

Evaluation of Level of Cognitive Domain in Short Answer Questions of 1st Professional Anatomy Written Examinations

Dr. Tahmina Akhter¹, DR. Mizanur Rahman Molla², Dr. MD. Mahbub Alam³,
Dr. Farjana Akhoond⁴, Dr. Bilkis Akhter⁵

¹Assistant Professor, Dept. of Anatomy, Army Medical College, Cumilla, Bangladesh

²Lt. Col. Dr. Mizanur Rahman Molla, Dept. of Ophthalmology, CMH, Dhaka, Bangladesh

³Assistant Professor, Dept. of Orthodontics, Shaheed Suhrawardy Medical College & Hospital, Dhaka, Bangladesh

⁴Assistant Professor, Dept. of Anatomy, MH Samorita Medical College & Hospital, Dhaka, Bangladesh

⁵Assistant Professor, Dept. of Anatomy, Enam Medical College and Hospital, Savar, Dhaka, Bangladesh

Abstract: ***Background and objective:** Short-answer questions (SAQs) are commonly used format in medical examinations in Bangladesh. The present study assessed the weightage given to the different components of cognitive domain in SAQs in anatomy of first Professional MBBS Examination under Bangladesh University of Professionals (BUP). **Materials and method:** This cross-sectional study was conducted in the Department of Anatomy, Army Medical College, Cumilla. Anatomy SAQ papers, Paper I and Paper II from July 2015 to November 2019 of Bangladesh University of Professionals (BUP) were selected. A total of 20 SAQ papers containing 280 questions were included in this study. Every question in a paper was categorized as recall, understanding and application types. Then the total number of marks allocated for each of the type of questions were calculated and compared with the total marks (98) allocated for the questions in a paper. Then the resultant weightage of marks were compared with the curricular directive weightage of marks allotted for SAQ. **Result:** On analysis it was found that during the period from May 2015 to November 2019, 65.83% and 71.75% of the SAQs of paper-I and paper-II addressed recall, 33.86 % and 28.24 % understanding level respectively. There was no application type of question in both papers. No significance difference was observed in between two papers, but significance difference ($p < 0.001$) was found with the curriculum. **Conclusion:** The study showing that SAQs introduced as an assessment tool in undergraduate medical curriculum was not properly implemented and its desired objectives were not fully achieved according to curriculum.*

Keywords: SAQs, level of cognitive domain, anatomy

1. Introduction

Within the arena of medical education, it is generally acknowledged that assessment has significant influences on a student's experience of higher education and has a huge impact on the quality of learning.¹ It is an educational tool to evaluate, motivate and help students to structure their academic efforts.² In addition, good assessment can help students to more effectively self-directed learners.³ Assessment is the process by which teachers judge whether the learning objectives of the course are met.⁴ The educational objectives can be broadly allocated to three domain- knowledge (what we know), skill (what we do) and attitude (what we feel). Knowledge includes all cognitive process from the mere recall of facts through comprehension and understanding to an ability to solve problem. Skills include the various psychomotor skills those are required to be performed by a competent physician. Attitude includes the personal qualities of students and their attitude towards medicine, their patients and their peers.⁵ There are different assessment instruments to judge the 3 different learning outcomes. Curriculum for Undergraduate Medical Education in Bangladesh-2002 have introduced short answer questions (SAQ) and multiple choice questions (MCQ) for written examination, objective structured practical examination (OSPE) and objective structured clinical examination (OSCE) for practical examinations and structured oral examination (SOE) for viva examinations to assess the different domains of learning objectives of undergraduate medical students.⁶ Hence each instrument has its strengths and weakness, no single

assessment instrument is perfect and no single tool can test all aspect of medical competence and performances.⁷

Short answer questions are the open ended questions that require students to generate an answer rather than to select from a fixed number of options.⁸ An SAQ asks the examinee clearly to select relevant facts, concepts and attitudes from memory/understanding and integrate them into a coherent written response.⁹ 'Definition' type, 'unique answer type', as well as 'draw and label' type SAQs are to measure the 'recall' level of cognitive domain, where as SAQ with the action verbs 'explain', 'describe', 'differentiate' can able to achieve the understanding level of cognitive domain. For long term retention of knowledge, learning should be accompanied by understanding, and it is essential for all doctors.¹⁰ Application of anatomical knowledge to clinical problem solving can be assessed by using one or more SAQs for a problem. In undergraduate examinees they give the real life feeling through the solving of the problem.¹¹

In Bangladesh, medical education is centrally controlled by the Government and run a unique undergraduate curriculum throughout the country in both public and private sectors. The present official form of undergraduate medical curriculum has first evolved in 1988 followed by revision in 2002 and 2012.¹² In the undergraduate medical curriculum of 2002 of Bangladesh, extensive modification of the assessment system was done. In this new curriculum, the written examination format was modified to SAQ and MCQ along with 10% mark added for formative assessment.¹³ Written examination consists of two papers and in each

paper 70% marks were allocated for SAQs. To assess different cognitive domains of students in anatomy, while constructing questions for SAQ, the curriculum has recommended, 70% marks for recall, 20% for understanding and 10% for application types of questions.¹⁴ This new format of assessment was implemented in 1st Professional MBBS Examinations in January, 2005. Keeping this fact in mind, the present study was conducted to determine the status of implementation of the curricular directive SAQ in assessing the different components of cognitive domains of the students in anatomy of MBBS course.

2. Materials and Methods

The present research was a set of observational study and conducted at the department of Anatomy of Army Medical College, Cumilla. Total twenty (20) paper-I and paper-II, Anatomy SAQ questions of the ten (10) first professional examinations of Bangladesh University of Professionals (BUP) from May 2015 to November 2019 were collected and fully checked. There were 2 examinations per year, so the question paper of twenty (20) exams were analysed. There were 14 questions per paper, so that (14x10) one forty (140) questions for each paper and total 280 were analysed. The numbered components (1a, 1b, 2a, etc) were identified as ‘parts’ and each ‘item’ present in that part was identified as ‘segment’. There were 140 questions, 311 parts, 325 segments in paper-I and 140 questions, 331 parts and 347 segments in paper-II. The questions were identified as ‘recall’, ‘understanding’ and ‘application’ level of cognitive domain they addressed according to the Modified Blooms taxonomy. The total number of each type of question was regarded as data and calculated.

Analyses of the Data

The data were analysed using statistical programmed for social science (SPSS) version-20. Data were expressed as mean% ± SD and percentage (%) frequency. Appropriate statistical test was performed to evaluate the statistical difference between two papers as applicable. P< 0.05 was considered as the level of significance.

3. Results

The table-I illustrates examples of the SAQs from the question papers of the First Professional MBBS Examinations of Bangladesh University of Professionals (May 2016 and November 2019)

Table 1: Examples of SAQs from the question papers of the First Professional MBBS Examinations of Bangladesh University of Professionals (May 2016 and November 2019)

Example*	Paper	Examination	Level of cognitive domain addressed
Mention the factors responsible for maintaining stability of a joint.	Paper-1	May 2016	Recall
Explain anatomically: central tendon of diaphragm is firmly adherent to the fibrous pericardium	Paper-2	Nov 2019	Understanding

* The language of the questions has been kept as it was in the question papers.

The distribution of the recall-based questions included in the 1st professional examination of various years has shown in table-II. Here the number of segments and their frequency % is shown separately for the paper-I and paper-II. The mean % of the frequency ±SD for the P-I and P-II is 65.83±8.38 and 71.75±8.12 respectively. Significance difference observed (p<0.001) in the both paper with the curriculum proposed to level of domain addressed.

Table 2: Frequencies of recall level of domain addressed in Anatomy p-I & p-II, SAQ question papers of the First Professional Examinations*

Examination	Overall % frequency of segments addressing recall level of cognitive domain	
	Paper-1 (n=214)	Paper-2 (n=250)
May 2019	24 (71%)	18 (56%)
November 2019	20 (65%)	26 (74%)
May 2018	21 (59.6%)	26 (71%)
November 2018	21 (59%)	27 (86%)
May 2017	18 (56%)	27 (66%)
November 2017	22 (78%)	28 (77%)
May 2016	26 (73%)	25 (74%)
November 2016	20 (59%)	27 (78%)
May 2015	19 (60%)	23 (67%)
November 2015	23 (77.77%)	23 (68.57%)

Mean %±SD: paper-I: 65.83% ±8.38 paper-II: 71.75 % ± 8.12

paper-I vs paper-II: p> 0.05

p-1 vs Curriculum: p< 0.001, p-II vs curriculum: p<0.001

* May 2015 to November 2019 (10 examinations held)

n: Total number of segments analysed in each paper

Table 3: Frequencies of understanding level of domain addressed in Anatomy p-I & P-II SAQ question paper of the First Professional Examinations*.

Examination	Overall % frequency of segments addressing understanding level of cognitive domain	
	Paper-1 (n=111)	Paper-2 (n=97)
May 2019	11 (29%)	14 (44%)
November 2019	12 (36%)	9 (26%)
May 2018	13 (40.4%)	11 (29%)
November 2018	12 (41%)	7 (14%)
May 2017	13 (44%)	11 (34%)
November 2017	8 (22%)	8 (23%)
May 2016	9 (23%)	8 (26%)
November 2016	13 (41%)	8 (22%)
May 2015	13 (40%)	10 (33%)
November 2015	7 (22.22%)	11 (31.42%)

Mean %±SD: paper-I: 33.86 % ± 8.86, paper-II: 28.24 % ±8.12

paper-I vs paper-II: p> 0.05

p-1 vs Curriculum: p< 0.001, p-II vs curriculum: p<0.001

* May 2015 to November 2019 (10 examinations held)

n: Total number of segments analysed in each paper

The distribution of the understanding based questions for both papers shown in table-III. The mean % of the frequency ±SD for the P-I was 33.86 ± 8.86 and for p-II was 28.24±8.12. Significance difference observed (p<0.001) in between two papers with the curriculum proposed to level of domain. Segments of the question addressing the application level of cognitive domain were not found.

4. Discussion

Assessment in medical education should not be used merely for classification, grading and certification rather it should become an instrument for promoting growth of knowledge.¹⁵ Evaluation of a learner's knowledge is an important step in the educational process that should be afforded the same attention given to the development and implementation of curricula and the results of evaluation of learning are used in establishing future learning goals, which completes the continuous cycle of learning (Collins, 2006). It is a worldwide common belief that anatomy must be taught and learnt in such a way that it becomes clinically meaningful and is linked to the proficiency mandatory for new medical graduates.¹⁶ By taking assessments we can discriminate effectively between good and poor candidates. A study on student perceptions of medical anatomy education by Whelan et al.¹⁷ observed that students invested most time studying anatomy at the beginning of medical school and had a high regard for the clinical value of anatomical knowledge. In different parts of the world, SAQs are the choice of many faculty members as a tool for their major exams.¹⁸ In Bangladesh a great majority of written assessment in both undergraduate and postgraduate examinations depend on the SAQs.

In the present study, it is observed that the mean % of the frequency \pm SD for the recall type questions for P-I and P-II is 65.83 ± 8.38 and 71.75 ± 8.12 and questions addressing understanding level for P-I and P-2 is 33.86 ± 8.86 and 28.24 ± 8.12 respectively. No significance difference was found among the papers whereas, significance difference observed ($p < 0.0001$), ($p < 0.001$) between both papers with the curriculum proposed for the level of domain should be addressed. No question addressing the application level was found. A study conducted by Akhter B on SAQs in Anatomy of first professional examination under university of Dhaka showed that the mean % of the frequency \pm SD for the recall type questions for P-I and P-II is 76.48 ± 5.39 and 74.09 ± 4.29 and questions addressing understanding level for P-I is 23.52 ± 5.41 and for p-II is 25.91 ± 4.23 respectively. No significance difference was found among the papers whereas, significance difference observed ($p < 0.002$), ($p < 0.001$) between both papers with the curriculum proposed for the level of domain should. But no question addressing the application level.¹⁹ Another study was done by Akhter J and Sayeed S on Anatomy SAQs under Dhaka University and revealed that recalled type questions was 76.58% and understanding type of question was 23.42% which are most within the range of recommended by curriculum. The only shortfall of the SAQ was that, no question was found to assess the application component of the cognitive domain of the students.²⁰ Study conducted by Chowdhury et al study on Pharmacology SAQs question papers of different university and found mean percentage of recall questions of Bangladesh University of Professional (BUP), Chittagong University (CU), Dhaka University (DU), Rajshahi University (RU) & Shahjalal University of Science & Technology (SUST) were 66.4 ± 6.17 , 53.0 ± 7.54 , 55.1 ± 7.29 , 52.9 ± 9.15 & 45.4 ± 7.35 respectively and Mean percentage of understanding type questions were 33.3 ± 6.05 , 46.8 ± 7.44 , 43.5 ± 7.41 , 45.0 ± 9.22 & 50.00 ± 7.46 for BUP, CU, DU, RU & SUST respectively. Application level

question was absent in most question paper. None of the question papers of any university covered all three parts of cognitive domain (recall, understanding and problem based) as per curriculum standard.²¹

Another study done by author Manara, where analyses were done with the question paper from Bangladesh University of Professional and the University of Dhaka.²² Problem-based questions help to integrate the preclinical and paraclinical subjects with clinical curriculum, motivate and inspire the examinees, and finally help them to identify their learning issues and set their own learning goals.²³ Medical skills that are most important for treating patients are problem-solving skills rather than memorizing skills.¹⁰ Here an examinee learns about a subject through the experience of solving an open-ended problem. Poorly constructed SAQs measure the recall of facts, but if SAQs are constructed properly they will be able to measure understanding, application and even the analysis level of cognitive domain. If there is difficulty in implementation of the curriculum, reviewing of the curriculum was proposed by the author.²² The author of the present research agreed with the proposal.

5. Conclusion

The study has revealed that SAQs introduced as an assessment tool in undergraduate medical curriculum was not properly implemented. Coverage of problem-solving type question was negligible. It is recommended that further study may be inaugurated to determine the situation in other subjects and to find out the causes of not achieving the objectives of SAQs Initiative must be taken during moderation of university professional question papers to cover stated standard of different type questions in the curriculum. Besides this, it is necessary to arrange regular and intensive training program for faculty members to improve the quality of SAQs.

References

- [1] Liu, N. and Carless: Peer feedback: the learning element of peer assessment. *Journal of Teaching in Higher Education*. 2006; 11 (3) 279-290
- [2] Farooqui F, Saeed N, Aaraj S, et al. A Comparison between Written Assessment Methods: Multiple-choice and Short Answer Questions in End-of-clerkship Examinations for Final Year Medical Students. 2018; 10 (12): e3773. doi:10.7759/cureus.3773 or,
- [3] Adniyi OS, Ogli SA, Ojabo CO, Musa DI. The impact of various assessment parameters on medical students' performance in first professional examination in physiology. *Niger Med J*. 2013; 54 (5): 302-5.
- [4] Amin, Z & Eng, KH. *Basics in Medical Education*. Singapore: World Scientific Publishing Company Private Ltd. 2007; 251-265 & 283-297.
- [5] Harden, RM 1979. 'Constructing multiple choice questions of the multiple true/false Type. *Medical Education*. July 1979; 13 (4):305-312.
- [6] B & DC (Bangladesh Medical and Dental Council) 2002, *Curriculum for Undergraduate Medical Education in Bangladesh 2002*. DGHS, Dhaka.

- [7] Swanwick, T. *Understanding Medical Education: Evidence, Theory and Practice*. London Deanery: Wiley Blackwell Publication. 2010: 195-270.
- [8] Wardy, N.M.A. Assessment methods in undergraduate medical education, *Sultan Qaboos University Medical journal*. 2010 ;10 (2): 203–209, <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3074721/>
- [9] Codone, S. (2011), Short answer question: a great middle ground, *Educational Assessment-Faculty Focus*, viewed 17 September 2016, <http://www.facultyfocus.com/articles/educational-assessment/short-answer-questions-a-great-middle-ground/>
- [10] Turney, B.W. Anatomy in a modern medical curriculum, *Annals of The Royal College of Surgeons of England* 2007;89 (2):104–107, doi10.1308/003588407X168244
- [11] Vuma, S. Sa, B. Evaluation of the effectiveness Of progressive disclosure questions as an assessment tool for knowledge and skills in a problem based learning setting among third year medical students, *Biomedical Central Research Notes*. 2015;8 (673):1-8, doi: 10.1186/s13104-015-1603-0
- [12] Shittu LAJ, Zachariah MP, Izegbu MC, Adesanya OA, Ashiru OA. The differential impact of various assessment parameters on the medical students performance in the professional anatomy examination in a new medical school. *Int J Morphol*. 2006; **24** (4): 659-64.
- [13] Lambert WTS, Cees PM van der Vleuten. ABC of learning and teaching in medicine written assessment. *BMJ*. 2003; **326**: 643–45
- [14] Haque M, Yousuf R, Abu Bakar SM, Salam A. Assessment in undergraduate medical education: Bangladesh perspectives. *Bangladesh J of Med Sci*. 2013; **12** (4): 357–63.
- [15] Sai NP. Comprehensive analysis of theory exam question papers of 2nd MBBS Pharmacology subject in Rajiv Gandhi University of Health Sciences, Karnataka, India. *Int J Basic Clin Pharmacol* 2019;8:1793-9.
- [16] Sawant SP, Rizvi S. Role of clinical anatomy in first MBBS curriculum. *MOJ Anat Physiol*. 2017;3 : 1–5. DOI: 10.15406/mojap.2017.03.00076
- [17] Whelan, A., Leddy, J.J., Mindra, S., Hughes, J.D.M., & Bialy, S.E., (2016) Student perceptions of independent versus facilitated small group learning approaches to compressed medical Anatomy, *Anatomical science education*, 9 (1), 41-45, doi: 10.1002/ase.1544
- [18] The University of Arkansas, (2015), *Answering the essay/ short answer exam question*, <https://blog.richmond.edu/introamgov1/files/2015/07/Answering-the-Essay-Exam.pdf>
- [19] Akhter B: Level of Cognitive Domain Addressed in SAQs of Undergraduate 1st Professional Anatomy Written Examinations. *Elixir Psychology* 2018;124 (52233-52235)
- [20] Akhter J and Sayeed S: Status of implementation of short answer question in anatomy examination of MBBS course in Bangladesh. *IMC J Med Sci* 2018; 12 (2): 69-72
- [21] Chowdhury DKP, Saha D2, Talukder HK, Habib A, Islam AFMS, Ahmad R, Hossin I. Evaluation of Pharmacology Written Question Papers of MBBS Professional Examinations . *Bangladesh Journal of Medical Education*.201;08 (2):12-17
- [22] Manara, A. Uddin, M.N. Habib, M.A. Ayub, M. (), Reflection of SAQ in undergraduate Anatomy MBBS course according to new curriculum of BMDC, *Journal of Armed forces medical college Bangladesh*. 2012; 8 (2): 3-7, DOI:<http://dx.doi.org/10.3329/jafmc.v8i2.16340>
- [23] Bhounsule, S.A. Samuel, L.J. Walke, Y.S. & Bandodkar, L.V. (), Problem-based learning (PBL) as a teaching-learning strategy to supplement the knowledge of pharmacology in medical school undergraduates, *Journal of research and method in education*. 2015; 5 (4):91-94, doi:10.9790/7388-05429194