



## COGNITIVE LEVEL OF GENERAL SURGERY QUESTION PAPERS – A QUALITATIVE RESEARCH

### General Surgery

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### ABSTRACT

#### Aims & Objective

- To Analyse the difficulty level of items in summative assessment of MBBS students
- To correlate the student performance to difficulty level of question paper.

#### Methodology

University exam General surgery theory question papers were collected from December 2012 to June 2015. Items were stratified based on the cognitive load being tested according to simplified modified Bloom's taxonomy. The raw scores of the students were obtained from the exam controller's office. Both were analysed.

#### Results

On an average, the questions tested 70% recall, 17% understanding and 17% problem solving ability. The performance of the students did not alter much according to the difficulty of the question paper.

#### Conclusions

Blue printing of question paper increases validity. Student discrimination is better with objective items. In spite of increase in higher order cognitive questions, the performance of students is the same.

### KEYWORDS

#### INTRODUCTION

The success of an educational program depends on its evaluation system. Written examination is a conventional & universal tool to evaluate the student's performance where the required cognitive load is defined through learning outcomes. Whether or not this evaluation reflects the student's ability depends on the items in the question paper. A valid and reliable examination paper must consist of items of varying difficulty levels to accommodate the different capabilities of students. Educators decide what to teach based on the curricula. But students decide what to learn based on the previous question papers. If students are constantly exposed to questions that require only low levels of intellectual demand, they will tend to think accordingly. Conversely, students who are given questions based on higher levels of thinking will tend to think more creatively and divergently.

In this work, these are the two issues which have been attempted to be addressed – difficulty level of the question paper and student performance.

#### AIMS AND OBJECTIVES

- To categorize the items in summative assessment relating to simplified Bloom's level of taxonomy.
- To map the percentage of marks allotted to items testing recall, understanding and problem solving in each question paper.
- To compare the student performance with the difficulty level of the items.

#### MATERIALS AND METHODS

General Surgery question papers for final year MBBS university exam, of Mahatma Gandhi Medical College & Research Institute from 2012 till 2015 were collected.

Each item in the question paper was categorized, based on the action verbs, into one of the three - recall, understanding & problem solving (simplified Bloom's taxonomy of learning objectives). Structured essays, which had a combination of different levels, were accounted for. This process was done by a group of three subject experts for general surgery and orthopedics respectively.

The raw theory scores of the students who gave these exams were obtained from the controller of examination's office. These raw scores were converted into percentages and the distribution of marks synthesized. The percentage of students scoring a particular score was deduced.

An attempt was made to compare the difficulty level of the question

paper to the actual student performance.

#### OBSERVATIONS AND RESULTS

This study was carried out on a total of six university exams, over a three year period, during the period of December 2012 to June 2015. The first two exams (December 2012 and June 2013) were conducted as per the old regulations of the Medical Council of India. (Table 1)

**Table 1: Pattern of old regulation question paper**

Old regulation		Number of items	Marks per item	Total
Paper I (80)	Section A			
	LAQ	1	10	10
	SAQ	5	6	30
	Section B			
	LAQ	1	10	10
	SAQ	5	6	30
Paper II (80)	Section A			
	LAQ	1	10	10
	SAQ	5	6	30
	Section B			
	LAQ	1	10	10
	SAQ	5	6	30
Total		24		160

For the December 2013 exams, major reforms had taken place and the new pattern of question paper was adhered to. (Table 2)

**Table 2: Pattern of new regulation question paper**

New regulation		Number of items	Marks per item	Total
Paper I (60)	Section A			
	LAQ	1	10	10
	SAQ	3	4	12
	VSAQ	4	2	8
	Section B			
	LAQ	1	10	10
	SAQ	3	4	12
	VSAQ	4	2	8
Paper II (60)	Section A			
	LAQ	1	10	10

	SAQ	3	4	12
	VSAQ	4	2	8
	Section B			
	LAQ	1	10	10
	SAQ	3	4	12
	VSAQ	4	2	8
Total		32		120

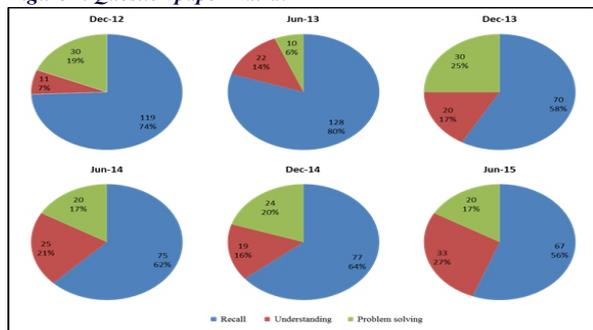
**Table 3 : Cognitive matrix of question paper – before reforms**

Before reforms (max = 160)	RECALL (%)	UNDERSTANDING (%)	PROBLEM SOLVING (%)
December 2012	119 (74)	11 (7)	30 (19)
June 2013	128 (80)	22 (14)	10 (6)
Mean	124 (77)	17 (10)	20 (13)

**Table 4: Cognitive matrix of question paper – after reforms**

After reforms (max = 120)	RECALL (%)	UNDERSTANDING (%)	PROBLEM SOLVING (%)
December 2013	70 (58)	20 (17)	30 (25)
June 2014	75 (63)	25 (21)	20 (17)
December 2014	77 (64)	19 (16)	24 (16)
June 2015	67 (56)	33 (28)	20 (17)
Mean	72 (60)	24 (20)	24 (20)

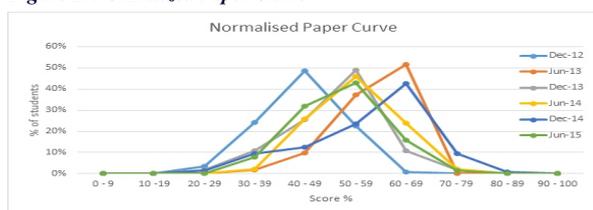
**Figure 1: Question paper matrix**



**Table 5: Percentage of scores obtained by percentage of students**

Percentage	Dec-12	Jun-13	Dec-13	Jun-14	Dec-14	Jun-15
0 – 9	0%	0%	0%	0%	0%	0%
10 – 19	0%	0%	0%	0%	0%	0%
20 – 29	4%	0%	2%	0%	1%	0%
30 – 39	24%	2%	11%	2%	10%	8%
40 – 49	49%	10%	25%	26%	13%	32%
50 – 59	23%	37%	49%	46%	24%	43%
60 – 69	1%	52%	11%	24%	43%	16%
70 – 79	0%	0%	2%	2%	10%	2%
80 – 89	0%	0%	0%	0%	1%	0%
90 – 100	0%	0%	0%	0%	0%	0%

**Figure 2: Normalized Paper Curve**



The cognitive matrix on an average was 70% recall, 17% understanding and 17% problem solving. There was a significant difference, before and after the workshop on blue printing of question paper, between the ratios of these three – recall (77% & 60%), understanding (10% & 20%) and problem solving (13% & 20%). (Table 3: Cognitive matrix of question paper – before reforms and Table 4: Cognitive matrix of question paper – after reforms)

**DISCUSSION**

Written exams are an integral part of assessment of a medical undergraduate and are one of the more popular assessment tools. It is proved to have the advantage of testing higher order cognitive thinking

with open ended questions. Each board responsible for assessing the students will have an arbitrary guide, if not a blue print, to guide the paper setter in setting the overall question paper with the required discriminating power.

During the reforms that happened in evaluation, in the third quarter of 2013, a question paper setting workshop was organized, for the entire faculty, by the controller’s office. A look at Table 3: Cognitive matrix of question paper – before reforms & Table 4: Cognitive matrix of question paper – after reforms reveals the effects of this workshop, reveals the outcome of the workshop. The percentage of items testing recall was brought down from an average of 77% to 60% and the percentage of items testing higher order thinking (both understanding & problem solving) went up from 22% to 40%. The same views were echoed in the work done by Sunita et. al. (18)

The reason that some teachers fail to move students up the levels of Bloom’s Taxonomy are many. A teacher might have low expectations concerning the students’ abilities. This is just sad and becomes a self-fulfilling prophecy. Another reason might be that it can become difficult and time consuming for the teacher. It is a complete truth that it is much easier to grade assignments based on the lower levels than on the higher levels. In fact, as you move up Bloom’s Taxonomy, you will find that rubrics become more important to ensure fair, accurate, and quick grading.<sup>3</sup>

Even after the standard of the question paper was increased, the student performance on the whole did not change by much. This may be due to the fact that the system is adequately satisfactory to make it clear to the students as to what the expected learning outcomes are. Thus the students are well prepared for the higher cognitive demand.

The test becomes more reliable with better structuring of items and with objective assessment. The class average in December 2012 and June 2013 are 43.75% & 58.15% respectively. Contrast this with the class average later – December 2013 – 50.83%; June 2014 – 55%; December 2014 – 57.5%; June 2015 – 51.7%. Another reason for the near smooth bell curve might be the increase in the number of test items from 24 to 32.

The findings of the study on summative assessment conducted in Bangladesh reveals that, there is an increase in understanding of specific type of questions in the new curriculum question papers. Along with this a decline in the amount of recall and non-specific type of questions are also observed, though the change was not significant. Again, increase in the amount of short answered questions (SAQ), decrease in short essay questions (SEQ) and absence of long essay questions in the ongoing curriculum in comparison to the older one has been observed (19).

The performance of the students have centered on the mean in all the exams except in June 2013 & December 2014 (Fig 1). In the both the cases there is a shift towards the right. Though the graphs may look similar, these two are not comparable for the following reasons

- i. the pattern of question papers were different
- ii. one had conventional items and the other had structured items
- iii. one is the main batch and the other is supplementary batch
- iv. one had global scoring (one evaluator correcting the whole paper, and there were four evaluators for the entire batch) and the other had item wise scoring (one evaluator correcting particular items for the entire batch)

**Recommendations**

In the light of finding and conclusions of the study, following recommendations were made.

- i. Paper should in strict compliance with the blue print.
- ii. Papers should be set by those setters who have full command on bloom taxonomy.
- iii. All types of questions (recall, understanding and problem solving) should be included in the question paper in appropriate proportions.

**CONCLUSIONS**

- i. Blue printing of question paper increases validity.
- ii. Student discrimination is better with objective items.
- iii. In spite of increase in higher order cognitive questions, the performance of students is the same.

**LIMITATIONS**

- i. The number of samples studied is too small to come a reliable conclusion.
- ii. The other variables (examinee, examiner, process/system, other) that could affect the test theory scores are not taken into consideration.

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