

Factors Affecting Student Learning Outcome in Medical Colleges

Hina Mahmood¹, Muhammad Naeem Shahzad² & Farzana Khan³

¹Superior University Lahore, Pakistan, Email: hinamahmood442@gmail.com

²Superior University Lahore, Pakistan, Email: naeem@piqc.edu.pk

³Superior University Lahore, Pakistan

ARTICLE INFO

Article History:

Received: October 15, 2025
Revised: November 18, 2025
Accepted: November 24, 2025
Available Online: December 07, 2025

Keywords:

Learning outcomes, structural equation modeling (SEM), Bloom Taxonomy.

Corresponding Author:

Hina Mahmood

Email:

hinamahmood442@gmail.com



ABSTRACT

Learning outcomes in medical colleges are an effective part of the evaluation for the educational process and can be described as an important procedure, mainly given priorities in professions that require a high level of competence. The primary objective of this study to identify the key factors affecting students' learning outcomes and analyze the relationship between these factors and students' learning outcomes based on Bloom's Taxonomy. A quantitative research study was employed by utilizing structured questionnaire. The analysis was carried out through Statistical Package for the Social Sciences (SPSS) for descriptive analysis, and Structural Equation Modeling (SEM) was used to study the hypothesized relationship between variables. Findings revealed that all proposed variables displayed a positive impact on learning outcomes, except teaching methods and assessment practice. Course design, Social and Family Influence, and Institutional facilities strongly affect Learning Outcomes at a 5% level of significance. The impact of Teaching Methods and Assessment practices proves to be negative but significant upon Learning Outcomes. Furthermore, on the basis of practical recommendations for improving learning outcomes in medical colleges, need to enhance teaching strategies, simulation-based learning, and interactive case discussions. Also, there is a need for improving the presence of formative assessments in the form of peer assessments and clinical exams to augment clinical judgment, problem-solving ability, and also the levels of knowledge recall.

Introduction

When understanding the learning outcomes from the perspective of the medical colleges, it is important to realise that they are not merely the theoretical kind of outcomes; they point to more of the applied, clinical, and interpersonal skills. The future medical practitioners need to have these

skills to be able to efficiently and effectively deliver their duties. In medical education, learning outcomes also guide institutions in evaluating their educational models as well as the competence of the graduates. It is expected that medical students should master all of these domains, and these competencies must, as a matter of necessity, run throughout the learning process of the students (Bastable et al., 2019). The reasons for analyzing these factors include the notion that even in the context of its continuous growth, medical education practices continue to pose challenges for the implementation of effective learning. The systematic approach used in this paper has helped in presenting information has been beneficial to the medical educators in increasing their understanding of the factors that influence the learning outcomes, so as to modify their teaching strategy and programs to fit the demanded competencies in the healthcare sector. Focusing on the environment of teaching, institutions, and systems in general, this research has helped to introduce enhanced and more efficient approaches for the colleges of medical education.

Statement of the Problem

The issue of increasing learning outcomes in medical colleges remains a significant factor that has not been resolved in a number of countries globally, while innovations are being actively made to shift to advanced education. As for the goals and objectives of medical colleges as the institutions capable of providing comprehensive education and enhancing students' performance, both in terms of theories and practical skills, the common concern is not addressed optimally. This difference poses many questions regarding the efficiency of the current approaches in the teaching process, methods of assessment, as well as the entire learning environment in the medical colleges. In this study, an attempt has been made to pinpoint the significant factors that may affect students' learning outcomes and reveal what helps or hinders students from becoming successful or unsuccessful in medical colleges: the role of the teaching methods, institutional resources, and the assessment practices, as well as the influence of the outside factors, namely, family. The findings of this study have been beneficial to future research and education by providing findings that would help educators and institutional administrators to enhance the strategies used in teaching, the support given to students, and the assessment procedures used to evaluate students' learning processes. The relevance of this study is found in the fact that the research has aimed at filling the gap that seems to exist between the current practices in the colleges and the intended learning achievement in the medical learning institutions. It has suggested the most influential factors affecting interaction between the teacher, students, and content by pointing out the learning factors that have that factor most closely associated with them.

Objective of the Study

The primary objectives of this research are as follows:

- To identify the key factors affecting students' learning outcomes in medical colleges.
- To analyze the relationship between these factors and students' learning outcomes based on Bloom's Taxonomy.
- To develop recommendations for improving educational practices in medical colleges.

Literature Review

Education in general becomes rather challenging due to the fact that students have to acquire the essential content knowledge in addition to developing the required cognitive skills to provide adequate care as members of the medical profession (Nascimento et al., 2021). According to Bloom's Taxonomy, it is an effective framework that can be used to evaluate and direct the learning accomplishments of the medical students. The taxonomy helps student learning in a way that it provides from the basics of knowledge construction up to advanced problem-solving and

finally critical thinking, which are crucial for a medical profession (Nascimento et al., 2021).

Teaching Method: In the medical education teaching methods play an important role by utilizing effective methods of delivery to enhance student learning outcome by ensuring engagement with the content and active development of their cognitive abilities. A several teaching methods or strategies used in medical education such as, interactive sessions of students, traditional style lectures, and student-centered learning models (Dunleavy et al., 2019). In particularly, Active learning improves students' ability for making reliable decisions in clinical problem-solving and also retain student competence in order to handle complex patient cases. Therefore, research proposes hypothesis H₁: Teaching Methods have a positive impact on student learning outcomes.

Institutional Facilities: The learning environment in the medical institution play a crucial role that direct influence on students through technological resources along with the physical facilities that affect students' cognitive development and learning processes. Two main categories of institutional facilities provided by educational institutions such as: technological-based tools and physical infrastructure that available in the simulation laboratories, classrooms and clinical teaching areas. Also, e-learning platforms available in the educational institutions that support both practical and theoretical learning (Challa et al., 2021). The quality standards of these facilities determine medical students' familiarity with their curricula and their cognitive development needed for medical practice, such as decision-making and diagnostic reasoning, and problem-solving. Therefore, the research hypothesis proposes H₂: Institutional Facilities have a positive impact on student learning outcomes.

Assessment Practices: Student assessment methods play a key role in the medical education used to assess how students learn and contribute to the enhancement of their cognitive development. Cognitive development depends heavily on assessment feedback since it provides students with both self-improvement direction and promotes reflection through practice. Student advancement in their cognitive capabilities depends on this feedback system because it helps students develop their critical thinking along with problem-solving abilities (Kang and Kim, 2021). Therefore, research proposes hypothesis H₃: Assessment Practices have a positive impact on student learning outcomes.

Family and Social Influence: The influence of family together with social factors should get more academic attention because they directly affect student learning outcomes. The academic results of students improve when family members show emotional backing together with financial aid and academic mentorship which boosts students' dedication and continuous effort and academic achievement (Van Diggele et al., 2020). Learning outcomes express significant dependence on family and social relationships thus developing supportive academic settings requires complete comprehension of these factors for cognitive development that produces minimized external pressures. Therefore, research proposes hypothesis H₄: Family and Social Influence has a positive impact on student learning outcome.

Course Design: Students receive foundational information first and follow it with progressively challenging concepts when the curriculum is properly designed. The structural composition of program shows how students well receive knowledge through content structure, curriculum and teaching delivery which defined educational goals (Antonioni et al., 2020). Therefore, research proposes hypothesis H₅: Course Design has a positive impact on student learning outcome.

Learning Outcome: The top priority of medical education is structured around cognitive domain learning outcomes as the primary objective (Barari et al., 2022). Medical education focuses on developing intellectual abilities for becoming capable healthcare professionals as a result of cognitive learning outcomes. Students' healthcare professional growth based on their cognitive

learning abilities like problem solving, clinical reasoning, critical thinking and analysis and synthesis.

Theoretical Framework

In the medical educational environment, numbers of factors play a crucial role to improve learning outcome such as: Institutional facilities, family and social influence, teaching methods and course design. These factors help collectively in the student intellectual development which is essential for their professional growth (Hieu et al., 2023). The framework describes in a comprehensive way how multiple aspects converge to produce critical cognitive capabilities in medical education.

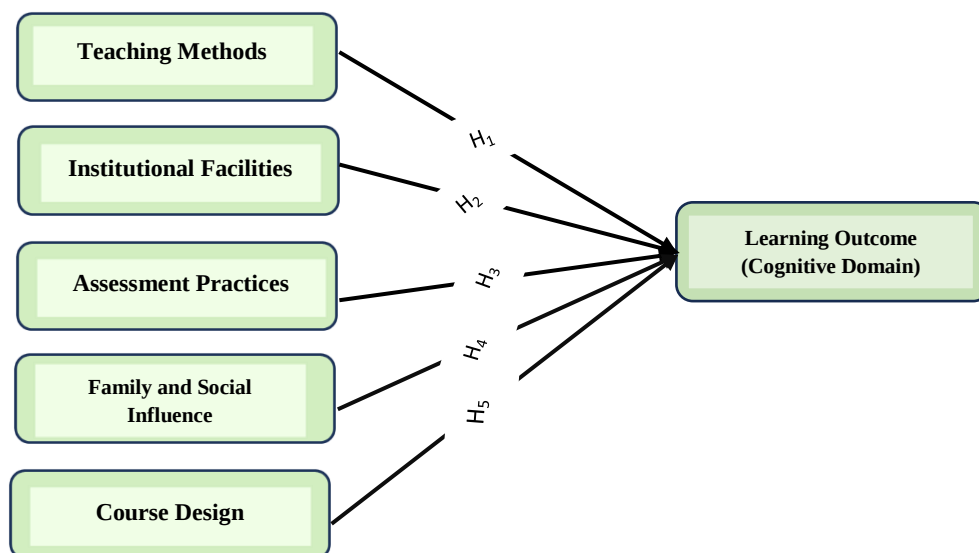


Figure 1: Theoretical Framework

Educational design institutions together with their teachers need to evaluate the complete set of factors during curriculum planning to maximize students' academic results. Medical education becomes more effective when teaching approaches integrate with the facilities of learning institutions and assessment systems while integrating student social environments and curriculum planning to develop better clinical readiness among graduates.

Material and Methods

To examine factors influencing students' cognitive learning outcomes in medical colleges this study employed a quantitative research design using cross sectional survey approach that covered larger range of medical students in Pakistan. The study employed a Likert scale item with a structured questionnaire as the primary data collection tool to ensure the consistency among the groups. To enhancing the external validity of the research outcomes through statistical analysis the findings allow for broader generalization across medical educational institutions. The research has focused on medical students currently studying in different medical programs of universities and medical colleges located in Lahore Pakistan. The research design includes students from different medical years to obtain diverse learning experiences across all stages of their education. The sampling unit for this study comprises on 16 different medical programs of universities and medical colleges (including both public and Private) located in Lahore Pakistan. The sample size of this study was 368, reflecting a response rate of 92%, which is significantly higher than the average typically observed in survey-based studies. To measure the structural model the study used advanced statistical technique that is Structural Equation Modeling (SEM) which evaluate the

directional of relationships between different educational factors influencing on student learning outcome.

Results and Findings

The research sample contains 225 male students who comprise a portion of 61% and 143 female students that account for 39% of the total 368 students. The sample shows male students represent more than 60% of the student population thus surpassing female students in numbers.

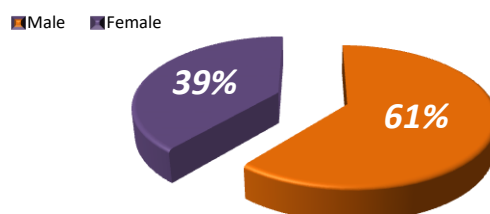


Figure 2: Gender Distribution

Among the sample students most belong to the 3rd year (27%) with 100 participants from this cohort. There are 89 students (24%) in the 2nd year whereas 76 students represent the 4th year (21%) according to the collected data. Only 12% (43 students) of the total sample comes from the 1st academic year whereas the smallest segment belongs to the 5th year with 16 students (16%). A majority of the study participants belong to 3rd and 2nd year (27%) and (24%) respectively. The data reveals that the 1st year and 5th year educational levels form a smaller segment than other academic levels in this research group.

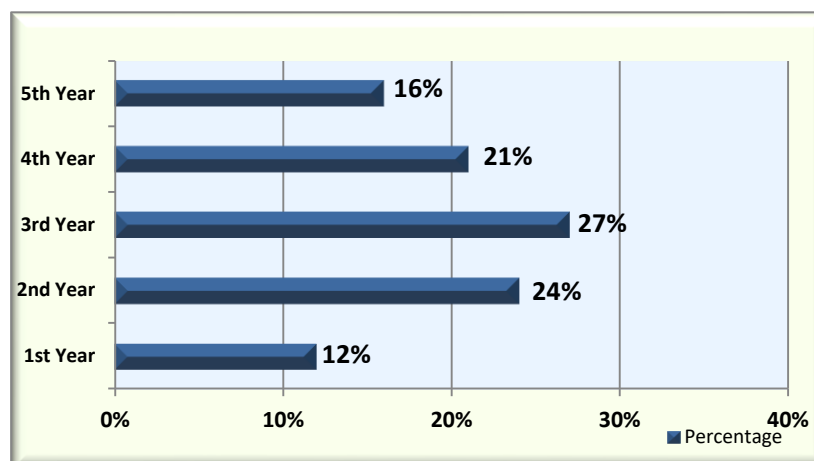


Figure 3: Year Distribution

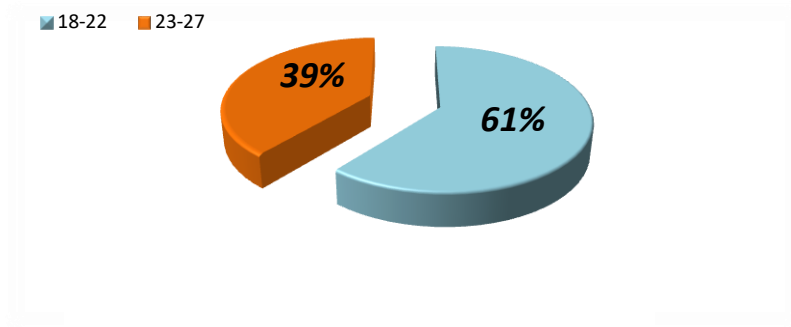


Figure 4: Age Distribution

Mostly students within the selected sample belong to the 18-30 age bracket since this group comprises 61% of the total population. This distribution clearly shows the population by age where younger students form the major portion and older students represent a minimal segment.

Reliability and Validity

According to the descriptive statistics mostly students scored an average of 3.3 to 4, which means that the students mostly agreed with the statement.

Table 1: Scale Reliability and Validity

Items	Mean	Cronbach's Alpha	Composite Reliability (CR)	Average Variance Extracted (AVE)	Fornell-Larcker Criterion (Discriminant Validity)
TM4	3.64	0.964	0.892	0.622	Valid
TM3	3.28				
TM2	3.50				
TM1	3.84				
IF6	3.74	0.978	0.834	0.696	Valid
IF5	3.67				
IF4	3.68				
IF3	3.36				
IF2	3.53				
IF1	3.85				
FSI5	3.73	0.980	0.925	0.675	Valid
FSI4	3.80				
FSI3	4.04				
FSI2	3.95				
FSI1	3.28				
AP4	3.72	0.979	0.893	0.678	Valid
AP3	3.79				
AP2	4.03				
AP1	3.94				
CD4	3.68	0.929	0.843	0.596	Valid
CD3	3.66				
CD2	3.72				
CD1	3.50				

LO7	3.60	0.985	0.944	0.709	Valid
LO6	3.64				
LO5	3.58				
LO4	3.46				
LO3	3.38				
LO2	3.51				
LO1	3.81				

A Cronbach's Alpha of all variable indicates excellent internal consistency as all values greater than 0.900, meaning that the items measuring all variables are highly reliable. The research obtained Composite Reliability (CR) values for the measurement model's constructs by examining the outputs from AMOS directly. The studied constructs show good internal consistency based on Composite Reliability (CR) values exceeding 0.7. The researcher calculated Average Variance Extracted (AVE) statistics to determine convergent validity. The latent construct effectively explains more than fifty percent of the observed variable variation when the AVE value surpasses 0.5. The AVE values for all constructs exceed 0.5 which confirms their good convergence validity. Discriminant validity testing requires comparing the square root of AVE for each construct with correlations between constructs. Discriminant validity means the square root value of AVE exceeds the correlations among constructs. The square root of AVE values exceeds the correlations which validates the discriminant validity for every construct, all higher than their respective off-diagonal correlation values which proves that teaching methods, institutional facilities, family & social influence, assessment practices, course design and learning outcomes were not overlapping and conceptually distinct. Overall, the results concluded that measurement model was reliable and valid for further statistical analysis.

Correlation Analysis

The correlation analysis investigates the relationships between several key factors—Teaching Methods, Institutional Facilities, Family & Social Influence, Assessment Practices and Course Design had positively related with Learning Outcomes. The statistical examination shows that Course design takes the highest score which is 0.915 and the most significant variable followed by family & social influence, teaching methods, institutional facilities and assessment practices. It can be concluded that the institutional and instructional elements are complex, curriculum design and social support are the most important contributors to education system and the learner's environment.

Table 3: Correlation Analysis

	Teaching Methods	Institutional Facilities	Family and Social Influence	Assessment Practices	Course Design	Learning Outcome
Teaching Methods	1					
Institutional Facilities	.933**	1				
Family and Social Influence	.675**	.662**	1			
Assessment Practices	.613**	.652**	.937**	1		

Course Design	.687**	.635**	.724**	.735**	1	
Learning Outcome	.528**	.579**	.752**	.646**	.915**	1

Confirmatory Factor Analysis (CFA)

Model Fit Summary

Following are the key model fit indices directly from the AMOS results:

Table 4: Model Fit Indices

Model Fit Index	Value	Threshold value
Chi-square (χ^2)	1125.012	
Degrees of Freedom (df)	415	
CMIN/DF	2.711	< 5
RMSEA (Root Mean Square Error of Approximation)	0.068	< 0.08
CFI (Comparative Fit Index)	0.918	> 0.90
NFI (Normed Fit Index)	0.977	> 0.90
TLI (Tucker-Lewis Index)	0.908	> 0.90

The indices demonstrate the model fits the data effectively through the assessment of CFI, NFI, TLI, CMIN/DF and RMSEA.

Standardized Regression Weights

Each standardized regression weight known as a factor loading shows the magnitude of connection between measured variables and underlying factors. The validated results of Confirmatory Factor Analysis demonstrate that the evaluation indices show substantial match between the model and research data while standardized factor measurements prove all variables significantly contribute to Learning Outcomes explanation. Overall, the estimates are strong, the standard errors are minimal, the C.R. values far exceed the threshold, and the P-values validate significance, suggesting that the examined survey items are valid and reliable indicators of their respective constructs, and the measurement model is both accurate and statistically valid.

Table 5: Standardized Regression Weight

			Estimate	S.E.	C.R.	P
TM4	<---	Teaching Methods	1.000			
TM3	<---	Teaching Methods	1.064	.019	57.425	***
TM2	<---	Teaching Methods	.933	.023	40.754	***
TM1	<---	Teaching Methods	.918	.020	46.525	***
IF6	<---	Institutional Facility	1.000			
IF5	<---	Institutional Facility	1.207	.022	54.424	***
IF4	<---	Institutional Facility	1.032	.028	36.237	***
IF3	<---	Institutional Facility	.960	.026	36.272	***
IF2	<---	Institutional Facility	.960	.022	44.086	***
IF1	<---	Institutional Facility	1.133	.020	57.463	***
FSI5	<---	Family and Social Influence	1.000			

FSI4	<---	Family and Social Influence	.870	.020	44.343	***
FSI3	<---	Family and Social Influence	.862	.016	52.840	***
FSI2	<---	Family and Social Influence	.632	.040	15.925	***
FSI1	<---	Family and Social Influence	.944	.016	59.891	***
AP4	<---	Assessment Practices	1.000			
AP3	<---	Assessment Practices	.882	.023	37.715	***
AP2	<---	Assessment Practices	.786	.023	34.012	***
AP1	<---	Assessment Practices	.821	.017	47.059	***
CD4	<---	Course Design	1.000			
CD3	<---	Course Design	1.401	.097	14.391	***
CD2	<---	Course Design	1.546	.098	15.747	***
CD1	<---	Course Design	1.520	.096	15.817	***
LO7	<---	Learning Outcome	1.000			
LO6	<---	Learning Outcome	1.024	.023	45.117	***
LO5	<---	Learning Outcome	.924	.022	42.592	***
LO4	<---	Learning Outcome	.930	.019	48.568	***
LO3	<---	Learning Outcome	.858	.019	45.337	***
LO2	<---	Learning Outcome	.991	.017	56.893	***
LO1	<---	Learning Outcome	.990	.013	76.060	***

Structural Equation Modelling (SEM)

The measurement model determines the quality of associations between observed variables and latent constructs. From the AMOS output, the observed variables like Teaching Methods (TM), Institutional Facilities (IF), Family & Social Influence (FSI), Course Design (CD), and Assessment Practices (AP) load onto their respective latent factors. Standardized factor loadings contained in the below table demonstrate the relationships' powers.

The structural model verifies the proposed connections between the latent variables. These parameters define the essential relationships which the model needs to test:

- Teaching Methods → Learning Outcomes (LO)
- Institutional Support → Learning Outcomes (LO)
- Social and Family Influence → Learning Outcomes (LO)
- Assessment Practices → Learning Outcomes (LO)
- Course Design → Learning Outcomes (LO)

Table 6: Path Analysis

			Estimate	S.E.	C.R.	P
Learning Outcome	<---	Teaching Methods	-.217	.010	-21.7	***
Learning Outcome	<---	Institutional Facility	.325	.022	14.772	***
Learning Outcome	<---	Family and Social Influence	.561	.031	18.096	***
Learning Outcome	<---	Assessment Practices	-.104	.009	-11.555	***
Learning Outcome	<---	Course Design	1.630	.103	15.826	***

The path analysis measures the strength and significance between latent variables and Learning Outcomes (LO). The table display direct influence values which represent relationships between latent variables and Learning Outcomes (LO). SEM analysis shows that the direct relationships exist between Teaching and Institutional Support and Social and Family Influence and Course Design with Learning Outcomes. Analysis of the model fit indices indicates strong compatibility between the proposed model and the collected data which upholds your theoretical framework. Course design (estimate = 1.630) strongly affects the development of Learning Outcomes at significance level $p < 0.05$. Learning Outcomes also display the maximum positive correlation with Social and Family Influence at a significance value below 0.05 (estimate = 0.561). The impact of Teaching Methods (estimate = -.217) and Assessment practices (estimate = -.104) upon Learning Outcomes proves to be negative but significant at the $p < 0.05$ level. Institutional facilities positive affects the development of Learning Outcomes at (estimate = 0.325) significance level $p < 0.05$.

Conclusion

This study has provided a research study that has comprehensive findings of the factors influencing student learning outcomes in medical education studies. The results of the SEM analysis corroborated all the hypotheses of which there was one for each variable each of which examined the effect of a certain factor on the performance of students. The findings suggested that there is need for improving teaching strategy of PBL, simulation based learning and interactive case discussions that were negatively related to the learning outcome. The direct path coefficient between level of institutional facilities, clinical training areas, laboratory and information technology facilities and learning outcome was positively related. This means that well equipped institutional facilities enhance learning outcome. This accredits with Gonzalo et al. (2020) who noted that wards and updated facilities ensure that there is a link between all that is learnt and the field practice. Also, family and social factors were found to have a significant impact on the student learning outcomes with standardized path coefficient, proving that family encouragement and social support help students overcome the difficulties of studying in medical school (Antoniou et al., 2020). Regarding the impact of the assessment practice on students' learning outcomes was negatively related. According to the analysis, there is need for improving in the presence of formative assessments in the form of peer assessments and clinical exams augmented clinical judgment, problem-solving ability and also the levels of knowledge recall. Lastly, the hypothesis regarding the course design was also statistically significant, which indicated that the design of the courses which include the practical aspects and the simulations enhances the students' learning outcome. These results support the literature, particularly for the need of a synthesis of skills and knowledge of medical practice (Meyer et al., 2019).

Recommendations

The following can be recommended from the findings of this study regarding the medical education institutions:

Promoting active learning: The research presented in this paper shows that active learning should equally be promoted in medical education. Evidence also shows that there is a need to observe the implementation of the protocol and means that the integration of PBL, clinical simulations and discussions based on case should be sustained throughout medical school. These teaching patterns are effective to achieve the cognitive changes of the students which is essential for their professional practice.

Providing Modern Infrastructure: Medical institutions should invest in digital learning resources; clinical training workshops and simulation laboratories as institutional facilities play an important

role in influencing the students' academic performance by providing them exposure of real-life scenarios.

In particular, family and social support play a significant role in encouraging students toward academic accomplishment. Therefore, medical institutions should maintain family-oriented initiatives for students' academic success such as counseling services or workshops.

Improvement on Assessment Practices: The hike in the assessment practices and performance improvements shows that for more formative assessments such as clinical examination, peer assessment and feedback system, medical schools should embrace them. In this way, these assessments foster students' ability to enhance and refine their competence and hence become competent health care workers.

Revise Course Design: Finally, as the new ideas continue to develop in the field of medical, so there is need to review and improve existing curricula by incorporating internship opportunities, interprofessional education and hands-on training for the student academic success.

References

1. Alsoufi, A., Alsuyihili, A., Msherghi, A., Elhadi, A., Atiyah, H., Ashini, A., ... & Elhadi, M. (2020). Impact of the COVID-19 pandemic on medical education: Medical students' knowledge, attitudes, and practices regarding electronic learning. *PLOS ONE*, 15(11), e0242905. <https://doi.org/10.1371/journal.pone.0242905>
2. Anderson, L. W., & Krathwohl, D. R. (Eds.). (2001). *A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives (Complete edition)*. New York, NY: Addison Wesley Longman.
3. Antoniou, P. E., Arfaras, G., Pandria, N., Athanasiou, A., Ntakakis, G., Babatsikos, E., ... & Bamidis, P. (2020). Biosensor real-time affective analytics in virtual and mixed reality medical education serious games: Cohort study. *JMIR Serious Games*, 8(3), e17823. <https://doi.org/10.2196/17823>
4. Barari, N., RezaeiZadeh, M., Khorasani, A., & Alami, F. (2022). Designing and validating educational standards for e-teaching in virtual learning environments (VLEs), based on revised Bloom's taxonomy. *Interactive Learning Environments*, 30(9), 1640–1652. <https://doi.org/10.1080/10494820.2019.1696841>
5. Bastable, S. B., Sopczyk, D. L., Gramet, P. R., & Jacobs, K. (2019). *Health professional as educator: Principles of teaching and learning*. Burlington, MA: Jones & Bartlett Learning.
6. Challa, K. T., Sayed, A., & Acharya, Y. (2021). Modern techniques of teaching and learning in medical education: A descriptive literature review. *MedEdPublish*, 10(1), 18. <https://doi.org/10.12688/mep.7551.1>
7. Chernikova, O., Heitzmann, N., Fink, M. C., Timothy, V., Seidel, T., Fischer, F., & DFG Research Group COSIMA. (2020). Facilitating diagnostic competences in higher education: A meta-analysis in medical and teacher education. *Educational Psychology Review*, 32(1), 157–196. <https://doi.org/10.1007/s10648-019-09492-2>
8. Dunleavy, G., Nikolaou, C. K., Nifakos, S., Atun, R., Law, G. C. Y., & Tudor Car, L. (2019). Mobile digital education for health professions: Systematic review and meta-analysis by the digital health education collaboration. *Journal of Medical Internet Research*, 21(2), e12937. <https://doi.org/10.2196/12937>
9. Dunlosky, J., Rawson, K. A., Marsh, E. J., Nathan, M. J., & Willingham, D. T. (2013). Improving students' learning with effective learning techniques: Promising directions from cognitive and educational psychology. *Psychological Science in the Public Interest*, 14(1), 4–58. <https://doi.org/10.1177/1529100612453266>

10. French, H., Arias-Shah, A., Gisondo, C., & Gray, M. M. (2020). Perspectives: The flipped classroom in graduate medical education. *Neoreviews*, 21(3), e150–e156. <https://doi.org/10.1542/neo.21-3-e150>
11. Gonzalo, J. D., Chang, A., Dekhtyar, M., Starr, S. R., Holmboe, E., & Wolpaw, D. R. (2020). Health systems science in medical education: Unifying the components to catalyze transformation. *Academic Medicine*, 95(9), 1362–1372. <https://doi.org/10.1097/ACM.0000000000003405>
12. Hieu, T. M., Vinh, N. T., Ngan, N. N. T., & Loc, P. T. (2023). Factors affecting students' learning outcomes at the Faculty of Economics and Business Administration, An Giang University. *The VMOST Journal of Social Sciences and Humanities*, 65(3), 89–98.
13. Kang, H. Y., & Kim, H. R. (2021). Impact of blended learning on learning outcomes in the public healthcare education course: A review of flipped classroom with team-based learning. *BMC Medical Education*, 21, 1–8. <https://doi.org/10.1186/s12909-021-02793-6>
14. Karami, M., Hashemi, N., & Van Merriënboer, J. (2021). Medical educators' beliefs about learning goals, teaching, and assessment in the context of curriculum changes: A qualitative study conducted at an Iranian medical school. *BMC Medical Education*, 21(1), 446. <https://doi.org/10.1186/s12909-021-02966-3>
15. Lucey, C. R., Hauer, K. E., Boatright, D., & Fernandez, A. (2020). Medical education's wicked problem: Achieving equity in assessment for medical learners. *Academic Medicine*, 95(12S), S98–S108.
16. Meyer, E. G., Chen, H. C., Uijtdehaage, S., Durning, S. J., & Maggio, L. A. (2019). Scoping review of entrustable professional activities in undergraduate medical education. *Academic Medicine*, 94(7), 1040–1049.
17. Nascimento, J. D. S. G., Siqueira, T. V., Oliveira, J. L. G. D., Alves, M. G., Regino, D. D. S. G., & Dalri, M. C. B. (2021). Development of clinical competence in nursing in simulation: The perspective of Bloom's taxonomy. *Revista Brasileira de Enfermagem*, 74, e20200135. <https://doi.org/10.1590/0034-7167-2020-0135>
18. Pei, L., & Wu, H. (2019). Does online learning work better than offline learning in undergraduate medical education? A systematic review and meta-analysis. *Medical Education Online*, 24(1), 1666538. <https://doi.org/10.1080/10872981.2019.1666538>
19. Pham, T. T. T., Le, H. A., & Do, D. T. (2021). The factors affecting students' online learning outcomes during the COVID-19 pandemic: A Bayesian exploratory factor analysis. *Education Research International*, 2021(1), 2669098. <https://doi.org/10.1155/2021/2669098>
20. Regmi, K., & Jones, L. (2020). A systematic review of the factors—enablers and barriers—affecting e-learning in health sciences education. *BMC Medical Education*, 20, 1–18.
21. Sahu, P. K., Chattu, V. K., Rewatkar, A., & Sakhamuri, S. (2019). Best practices to impart clinical skills during preclinical years of medical curriculum. *Journal of Education and Health Promotion*, 8(1), 57.
22. Schwartzstein, R. M., Dienstag, J. L., King, R. W., Chang, B. S., Flanagan, J. G., Besche, H. C., ... & Pathways Writing Group. (2020). The Harvard Medical School pathways curriculum: Reimagining developmentally appropriate medical education for contemporary learners. *Academic Medicine*, 95(11), 1687–1695.
23. Seddon, G. M. (1978). The properties of Bloom's taxonomy of educational objectives for the cognitive domain. *Review of Educational Research*, 48(2), 303–323. <https://doi.org/10.3102/00346543048002303>
24. Turk, B., Ertl, S., Wong, G., Wadowski, P. P., & Löffler-Stastka, H. (2019). Does case-based blended learning expedite the transfer of declarative knowledge to procedural knowledge in practice? *BMC Medical Education*, 19, 1–10.

25. Van Diggele, C., Burgess, A., & Mellis, C. (2020). Planning, preparing and structuring a small group teaching session. BMC Medical Education, 20(Suppl 2), 462.
26. Ventista, O. M., & Brown, C. (2023). Teachers' professional learning and its impact on students' learning outcomes: Findings from a systematic review. Social Sciences & Humanities Open, 8(1), 100565. <https://doi.org/10.1016/j.ssaho.2023.100565>