Original Article

The Predominance of Recall in Histology Knowledge Among Undergraduate Medical Students

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ABSTRACT:

Context: *Histology, an essential branch of anatomy, focuses on the microscopic structure of tissues and organs of the human body. A sound understanding of histology is fundamental for developing competent physicians, as it provides the basis for correlating structure with function at the cellular and tissue levels. By linking normal and abnormal structures, medical students can better identify pathological changes and contribute to accurate diagnosis and effective management of disease.*

Materials and methods: *Answering recall-level and understand-level and application-level true/false questions and fill-in-the-blanks type questions was attempted by 100 medical undergraduates who were eligible for the first professional examination in two government and one private medical college of Bangladesh. Kruskal-Wallis Anova post Hoc test was done for comparing correct responses.*

Results: *The performances of the medical undergraduates in answering 'application-level' and 'understand-level' objective written questions were significantly poorer (p = 0.00) than 'recall-level' objective written questions.*

Conclusion: *The present research indicates that there is no single learning method to learn Histology. A combination of strategies may be more useful. It indicates that higher levels of cognitive domains need to be addressed properly in the written question papers. This study also focuses that proper implementation of curriculum is necessary.*

Key Words:
Histology, Medical undergraduate, cognitive domain, assessment

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Introduction

Assessment is a tool for evaluating students and for determining how effectively learning materials are presented to students. Moreover, effective evaluation can help students to become self-directed learners (Adeniyi et al. 2013). The written examination is an effective assessment tool since it can measure not only students' memorization skills but also their higher-level cognitive abilities (Akhter and Sayeed 2019, Ghosh et al. 2012). According to Haque et al (2013), the written examination is one of the important parts of the MBBS program and the curriculum of Bangladesh emphasizes SAQs over lengthy descriptive questions. Amin (2008) analyzed Histology portion of the first professional MBBS question papers from 2005 to 2007. Author identified that beyond 98% of the question-segments addressed the 'recall-level' of the cognitive domain and only 2% addressed the 'understand-level'. After analyzing Regional Anatomy's first professional MBBS question papers from 2014 to 2018, Yasmin (2020) also noticed that 'recall-level' was predominant (91.42%) and 'understand-level' included only 8.58% of questions. Accord-

ing to previous studies, question-segments addressing the 'application-level' of the cognitive domain were not found in context of Bangladesh. Methods of assessment play an important part to know the effectiveness of a learning process (Ibarra-saiz et al. 2020). So, analysis of assessment instruments is essential to know the effectiveness of a learning process. Application of theoretical knowledge in clinical practice is done by recalling and understanding the topic. The present curriculum of Bangladesh includes both short answer questions and multiple-choice questions for the written assessment. So, an assessment of the performances of medical undergraduates' in answering questions addressing different levels of the cognitive domains can give an idea regarding the current learning process. Result of this study may help the teachers in modulating their way of teaching in Histology. It gives a way for curriculum designers and educational researchers to enhance the learning and evaluation of Histology as well as Anatomy. Traditionally, Histology is covered as part of the basic science course in the first and second year of medical college (Hussein et al. 2015). According to Britannica (2023), although the terms 'Histology' and 'microscopic Anatomy' can be used alternatively, the two fields of study can be readily distinguished. Determining how tissues function at every level of structure, comprising individual cells to molecules between cells to organs, is the primary goal of Histology.

Materials and Methods

The research was analytically carried out in the Department of Anatomy, Bangladesh Medical University (BMU), Dhaka.

Operational definitions:

Objective written questions

In the present research, this term was used by constructing 'true-false' and 'fill-in-the-blanks' types of questions.

'Recall-level' objective written questions

A question addressing the student's remembering of previously learned material and specific facts to complete theories.

'Understand-level' objective written questions

A question addressing the student's ability to grasp the interpretation of a material.

'Application-level' objective written questions

A question addressing the student's ability to use learned material in new and concrete situations.

Methods used to construct objective written questions

A total of 100 objective written Histology questions were constructed for the medical undergraduates. The number of questions to be constructed from the chapter was determined based on the proportion of pages in that chapter relative to the total number of pages in the book (Mescher 2021). This is an indirect way to determine the 'weights' of individual chapters. At first, the headings and the sub-headings were numbered sequentially in each chapter. Selecting the headings and subheadings by lottery for constructing objective written Histology questions. Repetition was prevented carefully by discarding the repeated topics. The illustrations and texts contained within the selected sub-headings were used to construct one objective written question. In this way, 100 objective written Histology questions were constructed. Among 100 questions 50 were 'illustration-based' and 50 were 'text-based'. Two types of questions were constructed for the test. These are: a) True/false type, b) Fill-in-the-blanks type.

Participants and conduction of the research

Undergraduates who were eligible to attend in first professional examination were selected as participants. Two government medical colleges and a private medical college under the University of Dhaka, Bangladesh were selected. The written permission was taken from the respective authority of the institutions for the performance of the test of the undergraduates. Detailed instructions were given regarding the conduction of the assessment using a Power-point presentation. These undergraduates were selected by randomization. The attendance register for the session was collected from the respective teacher after the 'roll call'. They answered 100 objective written questions.

Analyses of medical undergraduates' performances regarding the ability to answer 'recall-level', 'understand-level' and 'application-level' objective written questions on Histology

The responses from each participant were recorded and entered into the Statistical Package for Social Sciences (SPSS) version 27. The 'Shapiro-Wilk' test was done to

see whether the data is normally distributed. As some data were normally distributed and some were non-normal, for the comparison of 'recall-level', 'understand-level' and 'application-level', the Kruskal-Wallis Anova post Hoc test was done to see any significant differences between the correct responses. The results of the tests were expressed in terms of p values.

Results

A total of 100 objective written Histology questions were assessed by the undergraduates. The frequency of correct responses from 'recall-level', 'understand-level' and 'application-level' were analyzed among the 100 medical undergraduates. At first, the normality of the data at 'recall-level', 'understand-level' and 'application-level' was determined by the 'shapiro-wilk' test. The result of the test indicated that the data of correct responses at 'recall-level' 'understand-level' and 'application-level' questions were non-normally distributed where $p = 0.00$, $p = 0.02$ and $p = 0.00$ respectively. For the comparison of the performances, the values of the correct responses were expressed as means and medians (as there were non-normal distributions also determined). The hypothesis testing was done for the difference among 'recall-level', 'understand-level' and 'application-level' performances for the outcome variables using Kruskal-Wallis Anova post Hoc test (for non-normally distribution data).

The results of the hypothesis testing determined that the performances of the medical undergraduates in answering 'recall-level', 'understand-level' and 'application-level' written objective questions differed significantly regarding correct responses ($p = 0.00$). So, the performances of the medical undergraduates in answering 'application-level' and 'understand-level' written objective questions were significantly poorer ($p = 0.00$) than in answering 'recall-level' written objective questions.

For the comparison of the performances, the values of the correct responses were expressed as means and medians (as there were non-normal distributions also determined). The hypothesis testing was done for the difference among 'recall-level', 'understand-level' and 'application-level' performances for the outcome variables using Kruskal-Wallis Anova post Hoc test (for non-normally distribution data). The results of the hypothesis testing determined that the performances of the medical undergraduates in answering 'recall-level', 'understand-level' and 'application-level' written objective questions differed significantly regarding correct responses ($p = 0.00$) as shown in table 1. The means of the correct responses were also compared in Figure 1.

Table 1: Comparison of performances among the medical undergraduates answering 'recall-level' 'understand-level' and 'application-level'

Performance (frequency of responses)			Significance (P-value)
Recall-level	Understand-level	Application-level	
Mean ± SD Median (25th and 75th percentile)			
84.86 ± 10.22 88.00 (80.00, 94.00)	64.60 ± 13.66 64.29 (57.14, 74.29)	46.13 ± 14.36 46.13 (33.33, 53.33)	0.00 S

S: Significant ($P \leq 0.05$), NS: Non-significant

n = 100 medical undergraduates

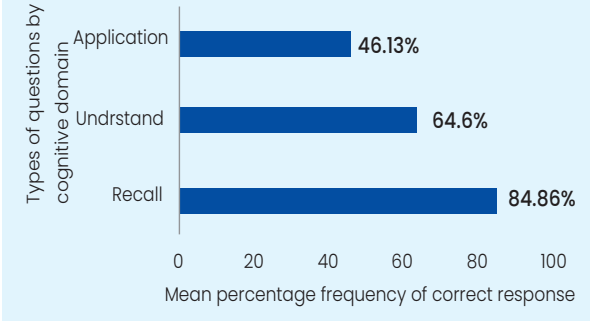

Figure 1: Comparison of the mean percentage frequencies of the scores among the medical undergraduates in answering 'recall-level' 'understand-level' and 'application-level' objective written Histology questions

Discussion

Assessing students' knowledge, skills, and attitudes is an important part of any course plan and a key part of any curriculum. Assessments that are based on well-organized materials can give the course a purpose (Nahar et al. 2015). In the present research the performances of medical undergraduates were assessed and compared in 'recall-level', 'understand-level' and 'application-level' questions on Histology. For analysis, Kruskal-Wallis Anova post hoc test was done and it revealed the efficacy of medical undergraduates in answering 'application-level' and 'understand-level' objective written Histology

questions was significantly poorer than those answering 'recall-level' objective written Histology questions constructed by the researcher (Table 1). A study was done by Sikder (2021), where embryology questions were used to compare the performances of the medical undergraduates between problem-based and traditional clinically-oriented questions. Medical undergraduates performed poorly in the problem-based group or 'application-level' questions. Likewise, Yasmin (2020) found a poorer inclination in the performance of medical undergraduates in answering problem-based or 'application-level' questions than in traditional clinically-oriented Regional Anatomy questions. The possible cause could be they have learned clinical Anatomy in their traditional didactic lecture-based learning method but could not learn to apply their clinical knowledge in a real situation. Moreover, undergraduates only memorized the clinical topics and answered the traditional clinical questions which were mostly recall-type questions and they did not think critically to understand and solve problems.

According to Wood (2003), problem-based learning is not only a problem-solving exercise; rather, it employs suitable problems to enhance comprehension and knowledge. So traditional clinical questions are usually recalled based on which do not achieve the 'application-level' of the cognitive domain. One can answer the traditional clinical questions from their memory. Fook and Sidhu (2010) reported that using 'understand-level' and 'application-level' questions in the assessment process not only encourages a wider range of learning but also helps students reach a better level of cognitive excellence. According to Carneiro et al. (2023), after analyzing a questionnaire replied to by 462 medical undergraduates about medical students' attitudes about the function of Histology showed that a number of the students in their clinical classes understood the importance of Histology. Eighty-nine (89) % of medical undergraduates in the Histology class think that learning this subject would be better with a clinical focus.

Conclusion

Histology is a key part of Anatomy. That being said, Histology needs to be taught in an approach that gets students inspired enough to confidently use what they've learned in clinical practice. But in many ways, undergraduates often fail to attain much confidence in Histology. In this research performance of the medical undergraduates in answering 'application-level' and 'understand-level' objective written questions was significantly poorer than the 'recall-level' objective written Histology questions (Figure1). Their performance was also poorer in answering 'understand-level' questions than 'recall-level' questions (Table 1).

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