each student sees his own score and description of right and wrong answers with explanation and reasoning. In addition to this, there was a post-quiz discussions in class room where facilitators discuss the keys and queries raised by the students and were asked to explain their choices of marking.

This descriptive, cross-sectional study was conducted at Fazaia Ruth Pfau Medical College (FRPMC), Karachi. A total of 183 medical students from the 3rd and 4th year MBBS programs participated in this study. The study was conducted during the period from 5th October,2024 to 30th November, 2024. Fazaia Ruth Pfau Medical College, Faisal Base, Shah rah-e- Faisal Karachi. Prior to the commencement of the study, approval was obtained from the institutional ethical committee of Fazaia Ruth Pfau Medical College (Ref. No: FRPMC-IRB-2024-79). All participants voluntarily took part in the research, and written consent was obtained from each participant. To ensure data security, all data will be kept under strict custody using a lock-and-key system in a separate location, with access restricted to the investigator.

Exclusion and Inclusion Criteria: Students who participated to fill the questionnaire with complete responses were included in the study. These were those students of 3rd and 4th year who have attended formative assessment quizzes in one block of their respective year on Moodle and completed this activity. The students who have not attended online Moodle quiz and unable to complete full responses in the questionnaire were excluded from study. Students of 1st, 2nd and final year were also excluded as initial two classes do no study forensic medicine and formative assessment on LMS-Moodle was not routinely used at the time of final year batch.

Sample Size Calculation: The sample size of this study is 183 out of 200 medical students from 3rd and 4th year MBBS classes. Estimation was done with a convenient sampling technique as this is educational research. Convenient sampling allows us to take all samples whichever is available, therefore in our case all students were added from two class which make our sample size 183 out of 200 students fulfilled our criteria .

Data Collection: A structured 5-point Likert scale questionnaire with 13 items was used as the primary data collection instrument. The questionnaire was designed to capture students' perceptions and experiences related to online formative assessments. It consisted of five options, ranging from "Strongly Disagree" to "Strongly Agree," with a neutral point allowing respondents to neither agree nor disagree. Data collection was carried out using an online Google Form. The link was shared with students, who then filled out the form and submitted it online.

Data Analysis: The collected data was analyzed using Statistical Package for the Social Sciences (SPSS, version 26). Descriptive statistics, including frequencies, mean values, standard deviations, and factor analysis, were calculated for each variable. Cronbach's alpha value was also calculated to assess the reliability of the questionnaire.

RESULT

Table 1 show majority of respondents either agreed or strongly agreed with most variables, indicating overall positive perception for all the items in the questionnaire. 68.8% of respondents were in agreement (19.1% strongly agree, 49.7% agree) that the online formative assessment activity was organized and relevant to their subject. 60% of students agree that learning objectives were aligned with online formative exams. Approximately 65% of students believes that the on line formative exam helps in recalling knowledge of forensic medicine subject, while70% of students thought that the exam question was challenging and thought provoking. However nearly 41% of students expressed concern over technical issues occurring during the online exam. Moreover 69 to 70 percent students thought the duration of exam was not sufficient and level of difficulty was not appropriate. 65% of students think that this mode of exam is fair for evaluation and can be used in future.

Fig no:1 show percentage of Likerst scale for each responses obtained from each item or question on 5-point likert scale questionnaire, As this chart clearly depict that for each question in questionnaire most the responses for category of Strongly agree came out to be more than 70 percent which also been validated by the table 1 given above. Cronbach's á value came out to be 0.893 which shows good level of internal consistency and indicates an acceptable level of reliability of items in the questionnaire.

We assumed below Hypothesis to identify whether underlying structure in data i.e. factors exist or not. Null Hypothesis (Ho): There is no underlying structure in the data i.e., no factors exist. Alternative Hypothesis (H1): There is an underlying structure in the data i.e., factors exist.

Below are the results of our detail analysis of data: Table 2: The Kaiser-Meyer-Olkin (KMO) value i.e. 0.916 indicates the appropriateness of the factor analysis for the data. Also Bartlett's Test of Sphericity shows a significant value that indicates there is an underlying structure in the data i.e., factors exist. As per Exploratory Factor Analysis results shown in table III, we can say that there is a structure of the relationship between the variable & respondent.

DISCUSSION:

Formative assessment provides valuable support to students by enhancing their ability to track ongoing learning. For learning assessments, formative evaluations typically give students guidance and feedback on their own performance. These kinds of evaluations are usually conducted in tandem with education. Additionally, formative assessment facilitates student learning by identifying and correcting mistakes,

Table-1: Frequency Distribution Of Students` Responses On 5-Point Likert Scale (n = 183)

Questions/Items	Strongly Agree (%) (n)	Agree (%) (n)	Neutral (%) (n)	Disagree (%) (n)	Strongly Disagree (%) (n)	Mean
Organization and Relevance	19.1 (35)	49.7 (91)	24.6 (45)	6.0 (11)	0.5 (1)	3.80874
Support for Learning Goals	15.3 (28)	45.9 (84)	25.1 (46)	10.9 (20)	2.7 (5)	3.60109
Recall of Forensic Medicine Knowledge	18.6 (34)	46.4 (85)	27.3 (50)	4.9(9)	2.7 (5)	3.73224
Challenge and Thought-Provocation of MCQs	18.0 (33)	48.1 (88)	28.4 (52)	4.9 (9)	0.5 (1)	3.78142
Clarity of MCQs	7.1 (13)	31.1 (57)	35.0 (64)	20.8 (38)	6.0 (11)	3.12568
Sufficiency of Time Allocation	18.0 (33)	53.0 (97)	22.4 (41)	4.4 (8)	2.2 (4)	3.80328
Appropriateness of Difficulty Level	14.2 (26)	50.8 (93)	28.4 (52)	4.9 (9)	1.6 (3)	3.71038
Ease of Following Steps	17.5 (32)	53.6 (98)	23.5 (43)	4.4 (8)	1.1(2)	3.81967
Technical Issues	8.7 (16)	33.3 (61)	27.9 (51)	21.9(40)	8.2 (15)	3.12568
Satisfaction with Responsiveness	13.7 (25)	53.0 (97)	21.9 (40)	7.7 (14)	3.8 (7)	3.65027
Aid of Immediate Feedback	17.5 (32)	49.2(90)	24.0 (44)	7.1(13)	2.2 (4)	3.72678
Fairness of Evaluation	13.7 (25)	49.7 (91)	29.0 (53)	4.4 (8)	3.3 (6)	3.6612
Recommendation for Future Use	20.8 (38)	44.8 (82)	24.0 (44)	6.0 (11)	4.4 (8)	3.71585

Figure 1: Responses against questions related to effectiveness of formative assessment in Forensic Medicine

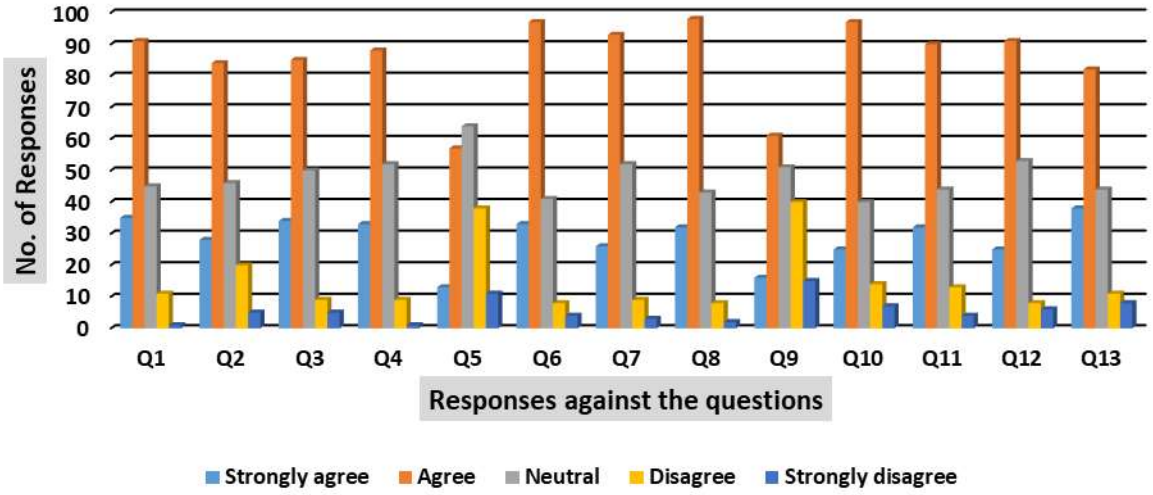

Table 2: KMO and Bartlett's test

Kaiser – Meyer –Olkin Measure of sampling adequacy		.916
Bartlett's Test of Sphericity	Approx. Chi-Square	1449.958
	df	78
	Sig.	.000

thereby improving performance through repeated practice. A study conducted by Couto LB and Durand concluded similar findings, demonstrating that formative assessment has a productive impact on learning and on the results of final module and professional MBBS summative exams.[17]Therefore, it supports all teaching and learning activities planned by the facilitator.[18]

Our study revealed an overall positive perception by students regarding ongoing formative assessments in forensic medicine on Moodle. Most students expressed satisfaction, stating that formative assessment plays a vital role in their learning process and significantly impacts their preparation for the final examination. The majority of students also reported that the online formative assessments were well-organized, relevant to their forensic medicine syllabus, and aligned with their learning objectives. This aligns with previous research by Anderson, which indicates that well-designed and effectively implemented formative assessments can significantly reinforce learning and improve subject matter retention.[19] The students valued how Moodle allows them to feel free to respond honestly, receive prompt feedback, and have teachers gather statistics about them in real time. Alvarez and Villamane (2024) supported that use of Moodle

Table 3: Exploratory Factor Analysis

Rotated Component Matrix[a]	Component	
	1	2
Did the immediate feedback from the online formative assessment aid your learning in forensic medicine?	.837	
Did the structure of the online formative assessment support you in achieving your learning goals in forensic medicine?	.819	
Was the online formative assessment well organized and relevant to forensic medicine syllabus?	.819	
Did the online formative assessment improve your ability to recall forensic medicine knowledge?	.817	
Do you feel that online formative assessment was a fair evaluation of your forensic medicine knowledge?	.811	
Were you satisfied with the responsiveness of online assessment system?	.790	
Was the difficulty level of online MCQs appropriate for your understanding?	.778	
Were the steps for completing online formative assessment easy to follow?	.775	
Do you recommend online formative assessments for other students?	.767	
Was the time allocated for online formative assessment sufficient?	.743	
Were the MCQs in the formative assessment challenging and thought-provoking?	.718	
Was any MCQ in the formative assessment unclear or confusing?		.798
Did you encounter any technical issues during the online formative assessment?		.785

for formative assessment is very beneficial, as it has built in learning management system features.[20] The literature claims that Moodle has become a well-recognized platform that is appropriate for usage in higher education.

These findings highlight the successful integration of online formative assessments into the curriculum, demonstrating their role in supporting students' understanding and application of forensic medicine knowledge.[21]

A notable 65% of students felt that the online formative exams were effective in helping them recall knowledge in forensic medicine. Additionally, 70% found the questions challenging and thought-provoking, suggesting that the assessments were designed to encourage critical thinking and deeper engagement with the material. Many studies, including one by Senadheera, are consistent with the principles of formative assessment, emphasizing the importance of challenging students to enhance their learning and critical thinking skills.[22] The alignment of assessment questions with learning goals ensures that students are not only reviewing their knowledge but also applying it in meaningful ways.

Despite the overall positive feedback, concerns were raised regarding technical issues, with nearly 41% of students expressing dissatisfaction. Technical difficulties can undermine the effectiveness of online assessments and detract from the learning experience. These issues may also contribute to student anxiety, negatively impacting performance and overall satisfaction. A significant proportion of students (69-70%) felt that the exam duration was insufficient and that the difficulty level of the questions was not always appropriate. These concerns highlight the need to refine the logistical aspects of online assessments to ensure they are both fair and effective. Berisha's study similarly pointed out that challenges such as technical glitches or inappropriate difficulty levels in online formative assessments can negatively impact their full and effective implementation within the medical curriculum.[23]

The reliability of the questionnaire, as indicated by a Cronbach's alpha of 0.893, suggests a high level of internal consistency among the items. This demonstrates that the questionnaire is a reliable tool for capturing student perceptions.[24] However, the factor analysis results indicated that some items (e.g., clarity of MCQs and technical issues) had lower communalities, suggesting potential areas for improvement in the assessment instrument. Statistical technique called exploratory factor analysis (EFA) finds groups of variables that have a tendency to correlate with one another in order to reveal the underlying structure of a set of variables. It is often used in the early stages of research to gather information about the interrelationships among a set of variables. As per Exploratory Factor Analysis results, we can say that there is a structure of the relationship between the variable & respondent. The Kaiser-Meyer-Olkin (KMO) value i.e. 0.916 indicates the appropriateness of the factor analysis for the data. Also Bartlett's Test of Sphericity shows a significant value that indicates there is an underlying structure in the data i.e., factors exist.[25]

The positive feedback from students regarding the fairness and potential future use of online formative assessments (65% agreed that this mode of examination is fair and could be used in the future) underscores their acceptance of this assessment method. This acceptance suggests that online formative assessments have the potential to become a valuable component of the medical curriculum, provided the identified issues are addressed. For future implementations, it will be crucial to enhance technical support, ensure appropriate exam duration, and calibrate the difficulty level of questions to better align with students' abilities and learning objectives.

Moreover, incorporating student feedback into the design and implementation of online assessments can lead to iterative improvements and a more refined assessment process.[26] Future research should explore strategies to mitigate technical issues and optimize assessment conditions to enhance the overall effectiveness of formative assessments.

CONCLUSION

Online LMS-Moodle quiz for formative assessments have been positively received by students at FRPMC, with many reporting benefits in terms of enhancement of learning. However, to fully realize the potential of these assessments, it is essential to address technical and logistical issues and ensure that the assessments are appropriately challenging and fair. Future research could explore strategies to improve the technical infrastructure and assessment design to better support student learning and address the limitations identified in this study.

Authors Contribution:
Syed Zubair Ahmed Tirmizi: Visualize Initial concept, made research question, contribute in introduction writing
Muhammad Adil: Develop Methodology, contribute in data collection and analysis and develop result
Muhammad Faisal Rahim: Contribute in discussion writing, contribute in data collection
Hadiqa Sahar: Contribute in introduction writing, contribute in data collection
Asghar Mehdi: Revise article and references critically

REFERENCES

1. Aulino G, Beccia F, Siodambro C, Rega M, Capece G, Boccia S, Lanzone A, Oliva A. An evaluation of Italian medical students attitudes and knowledge regarding forensic medicine. Journal of Forensic and Legal Medicine. 2023 Feb 1;94:102484. DOI: https://doi.org/10.1016/j.jflm.2023.102484
2. Gupta S, Parekh UN, Ganjiwale JD. Student's perception about innovative teaching learning practices in Forensic Medicine. Journal of Forensic and Legal Medicine. 2017 Nov 1;52:137-42. DOI: https://doi.org/10.1016/j.jflm.2017.09.007
3. Ismail SM, Rahul DR, Patra I, Rezvani E. Formative vs. summative assessment: impacts on academic motivation, attitude toward learning, test anxiety, and self-regulation skill. Language Testing in Asia. 2022 Sep 13;12(1):40.
4. Boston C. The concept of formative assessment. Practical assessment, research, and evaluation. 2019;8(1):9.
5. Dolin J, Black P, Harlen W, Tiberghien A. Exploring relations between formative and summative assessment. Transforming assessment: Through an interplay between practice, research and policy. 2018:53-80.
6. Vaganova OI, Smirnova ZV, Vezetiu EV, Kutepov MM, Chelnokova EA. Assessment tools in e-learning Moodle. International Journal. 2020 May;9(3):2488-92.
7. Kitchen H, Bethell G, Fordham E, Henderson K, Li RR. OECD reviews of evaluation and assessment in education: student assessment in Turkey. Paris: OECD Publishing; 2019. p. 25. DOI: https://doi.org/10.1016/j.ssaho.2022.100323
8. Otaki F, Gholami M, Fawad I, Akbar A, Banerjee Y. Students' perception of Formative Assessment as an Instructional Tool in competency-based medical education: Proposal for a proof-of-concept study. JMIR Research Protocols. 2023 Mar 20;12(1):e41626. DOI: https://doi.org/10.2196/41626.
9. Granberg C, Palm T, Palmberg B. A case study of a formative assessment practice and the effects on students' self-regulated learning. Studies in Educational Evaluation. 2021 Mar 1;68:100955. DOI: https://doi.org/10.1016/j. stueduc.2020. 100955
10. Buyukkarci K, Sahinkarakas S. The impact of formative assessment on students' assessment preferences. The Reading Matrix: An International Online Journal. 2021 Apr 1;21(1):142-61.
11. Morris R, Perry T, Wardle L. Formative assessment and feedback for learning in higher education: A systematic review. Review of Education. 2021 Oct;9(3):e3292. DOI: https://doi.org/10.1002/rev3.3292
12. McCallum S, Milner MM. The effectiveness of formative assessment: student views and staff reflections. Assessment & Evaluation in Higher Education. 2021 Jan 2;46(1):1-6. DOI: https://doi.org/10.1080/02602938.2020.1754761
13. Van der Vleuten CP, Schuwirth LW, Driessen EW, Dijkstra J, Tigelaar D, Baartman LK, Van Tartwijk J. A model for programmatic assessment fit for purpose. Medical teacher. 2012 Mar 1;34(3):205-14. DOI: https://doi.org/10.3109/0142159X.2012.652239
14. Shumway JM, Harden RM. AMEE Guide No. 25: The assessment of learning outcomes for the competent and reflective physician. Medical teacher. 2003 Nov 1;25(6):569-84. https://doi.org/10.1016/j.ssaho.2022.100323
15. Cardozo LT, Azevedo MA, Carvalho MS, Costa R, de Lima PO, Marcondes FK. Effect of an active learning methodology combined with formative assessments on performance, test anxiety, and stress of university students. Advances in Physiology Education. 2020 Dec 1;44(4):744-51. DOI: https://doi.org/10.1152/advan.00075.2020
16. Molin F, De Bruin A, Haelermans C. A conceptual framework to understand learning through formative assessments with student response systems: The role of prompts and diagnostic cues. Social Sciences & Humanities Open. 2022 Jan 1;6(1):100323. DOI: https://doi.org/10.1016/ j.ssaho.2022. 100323
17. Couto LB, Durand MT, Wolff AC, Restini CB, Faria Jr M, Romão GS, et al. Formative assessment scores in tutorial sessions correlate with OSCE and progress testing scores in a PBL medical curriculum. Medical Education Online. 2019 Jan 1;24(1):1560862. DOI: https://doi.org/10.1080/10872981. 2018.1560862
18. Van Diggele C, Roberts C, Burgess A, Mellis C. Interprofessional education: tips for design and implementation. BMC Medical Education. 2020 Dec 3;20(Suppl 2):455.
19. Anderson L, Fernandez-Branson C. Promoting physiology integration through alignment of learning objectives and formative assessments. FASEB J. 2021 May;35. DOI: https://doi.org/10.1096/fasebj.2021.35.S1.02624
20. Alvarez A, Villamañe M. Facilitating complex assessment using Moodle. Interactive Learning Environments. 2024 Feb 7;32(2):585-99.

21. Gupta S, Reddy JN, Parekh U. Competency-based or competency-driven medical education in forensic medicine: crossroads and way forward. Journal of Forensic Medicine and Toxicology. 2022;39(1):1-4. DOI: https://doi.org/10.5958/0974-4568.2022.00001.1.

22. Senadheera P, Kulasekara GU. A formative assessment design suitable for online learning environments and its impact on students' learning. Open Praxis. 2021 Dec 1;13(4):385-96.

23. Berisha, Fatlume & Vula, Eda & Gisewhite, Rachel & McDuffie, Hannah. (2023). The effectiveness and challenges implementing a formative assessment professional development program. Teacher Development. 28. 1-25. DOI: https://doi.org/10.1080/13664530.2023.2210533.

24. Aithal A, Aithal PS. Development and validation of survey questionnaire and experimental data: a systematic review-based statistical approach. Int J Manag Technol Soc Sci. 2020 Nov 3;5(2):233-51. DOI: https://doi.org/10.2139/ssrn.3724105

25. Shrestha N. Factor analysis as a tool for survey analysis. Am J Appl Math Stat. 2021 Jan 20;9(1):4-11. DOI: https://doi.org/10.12691/ajams-9-1-2.

26. Thangaraj P, Sethuraman D, Ramalingam R. Knowledge and attitude toward formative assessment among teaching faculties of medical institutions. MRIMS J Health Sci. 2023 Dec 22. DOI: https://doi.org/10.5958/0974-4568.2022.00001.1.

27. Holmes W. Artificial intelligence in education: Promises and implications for teaching and learning. Center for Curriculum Redesign. 2019.

28. Tempelaar D, Rienties B, Nguyen Q. Subjective data, objective data and the role of bias in predictive modelling: Lessons from a dispositional learning analytics application. PloS one. 2020 Jun 12;15(6):e0233977.