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Written Versus Oral Assessment Are Both Equally Effective in Pharmacology ?

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Abstract

Background: The undergraduate medical curriculum guidelines established by the Bangladesh Medical and Dental Council (BMDC) placed significant emphasis on assessing knowledge, skills, and attitudes in pharmacology. Currently, students are mostly assessed through written and oral assessments. However, oral assessment is resource-intensive and time-consuming while written assessment can efficiently assess a larger number of students in a shorter timeframe. **Objective :** This study aimed to observe the level of effectiveness of written assessment and oral assessment in evaluating learning objectives in pharmacology education for MBBS students. **Methods:** A formative interventional study was conducted from August 2022 to September 2023 at four medical colleges in Chattogram, Bangladesh, involving fourth year MBBS students and faculty members of pharmacology. Pharmacologists' opinions were gathered prior to the assessment, and post-assessment feedback from students and examiners were collected regarding the effectiveness of written and oral assessment methods in evaluating learning outcomes aligned with the curriculum objectives. **Results:** A total number of 240 students and 16 faculty members of pharmacology participated in the study. There was no significant differences found in students' and teachers' perceptions of written and oral assessment when evaluating objectives related to the cognitive and affective domains. However, written assessment was significantly preferred for evaluating objectives related to prescribing drug for special group and analyzing information. Teachers also favoured written assessment for evaluating objectives related to prescription writing. Examiners who conducted written assessment indicated that all objectives, except for communication with patients, could be effectively evaluated through written assessment. Oral examiners reported that certain objectives could be fully assessable by oral, while objectives related to drug history taking, ethics of prescribing and prescribing for special groups were partially assessable. Choosing safe and effective drugs and analyzing information could not be adequately evaluated through oral assessment. **Conclusion:** Findings of this suggest that written assessment can serve as a valid alternative to oral assessment in the pharmacology curriculum within medical education of Bangladesh. This study provides valuable insights for the BMDC, offering a cost-effective and time-saving approach to pharmacology assessment in the MBBS curriculum with adequate learning outcomes.

Keywords: Written assessment, Oral assessment, Medical education, curriculum, Pharmacology

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Introduction

"Students can, with difficulty, escape from the effect of poor teaching. However, they cannot escape the effects of poor assessment"[1]. In the realm of medical education, assessment is recognized as a driving force behind learning. It significantly influences students' performance in higher education, and improving assessment methods directly impacts the quality of learning[2]. Assessment of medical education should align with the curriculum's objectives across the three domains of knowledge, skills, and attitudes[3]. To ensure consistency between assessments and curricular objectives, well-thought-out assessment plans are essential.

Objectives serve as the cornerstones of a curriculum, outlining the desired learning outcomes and shaping the assessment methods[4, 5]. In recent years, there has been a strong emphasis on providing accurate and prompt evaluations of students' proficiency[6]. Numerous studies have investigated pharmacology education in Bangladesh (curriculum, textbooks and question papers) from various viewpoints[7-14].

Measurable objectives, with clear levels of competence, are crucial. Assessment methods, through formative and summative assessment, determine whether objectives are achieved[15]. While each assessment method has its own set of strengths and limitations, it is crucial to examine how the assessment process can uphold future learning[16]. The new curriculum emphasizes customizing written assessment, incorporating short answer questions (SAQs), short essay questions (SEQs), and multiple-choice questions (MCQs), including multiple true/false and single best answer formats. Many researchers believe that multiple choice question provide wider course coverage than other assessment methods and are suitable for testing factual information. They allow testing large samples in a short time, are applicable to large groups, and enable easy scoring. In contrast, essay assessment assess higher-order cognitive skills, are more specific and reliable, and allow testing a wide range of topics[17.18]. Another form is SAQ, which test learning outcomes in different cognitive domains, including knowledge, comprehension, and application, and to a lesser extent, analysis. SAQs are considered the most reliable and objective assessment method.

Structured oral assessments, on the other hand, offer the opportunity to evaluate interactive skills, depth of knowledge, communication abilities, and

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professionalism[19]. They also examine students' communication skills and provide immediate feedback[20]. However, research suggests that a majority of oral questions focus primarily on the recall of factual information rather than assessing higher-order cognitive skills such as problem-solving and critical thinking[21]. Teachers still need to develop their skills in conducting structured oral assessment effectively[22]. Unfortunately, Oral assessment can be susceptible to errors such as halo effects, central tendency errors, a general leniency bias, and contrast errors. These biases can impact the accuracy and fairness of the assessment process.[21, 23]. Studies have shown that scores are directly proportional to the number of words spoken by the examiner and the time taken[24]. Candidate's anxiety level and test environment also determine scores[24]. Rowland-Morin et al. (1991)[25] and Burchard et al. (1995)[26] highlighted that students' verbal style and attire can influence their oral examination scores. Overall oral assessment also time-consuming, consumes at least three to four months of each year and resource-intensive exercise.

Due to these limitations, leading medical schools worldwide have restricted oral assessment to borderline or distinction students[27]. In this context, Bangladesh should consider reducing the emphasis on oral assessment in the MBBS program and focus on more objective written assessment. To determine the feasibility of this shift, it is essential to evaluate whether the learning outcomes of written and oral assessments in pharmacology are equivalent. By comparing the effectiveness of these two assessment methods, we can determine if written assessment can adequately measure the same learning objectives as structured oral assessment. Thereby reducing time and resource allocation while maintaining the integrity of the assessment process. The present study was designed to observe the level of effectiveness of written assessment and oral assessment in evaluating learning objectives in pharmacology education for MBBS students.

Methodology

The study was formative interventional research conducted at two governments medical college (Chittagong Medical College and Rangamati Medical College) and two Non-government medical colleges (BGC Trust Medical College and Chattogram International Medical College), from August 2022 to August 2023. The study was initiated after obtaining the ethical clearance from the Institutional Review Board (IRB) of BGC Trust Medical College (BGCTMC). After getting the ethical clearance from the IRB, Memorandum of

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Understanding (MoU) was signed between the Department of Pharmacology, BGCTMC and the Departments of Pharmacology & Therapeutics of the selected medical colleges.

Study procedure: The proposed study included 16 faculty members of pharmacology of Chattogram division and 240 students of 4th year from selected medical college, as pharmacology is taught in 4th year of medical college in Bangladesh. Two groups were formed, one for written assessments and another for oral assessments, each consisting of one government and one non-government medical college, with a total of 120 students in each group participating in this study. The students were informed about the study design and its objectives. They were encouraged to participate voluntarily, and informed written consent was taken from them.

Topic Selection and Lecture: A single topic from one system of pharmacology was selected in collaboration with co-investigators and an expert panel. Two pharmacologists with over 15 years of teaching experience and one medical educationist formed the expert panel. Lecture content was prepared based on the pharmacology learning objectives outlined in the BM&DC curriculum. The lecture content was evaluated by the expert panel for their alignment with the curriculum objectives and overall quality. One week before the assessment, prepared lecture on the selected topic was delivered to four selected medical colleges.

Assessment Preparation: Separate written assessment papers and structured oral assessment questions were prepared by pharmacology teachers from the selected medical colleges. The question papers were evaluated by the expert panel for their alignment with the curriculum objectives and overall quality. Upon approval, the written assessment group was assessed through a written examination, while the oral assessment group was assessed through a structured oral examination. Two pharmacologists conducted written assessment and two pharmacologists conducted oral assessment of respected medical college.

Assessment and Feedback Collection: Students were informed about the date of the examination one week after conduction of lecture. Prior to the assessment, a structured checklist of pharmacology learning objectives was developed to gather input from pharmacologists on the efficacy of written and oral assessment methods in evaluating the curriculum objectives. Subsequently, feedback was collected from

both students and examiners using the same checklist to evaluate the effectiveness of the assessment methods in evaluating the curriculum objectives.

Statistical analysis: Data was compiled, presented, and analyzed using SPSS version 22. Unpaired t-test and fisherman's exact test was done to determine the significance of difference between the mean values. Statistical analysis was performed at a 95% confidence interval and significance was determined at $p< 0.05$.

Results

A total number of 240 students and 16 faculty members of pharmacology participated in the study. In Table I, the findings reveal that a greater portion of students provided feedback on the assessment methods for written and oral assessments in assessing learning objectives of pharmacology curriculum. Notably, the majority of students expressed that objectives related to the cognitive domain can be equally assessed through both written and oral assessments. The percentage of students for fully evaluating objectives related to basic and clinical pharmacology is 70%, recognizing and managing Adverse Drug Reactions (ADRs) is 43%, principles of rational prescribing is 41%, and ethical and legal issues of drug prescribing is 41%. Conversely, students indicated that objectives associated with basic and clinical pharmacology (50%), recognizing and managing ADRs (38%), principles of rational prescribing (39%), and ethical and legal issues of drug prescribing (33%) can be fully evaluated through oral assessments. Regarding objectives related to psychomotor domain, 35% and 45% of students mentioned that prescription writing and the selection of appropriate drugs, respectively, can be fully evaluated by written assessment. In contrast, only 18% and 28% of students suggested that these objectives can be fully evaluated through oral assessment. Furthermore, 46% and 38% of students stated that getting informed consent and analyzing information, respectively, can be fully evaluated by written assessments. On the other hand, 28% and 18% of students provided feedback indicating that oral assessments can fully evaluate these objectives. Objectives related to the affective domain, almost similar percentage of students (26% and 28%) agreed that both written and oral assessments can evaluate these objectives equally.

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Table I: Students' feedback of oral and written assessments in assessing learning objectives of pharmacology curriculum {n = 120 (written assessment) & 120 (oral assessment)}

Learning Objectives	Assessment	Fully evaluated		Evaluated		Partially evaluated		Not evaluated	
		Frequency	%	Frequency	%	Frequency	%	Frequency	%
Assessment of Cognitive Domain (Knowledge and Understanding)									
Basic and clinical Pharmacology	Oral	60	50	13	11	37	31	09	08
	Written	84	70	19	16	17	14	00	00
ADR recognize, management and reporting	Oral	46	38	27	23	44	37	03	03
	Written	51	43	33	28	26	22	02	02
Concepts of rational prescribing	Oral	47	39	24	20	40	33	19	16
	Written	50	41	39	32	23	19	08	07
Concept of essential drug list	Oral	44	37	34	28	16	13	26	22
	written	48	40	26	22	14	12	22	18
Drug information Sources	Oral	35	29	31	26	37	31	18	15
	written	40	33	31	26	29	24	25	21
Ethics of prescribing	Oral	43	36	17	14	27	23	31	26
	written	50	41	22	18	25	21	24	20
Ethical and legal issues of drug prescribing	Oral	39	33	30	25	28	23	29	24
	written	50	41	27	23	20	17	15	13
Assessment of Psychomotor Domain (skill)									
Taking drug history	Oral	39	32	27	23	32	27	18	15
	written	50	41	28	23	27	23	15	12
Prescription writing	Oral	22	18	32	27	36	30	33	28
	written	42	35	24	20	22	18	32	27
Selection of appropriate drug	Oral	34	28	32	27	32	27	23	19
	written	54	45	23	19	28	23	15	12
Recognize, manage and report the ADRs	Oral	39	33	32	27	35	29	16	13
	written	52	43	31	26	24	20	13	11
Prescribing Drug for Special Group	Oral	35	29	21	18	42	35	22	18
	written	46	38	34	28	32	27	8	07
Information to support safe and effective prescribing	Oral	41	34	29	24	37	31	13	11
	written	57	48	29	24	27	23	07	06
Getting informed consent	Oral	33	28	36	30	24	20	28	23
	written	55	46	27	23	15	12	23	19
Analyzing information	Oral	21	18	36	30	36	30	26	22
	written	46	38	30	25	33	28	9	08

Assessment of effective domain (Attitude)									
Continuous Professional development	Oral	31	26	32	27	38	32	13	11
	written	34	28	37	31	39	33	10	08
Communicating with patient	Oral	36	30	32	27	28	23	29	24
	written	32	27	35	29	34	28	19	16

Table II revealed that there were no significant differences in students' perceptions between written and oral assessments for objectives related to the cognitive domain. In the assessment of the psychomotor domain, significant differences were observed in favor of written assessment for the evaluation of objectives related to prescribing drug for special group and analyzing information. There were no significant differences in students' perceptions between written and oral assessments for objectives related to the affective domain.

Table II: Comparison between the responses of students in written and oral assessment

Learning Objectives	Oral assessment Mean ± SD n=120	Written Assessment Mean ± SD n=120	p value
Assessment of Cognitive Domain(Knowledge and Understanding)			
Basic Pharmacology and clinical Pharmacology	3.43±0.83	3.53±0.74	0.4900
ADR: Recognize, management and reporting	3.30± 0.85	3.12±0.88	0.2314
Concepts of Rational prescribing	2.96±1.10	3.15±1.00	0.3502
Concepts of essential drug	2.80±1.16	2.86±1.14	0.7756
Drug Information Sources	2.83±1.06	2.71±1.13	0.5497
Ethics Of prescribing	3.06±1.09	3.07±1.18	0.9601
Ethical and Legal issues Of Drug Prescribing	2.83±1.12	2.78±1.04	0.8004
Assessment of Psychomotor Domain (skill)			
Taking Drug History	2.78±1.06	3.03±1.09	0.2053
Prescription writing	2.75±1.08	3.01±1.24	0.2059
Selection Of Appropriate Drug (P Drug)	2.45±1.07	2.66±1.13	0.2980
Recognize, manage and report the (ADRs)	2.73±1.06	3.06±0.94	0.0737
Prescribing Drug for Special Group	2.81±1.05	3.18±0.91	0.0481
Obtaining information to support safe and effective prescribing	2.78±1.04	3.03±1.04	0.0653
Getting informed consent	2.96±1.22	2.95±1.11	0.9626
Analyzing information	2.50±1.04	3.00±1.02	0.0089

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Assessment Of effective domain (Attitude)			
Continuous Professional development	2.6±0.99	2.91±0.91	0.0767
Communicating with Patient	2.71±1.17	2.0±1.05	0.3511

Unpaired t test was done, p ≤0.05= statistically significant. Fully evaluated= 4, evaluated =3, partially evaluated =2, not evaluated=1

Table III indicated that there were no significant differences in teachers' perceptions between written and oral assessments for objectives related to the cognitive domain. In the assessment of psychomotor skills, significant differences were observed in favor of written assessment for the evaluation of objectives related to prescription writing. There were no significant differences in teachers' perceptions between written and oral assessments for objectives related to the affective domain.

Table III: Teachers view of Oral and Written assessments in assessing Learning Objectives of Pharmacology Curriculum (n=16)

Learning Objectives	Fully possible		Partially possible		Not possible		p value
	Written	Oral	Written	Oral	Written	Oral	
Assessment of Cognitive Domain (Knowledge & Understanding)							
Basic Pharmacology (effects & mechanism) & clinical pharmacology	16	16					1.00
ADR Recognize, management & reporting	16	16					1.00
Concepts of Rational prescribing	16	15				1	0.22
Concepts of essential drug	16	16					1.00
Drug Information Sources	15	14	1			2	0.11
Ethics of prescribing	15	14	1	2			0.36
Ethical and legal issues of drug prescribing	16	14		2			0.36
Assessment of Psychomotor Domain (skill)							
Taking Drug History	11	13	4	3	1		0.23
Prescription writing	16	11		5			0.002
Selection of Appropriate Drug (P Drug)	14	15	2	1			0.24
Recognize, manage and report the ADRs	16	13		3			0.063
Prescribing Drug for Special Group	15	14	1	2			0.145
Obtaining information to support safe and effective prescribing	15	14	1	2			0.145
Getting informed consent	15	11	1	4		1	0.15
Analyzing information	15	12	1	3		1	0.009

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Continuous Professional development	13	15	3	1		0.15
Communicating with Patient	10	13	3	3	3	0.14

Fisher's exact test was done. p≤0.05= statistically significant

Figure I presents the feedback from examiners following evaluation of objectives through written and oral assessments. Examiners conducting oral assessment mentioned that objectives related to the cognitive domain are fully possible to evaluate, while objectives related to drug history taking, ethical and legal issues, prescribing for special groups, and selecting safe and effective drugs were partially assessable. Choosing safe and effective drugs and analyzing information could not be adequately evaluated through oral assessments.

Conversely, examiners conducting written assessment mentioned that fully possible to evaluate all objectives except for communicating with patients, which is partially possible to evaluate in written assessments.

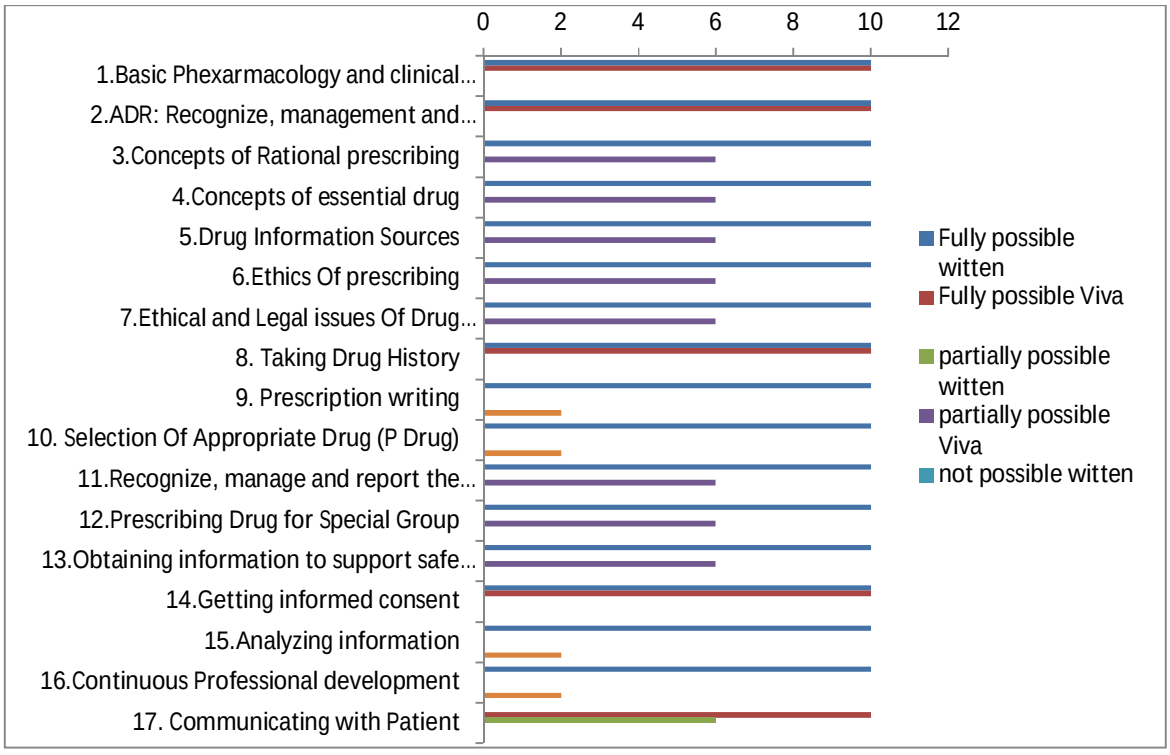

Figure 1: Examiners' feedback on Oral and Written assessments in assessing Learning Objectives of Pharmacology Curriculum.

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Discussion

This research aimed to observe the level of effectiveness of written assessment and oral assessment in assessing the achievement of learning objectives in pharmacology education for MBBS students. The findings are multi-faceted and provide valuable insights into the comparative effectiveness of these assessment methods. The research found that there was no significant difference in teacher perceptions between written and oral assessments for objectives related to the cognitive domain. This suggests that both written, and oral assessments are equally effective in evaluating students' theoretical knowledge in pharmacology. Students seem to responded similarly in demonstrating their understanding of these foundational concepts, regardless of the assessment method employed.

In the assessment of psychomotor domain, the study revealed significant differences were observed in responses of students in favour of written assessment for the evaluation of objectives related to prescribing drug for special group and analyzing information and in the teachers view significant differences were observed in favour of written assessment for the evaluation of objectives related to prescription writing. The significant difference in favor of written assessment suggests that these skills may be better assessed through written examination formats. Conversely, there was no significant difference between the two assessment methods for objectives related to history taking, selecting P drugs, obtaining information to support safe and effective prescribing, recognize, manage and report the adverse drug reactions (ADRs), getting informed consent. This pointed out that both written and oral assessments appear to be equally effective in assessing these objectives.

In regard to assess affective domain, the research findings indicated no significant differences in student and teachers' perceptions between written and oral assessments for objectives related to the affective domain. This finding revealed that, in the affective domain, which encompasses attitudes towards continuous self-development and communication with patient, both written and oral assessments seem to be equally effective.

In this research, the feedback from examiners who conducted the assessments provided valuable feedback of evaluating specific objectives using written and oral assessments. Examiner feedback highlighted that for certain objectives, both assessment methods were fully possible for evaluation. These objectives included understanding

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basic (effect and mechanism) and clinical pharmacology, ADRs recognize, management and reporting, drug information sources, and ethics of prescribing. However, for objectives related to specific skills (e.g., prescription writing, selecting appropriate drugs, rational prescribing and analyzing information), written assessments were found to be more suitable while objectives related to drug history taking, ethical and legal issues, prescribing for special groups, and selecting safe and effective drugs were partially assessable by oral assessment. This is likely because written assessment allow students to demonstrate their knowledge and application of these skills in a structured and well-organized manner.

Conversely, for objectives tied to communication with patient fully possible by oral assessment and partially possible by written assessment. This finding highlights the importance of oral assessment in evaluating students' ability to effectively communicate complex medical information to patients in a clear and concise manner. While written assessments can assess certain aspects of communication, such as clarity and organization, they cannot fully replicate the real-life scenario of patient interaction. Assessing objective continuous professional development both assessment methods were considered partially possible. A study conducted by Alam MS (2015) revealed that a significant discrepancy between the types of oral assessment questions used and those outlined in the curriculum. Recall questions dominated the assessment, accounting for 97% of the questions, while interpretation and problem-solving questions were notably underrepresented, making up only 3% of the assessment [20].

According to findings of several studies, there was no significant correlation was found between oral and written marks of failed and borderline student and also found reasonably high correlation between oral and the theory marks of students of passed and passed with distinction categories[28]. Oral examinations can effectively differentiate among high-performing students through in-depth questioning where higher order cognitive skills can be assessed by in-depth questioning[29]. However, some examiners are inclined to award higher marks, while others tend to assign lower marks [30, 31]. One of the shortcomings of oral assessment is that confident, fluent but weak student may obtain a better grade than compared to a knowledgeable student but weaker communication skill. This is due to the limited time frame of oral examination, which may not allow examiners to fully assess a student's depth of knowledge. Furthermore, oral examination takes up three

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to four months annually, disrupting precious teaching hours because all senior teachers are engaged in oral assessments[32].

The advantage of written assessments is that they allow students to organize their thoughts, cite relevant information, and provide comprehensive explanations. This format enables students to explore deeper into complex topics, leading to more in-depth responses. In some cases, students excelled in written assessment by showcasing a broader and more profound understanding of the subject matter.

The study was conducted on a small scale and involved only a small number of participants. The study may not be generalized to a broader aspect, as it was conducted in only one division and the number of faculty members in the pharmacology department was limited.

Conclusions & Recommendations

This study suggests written assessments can serve as an effective alternative to oral assessments in the pharmacology curriculum for MBBS students. Written assessments not only achieved comparable learning outcomes in the cognitive, skill, and attitude domains, but also outperformed oral assessments in some cases. This shift would not only improve the quality of pharmacology education but also optimize the use of teaching resources. This study provides valuable insights for the Bangladesh Medical and Dental Council (BMDC), offering a cost-effective and time-saving approach to pharmacology assessment in the MBBS curriculum without compromising learning outcomes. Additionally, we recommend further research to explore the effectiveness of written assessments in other medical disciplines and to identify strategies for effectively implementing written assessments in various educational settings.

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References

1. Boud D. Assessment 2020: seven propositions for assessment reform in higher education. Sydney: Australian learning and teaching council. 2010; 1-4.

2. Liu, N. & Carless, D. Peer feedback: the learning element of peer assessment. Teaching in Higher Education. 2006; 11(3): 279-290.

ISSN: 2306-0654(Print), 2313-4224 (Online)
DOI: https://doi.org/10.3329/bjme.v16i1.79095

3. Leung WC. Competence based medical training: review. BMJ. 2002; 325: 693-694.
4. Swanwick T, McKimm J. Setting learning objectives. Br J Hosp Med. 2009; 70: 406-409.
5. Gamson DA, Eckert SA. Standards, instructional objectives, and curriculum design: A complex relationship. Phi Delta Kappan. 2019; 100: 8-12.
6. Johora F, Abbasy AA, Mahboob S, Jeenia FT, Ferdoush J, Rahman MS. Pharmacology written questions of one decade: Evaluation of curricular objectives and content coverage. Bangladesh Journal of Medical Education. 2023; 14 (1): 43-49
7. Johora F, Abbasy AA, Mahboob S, Jeenia FT, Ferdoush J, Rahman MS. Trend and weightage of problem-based questions in undergraduate pharmacology written question papers of Bangladesh. BGC Trust Medical College Journal. 2021; 6 (2): 19-22.
8. Begum M, Rahman MS, Islam AFMS, Khan IA, Akhter N. Eleven Years of the Undergraduate Medical Curriculum 1988: review on the changes in Pharmacology written questions. Bangladesh J PhysiolPharmacol. 1999; 15: 27-30.
9. Karim A, Haque M. 1996. Assessment system in Pharmacology- Does it Reflect Educational objectives and Community Health Needs? Bangladesh J Physiol Pharmacol. 1996; 12: 65-67.
10. MS Rahman, S Huda. Antimicrobial resistance and related issues: An overview of Bangladesh situation. Bang J Pharmacol. 2014;9, 218-224.
11. Chowdhury DK, Saha D, Talukder MH, Habib MA, Islam A, Ahmad MR, Hossin MI. Evaluation of Pharmacology Written Question Papers of MBBS Professional Examinations. Bangladesh Journal of Medical Education. 2017; 8: 12-17.
12. Nahar N, Kutubi A, Khan TH, Banu LA, Jahan I, Badhon NM. Analysis of undergraduate pharmacology written question of different universities I Bangladesh. J Shaheed Suhrawardy Med Coll 2017; 9 (1) 13-17.
13. Al-Kadri HM, Al-Monary MS, Roberts C, Van Der Vluuten CPM. Exploring assessment factors contributing to students' study strategies: Literature review. Med Teach.2012; 34: 42-50.
14. Ferdoush J, Johora F, Jeenia F, Chowdhury TM, Sadia H, Arifina R, Abbasy AA, Rahman MS. Evaluation of the Weightage on Pain Management in Pharmacology Curricula of the Undergraduate Medical Program (MBBS) of Bangladesh. Chatt Maa Shi Hosp Med Coll J. 2022:21(2):48-51.
15. Shumway JM, Harden RM AMEE Guide No. 25: The assessment of learning outcomes for the competent and reflective physician. Med Teach. 2003; 25: 569-584.
16. Welsh AL. Multiple choice objective tests. In: Saunders P, Welsh AL, Hansenwl, editors. Resource Manual for Teacher Training programs in Economics. New York: Joint Council on Economic Education. 1978; 191-228.
17. Vanderbilt AA, Feldman M, Wood IK. Assessment in undergraduate medical education: a review of course exams. Med Educ Online. 2013; 18:1-5
18. Pernar LIM, Askari R, Breen EM. Oral assessment in undergraduate medical education - What is the 'value added' to evaluation? Am J Surg. 2020; 220(2): 328-333
19. Newble D, Cannon RA handbook for medical teachers. 2 nd edn. Lancaster: MTP Press.1987
20. Alam MS and Begum T. Evaluation of structured oral examination format used in the assessment of undergraduate medical course (MBBS) of the University of Dhaka. Ibrahim Med. Coll. J. 2015; 9(1): 1-10
21. Evans, lR, Ingersoll RW, smith EJ. The reliability, validity and taxonomic structure of the oral examination, J of Med Edu. 1966; 41: 651–657.
22. Guilford JP (1954). Psychometric methods. New York: mcgraw Hill
23. Torke S, Abraham RR, Ramnarayan K, Asha K. The impact of oral-voce-voce examination on students' performance in theory component of the final summative examination in physiology. J Physiol Pathophysiol. 2010; 1: 10–12

24. Holloway PJ, Hardwick JL, Morris J, Start KB. The validity of essay and oral-voce examining techniques. Br Dent J. 1967; 123:227-232
25. Rowland-morin PA, Burchard KW, Garb JL et al. Influence of effective communication by surgery students on their oral examination scores. Acad Med. 1991;66, 169–171
26. Burchard KW, Rowland-morin, PA, Coe NPW. A surgery oral examination: interrater agreement and the influence of rater characteristics. Acad Med. 1995; 70, 1044–1046
27. Norman G. Examining the examination: Canadian versus US radiology certification exam. Can Assoc Radiol J. 2000; 51, 208–209.
28. Ghosh A, Mandal A, Das N, Tripathi SK et al. Students' performance in written and oral-voce components of final summative pharmacology examination in MBBS curriculum: A critical insight. Indian J Pharmacol. 2012; 44: 274-275
29. Wakeford R, Southgate L, Wass V. Improving oral assessment: selecting, training, and monitoring examiners for the MRCGP. BMJ. 1985; 311: 931-935
30. Thomas CS, Mellsop G, Callender J, Crawshaw J, Ellis PM, Hall A, et al. The oral-voce examination: A study of academic and non-academic factors. Med Educ. 1993; 27: 433–439
31. Rahman MS. Changes required in Pharmacotherapy teaching to ensure rational use of drugs. Bang J Physiol Pharmacol. 1995: 11(1): 38-39
32. Haque M, Yousuf R, Abu Bakar SM, Salam A. Assessment in Undergraduate Medical Education: Bangladesh Perspectives. Bang J Med Sci.2013; 12: 357-363