AN ANALYSIS AND MAPPING OF EXISTING TEST ITEMS FOR ENGINEERING STUDENTS IN SELECT AFFILIATED COLLEGES IN TELANGANA

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ABSTRACT

Assessment is an indispensable part of teaching-learning process. Testing is an integral part of teaching because it gives information about the improvement and growth of a student. Students' learning can be measured by different procedures. Despite a significant increase in test procedures, numerous issues surrounding testing remain unresolved. Under the modern changeable conditions of the society today, students do not require readily available information instead they need the best possible methods to comprehend and apply their knowledge. Bloom's taxonomy in this regard is probably the most commonly used cognitive process models. It is a classification system that highlights the processes starting from remembering knowledge to evaluating knowledge. In the field of education, teachers of present day need to address issues related to forming and developing questions that are rightly mapped against the effective learning objectives. The questions must be designed in such a way that they must test the analytical and cognitive skills of students. Firstly, the aim of this study is to find out to what extent Bloom's taxonomy is being implemented in designing the question paper. The paper further examines whether the questions involved in assessing the students' performance are based on testing their lower order thinking or higher order thinking skills or both. In addition to this, the paper also aims in analyzing the final question papers of two Universities and map the test items against Blooms Taxonomy and observe if the questions test the sub skills of reading and writing.

Keywords: *Learning Objectives, Bloom's Taxonomy, Cognitive Process, Comprehension, Application.*

1. INTRODUCTION

Testing, assessment and evaluation has attracted much attention of many scholars as well as language teachers. The three terms though does not mean the same but aim in achieving the desired outcomes. A test is used to measure a student's ability to complete a task whereas assessment refers to collection of information using various means and evaluation is to form a judgement about something. The present education system seems to lack harmony between what is taught and what is tested. In a traditional classroom, though a lot of efforts have been made to bridge the gap between the two, at times some elements continue to remain unaddressed and overlooked while testing. Despite many innovations brought into the testing system, structure and overall curriculum, the changes continue to remain cosmetic with the question papers continuing to remain traditional and unchanged. In order to address this issue, many universities and colleges have changed the components of testing from merely testing grammar, vocabulary and content to test the student's style of presentation, their analytical, interpretational, and organizational skills.

Benjamin Bloom (1956) stressed the importance of testing lower level thinking skills of students as a basis to move to upper levels of cognition. Armbruster and Ostertag (1989, p. 2) claimed that "the questions should not only test high level but also should include questions of low level". They further pointed that "the use of factual questions is essential because students need to know certain basic information before they can engage in higher order thinking". The objective of learning is accomplished by conducting written test to evaluate the learning outcome and performance of the students. Written exam has been a typical and accepted form of

assessments as it tests learners' knowledge and understanding. So, it is important to frame good quality questions to measure different levels of cognition. However, framing such questions is a difficult task because the questions must match with the cognition level of the learners. Blooms taxonomy helps in this regard to design such questions testing lower and higher order thinking skills.

2. OBJECTIVE

Assessment in recent years has been receiving a lot of attention from educators to employers, from academicians to entrepreneurs because writing skills of the students were not up to the expected mark and looked less proficient and precise. This in turn has made educators, academicians and employers evince more interest in the various techniques and methods that are used to measure, evaluate, and predict the language and cognitive skills. Testing the cognitive level is the chief objective of any assessment system. Blooms Taxonomy helps in understanding the cognitive level of knowledge gained by student during a particular course. Hence assessment of learning outcomes for a course can be improved effectively through proper application of the taxonomy. The present paper highlights on mapping the test items against Blooms Taxonomy and examines if Blooms taxonomy is employed while framing questions that test both lower order and higher order thinking skills. The paper also examines whether the questions test the sub skills of reading and writing and also studies the final end question papers for the subject English of two Autonomous Colleges affiliated to two different Universities in Telangana. In the process, it demarcates he questions that test Lower Order Thinking Skills and Higher Order Thinking Skills.

The Graduate Engineering programs are more focused about imparting outcome based education to the students. Blooms taxonomy is used as one of the significant tool for defining learning outcomes and objectives of a program. Questions asked in various exams such as mid exams or end semester exams play an important role to assess student's skills. In this paper, a semester end question paper is of an Engineering College affiliated to Jawaharlal Nehru Technological University, Hyderabad and the other one from another Engineering College affiliated to Osmania University, Hyderabad is selected for English subject which is part of First Year curriculum for all the Engineering Programs running under these two Universities in Telangana. This study would help all the teachers for setting well balanced exam papers as per the requirement and framing questions keeping Blooms in mind.

2.1 BLOOM'S TAXONOMY

Bloom's Taxonomy was introduced with the objective of classifying educational goals and objectives. It has been used to structure the thinking process in education. Later research supported the concept that the natural thinking process begins with the lower levels of the Taxonomy, and proceeds to the higher levels. Bloom's Taxonomy provides a universally effective approach for designing all kind of content to impart learning. This taxonomy offers a classification system for the three levels of domain namely, knowledge-based goals, skills-based goals and affective goals to promote higher forms of thinking in education. Introduction of Blooms Taxonomy, offers teachers to take into account the learners' thinking and knowledge-based abilities. It also guides the teachers' mapping out of plans for the course, providing them an easy mode to think about appropriate assessment techniques. Blooms taxonomy also serves to be a guide-post while preparing the exam papers. Furthermore, this taxonomy can be applied in the following specific areas according to the author (Giesen, 2014):

1. Write and revise learning objectives.
2. Design curriculum.
3. Identify easy to most difficult skills.
4. Effectively align objectives to assessment techniques and standards.
5. Incorporate knowledge to be learned.
6. Facilitate questioning.

Figure: 1- Bloom's Taxonomy by E. Robyn, 2014, Expert Beacon, Inc.
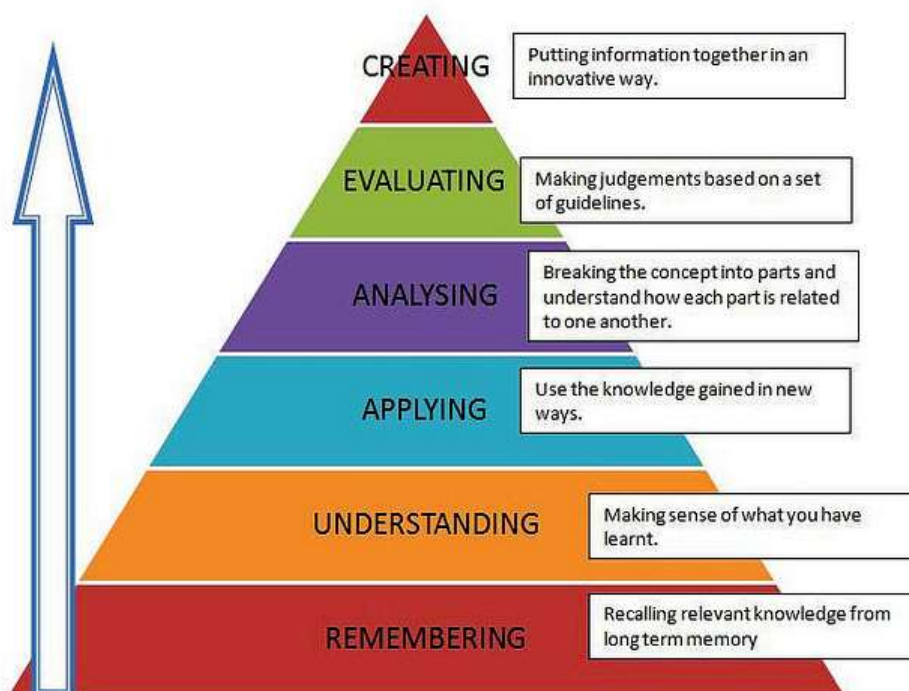
Th[...] content to tasks that students need to perform. It guides teachers to develop higher levels of thinking like critical thinking or creative thinking. It helps them to develop questions or projects that require development of thinking and reflection from the level of knowledge to the level of evaluation. This would also have certain important implications for curriculum design. Hence, Blooms Taxonomy principles serve as guidelines to the teachers for framing question and general syllabus design. The levels of Blooms Taxonomy are explained in the table given below.

Levels	Definition	Verbs
Create	Produce a new or original work.	Design, Develop, Prepare, Generate
Evaluate	Justify a stand or statement.	Justify, Assess, Support, Judge
Analyze	Draw connections among ideas, breaking down information into parts.	Compare, Contrast, Categorize, Examine
Apply	Use information in new situations.	Interpret, Demonstrate, Solve, Construct
Understand	Explain ideas or concepts.	Discuss, Explain, Describe, Summarize
Remember	Recall facts and basic concepts.	Define, List, State, Name

(Source:https://us.sagepub.com/sites/default/files/upm-inaries/53691_Gregory_Ch_6.pdf)

Blooms Taxonomy is broadly used in the education field and has proved to be successful in assisting education practices and teachings. Assessment of learning outcomes for any course can be improved efficiently through proper application of the taxonomy. Academicians are always in pursuit of bringing better and novel assessment techniques for improving student's understanding of the course. The important challenge regarding the application of Blooms Taxonomy is its effective implementation and understanding by teachers to set questions appropriately. Though Blooms taxonomy is widely being used today but, it was not effectively used few years back. In recent years, All India Council for Technical Education has made it mandatory to employ this taxonomy for framing questions and map them with the course objectives suitably. The Council has stated the importance of applying taxonomy and has recommended it to be used by universities and colleges to design their assessment strategies. The council also remarked upon certain deficit in the assessment system and the need to address them. It highlighted upon the following points:

- Indian engineering education system focuses more on written examinations in assessing the learning and awarding grades to the student.
- Universities and colleges give more weightage to the outcomes of written examinations.
- Assessment drives learning, hence question papers must be designed in such a way that go beyond mere test of memory recall.
- The students need to be tested higher order abilities and skills; and written examinations assess a very limited range of outcomes and cognitive levels. So, a variety of assessment methods (example; open ended activities, problem-solving assignments, course/ lab projects, etc.) need to be employed to warrant that assessment methods match with learning outcomes.
- Assessment plans should be formulated for each of the course in order to align it with learning outcome to achieve the level of learning.
- To employ Blooms Taxonomy in order to create optimal structure of examination papers to test the different cognitive skills.

(Source: https://www.aicte-india.org/sites/default/files/ExaminationReforms.pdf)

3. DISCUSSION & ANALYSIS

Bloom's Taxonomy is a classification of learning objectives that is designed to verify a student's cognitive level during a written examination. Teachers may sometimes face the challenge in analysing their examination questions to check if they fulfil the requirements of Bloom's taxonomy at different cognitive levels. This paper proposes an analysis of exam questions to determine the suitable level based on this taxonomy and evaluate whether the questions address subskills of reading and writing. The concept of Taxonomy has allowed the teachers to set examination papers that are well balanced, testing different cognitive skills without a tilt towards a tough or easy paper perception. Hence, Blooms Taxonomy serves as a parameter to the teachers to frame a balanced question paper. Many studies have used Blooms Taxonomy as a standard for judging whether tested items are of Lower-Order-Thinking or Higher-Order-Thinking skills.

The following paragraphs analyse various questions in semester end question paper and identify the level of the question aligned with blooms. This paper presents two set of semester end papers and analyse if the papers are aligned properly. The first question paper is set by an Autonomous Engineering College affiliated to Jawaharlal Nehru Technological University, Hyderabad. The question paper is for sixty marks and is divided into Part-A & Part-B. Part- A contains ten questions, each carrying two marks and Part-B contains five questions each carrying eight marks with internal choice. The first part consists of the following questions as:

1. Rewrite sentences after correcting them for grammatical accuracy.
2. Fill in the blanks.
3. Rewrite paragraph using transitional words.
4. Describe a landscape. (based on a lesson from the textbook.)
5. Explain concepts.
6. State differences between two items.
7. Rearrange the sentences to form a coherent paragraph.
8. Short questions from the lesson.
9. Write a short paragraph.

Analysis of Part-A gives a clear picture that it consists of questions that are largely based on lower level thinking skills without adequate focus on testing the higher thinking skills. The allocation of marks for all the levels is not uniform. The questions are focused more on remembering and understanding level and do not include questions testing their application and analysis levels in a uniform manner. There is only one question related to application and creation out of ten questions and the remaining nine questions are mapped against remembering and understanding level. The mapping is not appropriate as Taxonomy is not employed while designing the paper and is not aligned correctly. Though some questions were aligned with taxonomy the teachers were not clear about the different levels of cognition being tested. The question papers were set addressing low order thinking skills and few questions on higher order thinking skills (analyse, evaluate, create). Some of the questions in Part-A are framed to test the subskills of reading while maximum number of questions are framed to test the subskills of writing. A brief analysis is given in the table below.

Sl. No.	Questions	Subskills of reading	Subskills of Writing
1.	Rewrite sentences after correcting them for grammatical accuracy.	Syntax, Understanding grammatical information	Use grammar correctly.
2.	Fill in the blanks	predicting	Use of synonyms, antonyms, and other literary devices.
3.	Rewrite paragraph using transitional words	Connecting & Synthesizing, Understanding the cohesive devices & features of discourse	Use cohesive devices.
4.	Describe a landscape. (based on a lesson from the textbook.)	----	Structure a text into paragraphs and use devices such as thesis statement.
5.	Explain concepts	-----	Write purposefully and meaningfully
6.	State differences between two items	-----	Write purposefully and meaningfully, Write differences properly
7.	Rearrange the sentences to form a coherent paragraph	Identify main ideas, supporting details and conclusion	Arrange according to the topics sentences, closing sentence to give a clear understanding of the paragraph.
8.	Short questions from the lesson	-----	Develop writing strategies accurately, using pre writing techniques and writing well organised paragraphs
9.	Write a short paragraph	-----	Develop writing strategies accurately, using pre writing techniques and writing well organised paragraphs

The second part i.e. Part- B includes questions focusing on lower order thinking skills and few on higher order thinking skills. The test questions given in this paper are as follows:

1. Write a letter
2. Rewrite the sentences after correcting them.
3. Write paragraphs & essays
4. Reading Comprehension
5. Descriptive questions from the lesson.

The second part of the question paper also focuses more on testing the lower order thinking skills and there is less scope to test higher order thinking skills of students. The questions in this section are based on remembering, understanding and applying. Only few questions on analysing and creating were included in the paper. The paper has five questions with an internal choice and Q2, Q3, Q5, & Q6 are aligned with remembering & understanding. Q1, Q4 & Q7 are mapped against applying, analysing and creating level. The mapping has not been done keeping all the domains in mind. It includes more questions on lower order thinking skills giving less scope to test higher order thinking skills of students. Hence taxonomy is not applied while designing the paper and is not aligned correctly.

The study also shows that the allocation of marks for each domain must be uniform in order to satisfy the requirements of Bloom's Taxonomy. The question papers have not achieved this as the question paper did not include questions to test the higher order thinking skills. The tests reveal the questions on lower order are more detailed which requires less innovation by the students. Though a lot of revisions are made with the standards and tests, teachers must warrant that students are able to function at higher cognitive levels. Therefore, a need has surfaced to increase the use of higher order thinking skills by the students. Since many teachers have only tested the lower order thinking skills in the tests, there is a need for the teachers to include questions of higher order levels. Hence, it is observed that the application of Blooms Taxonomy at a higher level is not widely used while setting the question papers. Part-B of the question paper mostly focuses on testing the subskills of writing giving less scope to test the subskills of reading. The fourth question on reading comprehension is aligned with skimming, scanning, inferencing and other subskills of reading.

Sl. No.	Questions	Subskills of reading	Subskills of Writing
1.	Write a letter	----	Develop writing strategies accurately and write a well organised paragraph.
2.	Rewrite the sentences after correcting them	Syntax, Understanding grammatical information	Use grammar correctly.
3.	Write paragraphs & essays	---	Develop writing strategies accurately and write a well organised paragraph.
4.	Reading Comprehension	Skimming, Scanning, Inferencing, Predicting, Connecting & Synthesizing (integrate, relate ideas)	Convey links and connections, Use correct vocabulary.
5.	Descriptive questions from the lesson	----	Write purposefully and meaningfully

The second question paper taken for analysis is by another engineering college affiliated to Osmania University, Hyderabad. The question paper is divided into Part-A & Part-B. The first Section has ten questions, each carrying two marks and all are compulsory questions. Part-B contains seven questions each carrying ten marks and the students have to answer any five out of them. The first part consists test questions such as:

1. Match the following.
2. Fill in the blank using the appropriate word given in the bracket.
3. Add suitable suffixes to the root words.
4. Change from active to passive.
5. Rewrite the sentences after making necessary corrections.
6. Write Precis.
7. Expand the idiom.
8. Write synonyms & antonyms.
9. Change the tense form.

It is observed that Part-A consists of questions based on lower level thinking skills. The allocation of marks for all the levels is not uniform. Here, the questions are more focused on remembering and understanding level and do not include questions based upon applying and analysing in a uniform manner. In the present paper, around four questions are mapped for applying out of ten questions and the remaining questions are mapped against remembering and understanding level. The mapping is not appropriate as Taxonomy is not applied while designing the paper. In the above paper, some questions are aligned with taxonomy though it is not clear to the teachers that the questions tested different levels of cognition. The question papers are set on lower order thinking skills and has less scope for questions on higher order thinking skills (analyse, evaluate, create). A few questions (Q6, Q7) on creating are included in the paper. It is clearly understood that few years back, Blooms taxonomy was not widely used by the teachers and they did not use Taxonomy while designing papers, but today Taxonomy is used as it is a compulsory instruction by AICTE and is being followed from 2018. The questions in Part-A has more opportunity to test the subskills of writing compared to test the subskills of reading. So, a need has developed to have uniform set of questions to test the both the subskills.

Sl. No.	Questions	Subskills of reading	Subskills of Writing
1.	Match the following	----	Understand and complete the sentence to have proper meaning.
2.	Fill in the blanks using the appropriate word given in the bracket (antonym, synonym, prefix, tense)	----	Express meanings using different grammatical forms.
3.	Add suitable suffixes to the root words.	----	Express meanings using different grammatical forms.

4.	Change from active to passive	Syntax, Understanding grammatical information	Use grammar correctly.
5.	Rewrite the sentences after making necessary corrections.	Syntax, Understanding grammatical information	Use grammar correctly.
6.	Write Precis	Inferencing, Predicting Understanding the context, meaning etc.	Write purposefully and meaningfully. Paraphrasing
7.	Expand the idiom.	-----	Write a well organised paragraph
8.	Write synonyms & antonyms	Inferencing Predicting	Know the meanings of different words and use them correctly.
9.	Change the tense form.	Syntax, Understanding grammatical information	Use proper sentence structure.

The second part i.e. Part-B includes questions that are mainly focused on lower order thinking skills and few questions on higher order thinking skills are included. The questions in part-B include:

1. Explain a concept. (Explain the role of communication in today's world.)
2. Write differences. (Write 10 differences between verbal and non-verbal communication.)
3. Write essays.
4. Give meanings.
5. Descriptive questions from the lesson.
6. Write a report on an event, incident etc.
7. Descriptive questions from grammar.

The second part, i.e. Part-B of the paper also focuses more on lower order thinking skills and do not have much scope for questions on higher order thinking skills. The questions are mainly based on remembering, understanding and applying. Only few questions on analysing and creating are included in the paper. The paper has seven questions and Q1 is mapped against understanding level. Q2 is aligned with analysing level. Q3, Q4 & Q5 are mapped against remembering and understanding level. Q6 is based on creating where the student has to write a report on his own. The mapping has not been done keeping all the domains in mind. It includes more questions on lower order thinking skills giving less scope to test higher order thinking skills of the students. Hence, taxonomy is not applied properly while designing the paper as less questions on higher order thinking skills (evaluate, create) are included. The questions have more space for testing the subskills of writing than testing the subskills of reading. A brief analysis is given in the following table.

Sl. No.	Questions	Subskills of reading	Subskills of Writing
1.	Explain a concept. (Explain the role of communication in today's world.)	----	Write purposefully and meaningfully. Write a well coherent paragraph.
2.	Write differences. (Write 10 differences between verbal and non-verbal communication.)	----	Write a well organised paragraph. Use transitional words for similarities & differences.
3.	Write essays.	----	Write proper topic sentence, supporting sentences & closing sentence. Write a well-developed paragraph highlighting the main ideas with examples.
4.	Give meanings.	Syntax, Understanding grammatical information	Know the meanings of different words and use them correctly.
5.	Descriptive questions from the lesson.	----	Write purposefully and meaningfully. Write a well coherent paragraph.
6.	Write a report on an event,		Write purposefully and meaningfully.

	incident etc.		Paraphrasing
7.	Descriptive questions from grammar.	-----	Write a well organised paragraph. Use grammar properly.

4. RESULTS

The study reveals that framing of questions is an important component of written exams and little about this has been presented in the literature. However, framing a good question is a significant feature to observe the criteria on which the student will be assessed. Unfortunately, little attention is paid to the elements of designing a good paper. The questions included from the first college affiliated to Jawaharlal Nehru Technological University Hyderabad shows that the questions could have been developed in a better way. The test items reflect that effective usage of taxonomy verbs in the paper but all the questions did not follow the pattern as using these verbs is one of the important element in order to meet the objective.

Sl. No	Question	BT Level
	Question Paper by Engineering College affiliated to JNTU Hyderabad **Part-A**	
1.	Rewrite the sentences after correcting them for grammatical accuracy.	L2
2.	Fill in the blanks using appropriate prepositions.	L1
3.	Rewrite paragraph using transitional words.	L2
4.	Describe landscape of Ladakh.	L2
5.	Explain intensive and extensive reading.	L2
6.	State differences between a letter and a memo.	L2
7.	Arrange sentences to form a coherent paragraph.	L6
8.	Short questions from the lesson.	L2
9.	Short questions from the lesson.	L2
10.	Write a short paragraph.	L6

Therefore, it is observed that Part-A of the question paper reflects upon testing the lower order thinking skills giving less scope for testing higher order thinking skills. The questions are aligned as per Blooms and the verbs are used as mentioned in the revised Blooms Taxonomy. As the questions largely covered lower order thinking skills, provision for questions testing higher order thinking skills must be included. The questions should be designed uniformly giving scope to test higher order level too.

Sl. No	Question	BT Level
	Question Paper by Engineering College affiliated to JNTU Hyderabad **Part-B**	
1.	Write letter.	L6
2.	Rewrite the sentences after correcting them.	L2
3.	Choose appropriate transitional word.	L1
4.	Write a paragraph using cause and effect pattern.	L4, L5, L6
5.	Read the passage and answer the questions.	L2, L3, L4 & L5
6.	Descriptive questions from the lesson. Why according to the author Ladakh seems to be like Heaven's Gate?	L1
7.	Descriptive questions from the lesson. Justify the title.	L6

It is observed that Part-B emphasizes on testing lower order thinking skills and higher order thinking skills. Though both the kinds of questions have been asked but more emphasis is laid on testing lower order thinking skills.

Sl. No	Question	BT Level
	Question Paper by Engineering College affiliated to Osmania University, Hyderabad **Part-A**	
1.	Fill in the blanks by choosing appropriate words from the list.	L1
2.	Match the following.	L1
3.	Add suitable suffixes to the root words.	L2
4.	Change from active to passive.	L2

5.	Rewrite the sentences after making necessary corrections.	L2
6.	Write Precis.	L2
7.	Expand the idiom.	L3
8.	Write synonyms & antonyms.	L1
9.	Change the tense form.	L2

It is observed that Part-A of the question paper reflects upon testing the lower order thinking skills giving less scope for questions on testing higher order thinking skills. Hence, an attempt has to be made to design questions to address higher order thinking too.

Sl. No	Question	BT Level
	Question Paper by Engineering College affiliated to Osmania University, Hyderabad **Part-B**	
1.	Explain the role of communication in today's world.	L2
2.	Write 10 differences between verbal and non-verbal communication	L4
1.	Write an essay on a world without water.	L5
2.	Give meanings.	L1
3.	Descriptive questions from the lesson.	L4

The second part, i.e. Part-B deals with questions related to lower order thinking skills and limited scope has been given to include questions for higher order thinking skills. Hence, the paper must be designed in a way that it gives opportunity to include questions from lower and higher order thinking skills.

So, it is clear that implementation of Blooms existed while designing the papers but the teachers weren't aware of the taxonomy and they didn't design the paper keeping Blooms in mind. The papers designed are ideal for assessing how well a student can summarize the information, connect ideas and find associations, include and apply steps to route information. It is shown that taxonomy verbs have been used effectively but a particular pattern has to be followed. A lot of attention has to be paid on the quality of the questions. Many efforts have been made to frame questions carefully and seriously but less is followed. It is a challenging task to pay attention to the taxonomy while designing questions, though it's being followed but is partially fulfilled.

5. CONCLUSION

Finally, the study suggests that Blooms Taxonomy has to be implemented while designing the paper and the focus must be on testing both the thinking levels. After analysing all the questions in the question papers, it is clear that the questions demonstrate that most of the questions start with a taxonomy verb though most of the teachers were not aware of this taxonomy at that time. However, only some of the questions start with Wh-pronoun, a determiner, preposition or a noun and an adverb and the teachers must be trained to design the papers in line with Blooms taxonomy. Though the major focus is on testing the lower order thinking skills efforts are to be made to design a uniform paper testing the higher order and lower order thinking skills.

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