

A Comparative Study of Cognitive Demands Based on Bloom's Taxonomy in English Exam Questions at Matriculation Level in Pakistan

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ABSTRACT

Assessment and evaluation in the educational field play an important role in developing learning strategies and students' academic improvement. The current study aims at comparing subjective type, English Matriculation Examination Questions (i.e., prepared by Board of Intermediate and Secondary Education Multan) during the years 2014-2015 and thus years 2024-2025 which makes a total of 64 questions in all, 16 for each year with a gap of ten years. Total eight subjective question papers have been included. Each year got two question papers including both paper A and paper B respectively. This research has been conducted by applying Six Revised Bloom's Taxonomy levels (1956). Major domains of the model include low levels, such as remembering, understanding, applying, and high levels, such as analyzing, evaluating, and creating, which focus on acquiring critical skills. Furthermore, the research identifies amendments and thus define the proportion of low-order and high-order questions. The methodology comprises a mixed-method approach and seeks to find the alignment with the six different levels. Findings reveal that the paper setters should construct a balanced question paper, adding more high-order questions, which discourages memorization and rote learning among the students.

Keywords: Bloom's Taxonomy, English Exam Questions, Cognitive Skills, High and Low Order Questions.

Introduction

The questions designed for the written examination are set to evaluate the outcomes of students' learning during a set period of time. The subjective examination evaluates the ability of students through the questions presented in the paper. Questions should be selected from easy to difficult levels, that would help to evaluate the intellectual capabilities of different learners, depending upon their capabilities (Jones et al.,

2009). The criteria for writing a question paper are to identify the reasoning abilities and better learning outcomes of the students.

Written examination evaluates the learning process of the students and their ability to interpret the concepts they have learned during the course. Therefore, the examiner must take into consideration the quality of the questions to assess their knowledge and cognitive skills. The outcomes vary from student to student, relying on different levels of understanding of the subjects. A question paper is required to have a middle level, consisting of an amalgam of easy and difficult questions. The preparation of the examination consumes time if it is expected to be a balance of high-order and low-order questions. If the questions fail to meet the criteria of a balanced paper, they cannot determine the learning outcomes of the learners.

The examiners should follow a standard method in designing the question paper in a balanced manner to evaluate the real knowledge and creativity of learners. Thus, the standardized process can define a domain of question papers for the assessment of critical thinking skills. A methodology that has international standards can overcome the difficulties an examiner faces during the process of finalizing the question paper (Kumara, 2019). The examiner cannot assure the quality of the questions based only on their concepts. There is a need for a taxonomy that builds the structures of the examination paper following the guidelines of the international standard and evaluates the knowledge of the students.

The schools in Punjab have devised their examination system from playgroup to class 8th, whereas the exams of class 'Matriculation' and 'Intermediate' are conducted under the Board of Intermediate and Secondary Education (BISE) Multan, depending upon the respective districts located in the province. The 9th and 10th classes fall under Secondary School Certificate Exams (SSCE), and the 11th and 12th classes are under Higher Secondary School Certificate Exams (HSSC). This level of education is crucial for developing the cognitive skills and improving the ability to critically analyze the concepts instead of cramming them (Chandio, 2016).

The questions should tend to evaluate the students' thinking and reasoning ability, which they convey through their answers. The students memorize the surface-level meanings of the concepts to deliver the information they have stored in their minds for a short period. The basic questions, which only narrow down to extracting the data from the students, fail to develop reasoning skills that students could adopt in creating an answer (Swart, 2009). The question paper should equally deal with high-level and low-level questions to evaluate students' implementation and retention abilities. The questions should enable the students to apply the knowledge in practice.

The evaluation of the question paper is marked based on Bloom's Taxonomy (1956), which functions as the international standard base for designing examinations. This taxonomy plays a crucial role in contributing quality questions and language assessment in the question papers. These papers are analyzed through various domains of the model's revised version, starting from low order, including remembering, understanding, applying, and high order, like analyzing, evaluating, and finally creating. The first three stages from the bottom are low order, while the last levels are considered to be the high order according to Bloom's Taxonomy. Thus, this study analyzes the pattern of English examinations taken at the secondary level. The assessment of the learning outcome process is evaluated by applying Bloom's

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Taxonomy to the question structure and its language proficiency.

This paper examines a comparison of the question papers of the English subject, conducted by the BISE Multan in the years 2014-2015 to 2024-2025 with a gap of ten years, through the application of Bloom's Taxonomy (Chandio, 2016). This approach identifies the strategy of writing questions for the exams and the learning outcome of students to analyze their cognitive skills (Jayakodi et al., 2015). The levels of difficulties, ranging from low order to high order assess the basic knowledge and effective understanding of learning respectively.

Literature Review

This literature review focuses on the model of Bloom's Taxonomy, which has been elaborated, revised, and implemented in various works. Bloom (1956) developed a theory of Bloom's taxonomy, which primarily defines the terms of "thinking" and "problem solving." The taxonomy has been classified into six main classes from simple to complex order: "knowledge, comprehension, application, analysis, synthesis, and evaluation."

The original version was developed by Benjamin Bloom in 1956, whereas the revised version was developed by his former student (Anderson, 2001), as they contributed to the original taxonomy's design. Anderson (2001) took charge of correcting some of the problems occurring in the old version and suggested the revised levels of this model. This version differentiates the concept of "knowing what" and "knowing how" from thinking to problem-solving techniques.

The cognitive domain is defined by the original and revised versions with the changing of categories from noun to verb, and shifting the category from evaluation to creation on top of the pyramid, as it is illustrated in the figure below:

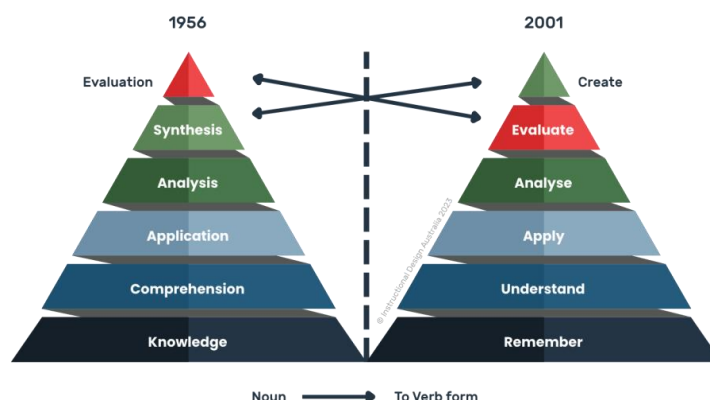


Fig 1: Bloom's taxonomy in 1956 and 2001

The knowledge of students is tested at various levels, including factual details, conceptual information, procedural techniques, and metacognitive knowledge assess the thinking process. The dimensions of revised Bloom's Taxonomy range from low to high domain: remember, understand, apply, analyze, evaluate, and create. According to Anderson, "Meaningful learning provides students with the knowledge and cognitive processes they require for effective problem-solving."

Previous studies have attempted to apply this model to categorize the exam questions

based on the cognitive domain. According to (Chung, 2009), an online test of English questions analyzes the cognitive levels through Bloom's taxonomy. The test system was organized to classify the data of various verbs stored in the model, including the verbs with capital and lowercase letters. The system was set to analyze the questions consisting of verb tenses. If the keyword was available in the test, then that question would be added to the category of selected keywords. The authors had developed four categories to include the matching keywords: Correct Match, Partial Match, No Keyword, and No Match (Omar et al., 2012). They concluded that the keywords collected were represented under the level of "Knowledge" in Bloom's taxonomy.

Bloom developed these domains in this taxonomy to save the time and efforts of the examiner by providing directions in preparing examination questions. Each level is set in the hierarchy and cannot change its place, as each level plays a vital role in the evaluation of the results of students (Krathwohl, 2002). Bloom's taxonomy is not only restricted to testing the critical thinking skills, but it also offers approaches and processes for understanding basic concepts of the subject (Churches, 2009). Each level, ranking from low to high, in the revised hierarchy of Bloom's taxonomy was linked with verbs and digital tools (Mullen, 2008). The use of verbs identified in editing, sharing, creating, and interacting is termed as "digital verbs," which are devised for the practical activities (Nikolić, 2016).

The current system of examination requires drastic reforms to assess the high-order skills and improve the low-order skills by analyzing the question paper to align with a better understanding and comprehension. Students rely on the guess or model papers, whereas the teachers follow the method of marking specific answers from the textbooks, instead of providing them the opportunity to explore and solve the answers with practicality. The reason was that cramming stems from the structure of examination questions, which are repeated over the years and follow the same pattern that encourages the students to focus on rote learning. As a result, students get deprived of demonstrating high-order skills. The assessment should promote generating high-order skills and enhance the cognitive skills (Rehmani, 2003). The outcome does not develop the thinking process or problem-solving techniques.

The majority of the questions asked in the exams are short and require a word response from the students. These questions fail to bring out the innovative thinking or problem-solving skills. Most of the questions are centered on obtaining information through data or facts (Bibi, 2020). Bloom's taxonomy creates the difference between closed-ended questions and open-ended questions, defining the narrow questions with limited answers and broad questions with extensive answers. Therefore, the present study highlights the need to balance low-order and high-order questions in English examinations at the Matriculation level by applying the mentioned theory.

Statement of the Problem

This study seeks to compare the design of examination questions and find differences that may have occurred in the batches 2024-2015 and 2024-2025, by applying the model originally given by Bloom (1956), particularly analyzing the subjective type of English exams at the secondary stage. The problem arises in the subjective type questions, which promote rote learning and hinder the development of critical thinking skills. The criteria of the questions reflect the ability of the students to think

critically, display their arguments, articulate, and express their ideas. Furthermore, the language assessment of the questions differentiates the low-order and high-order thinking skills.

Research Objectives

The research objectives have been given in the following. These are:

To compare the English exam questions with the levels of Bloom's taxonomy, with a time difference of 2014-2015 and 2024-2025 (i.e., four years with a gap of ten years).

To examine the balance of low and high-order questions in English exams during this timeline.

To assess the linguistic features contributing to the complexity of the subjective exams.

Research Questions

The research questions are as follows:

What is the comparative proportion of low-order and high-order questions in 2014-2015 and 2024-2025 English examinations?

Are the subjective-type questions from the two batches, 2014-2015 and 2024- 2025, aligned with the cognitive levels of Revised Bloom's Taxonomy?

Significance of the Study

This research holds significance in the area of education to assess and evaluate the testing system, mainly focusing on English exams at the secondary level (i.e., class 9th and class10th). It is necessary to analyze the examination papers and their alignment with the standardized criteria, such as the Revised Bloom's Taxonomy (1956). This study critically examines 16 questions per Exam paper to identify the improvement of cognitive and analytical skills. It helps the students to develop creativity in their answers and read the text critically through high-order thinking skills, including analyzing, evaluating, and creating. Repetition of the questions will promote cramming among the students, which will limit their intellectual growth.

Therefore, to encourage students and change their method of learning from traditional to a creative style, the exam setters should construct a balanced question paper to assess the thinking levels of the learners. Moreover, the study provides suggestions for the examiners to design effective questions and improve the quality of learning.

Delimitation

This study only focuses on the subjective type English language exam papers specified for the students, who are giving exams under the supervision of the BISE Multan, Pakistan. The language assessment and evaluation are limited only to the English subjective type and do not analyze the objective type questions. It is only critically analyzed through the framework of revised Bloom's Taxonomy to examine the progress of critical thinking skills and compare two batches, 2014-2015 and 2024-2025, which investigates the differences in the construction of the question papers over period of ten years.

Methodology

Research Design

This study employs a quantitative approach to analyze the distribution of low-order and high-order questions designed for the students of the 9th and 10th class at the BISE Multan. The present research focuses on six levels of the revised version of Bloom's Taxonomy (Anderson, 2001). This model assesses the division of subjective type questions based on the cognitive levels through the following revised stages:

Anderson (2001) defines the revised levels as:

Remembering

This level includes the capability of learners to recall previously learned data, knowledge, facts, and figures. It is the most basic step, which deals with retrieving basic concepts from memory, such as naming, locating, listing, and identifying. The type of questions asked under this domain involves: "What is...?" or "When did...?"

Understanding

It refers to comprehending the meaning, explaining, and interpreting the concepts. The learners explain any idea or key term in their own words. It requires comprehension of the text, instead of storing it in memory to recall. The students describe those concepts with the help of examples.

Applying

This level indicates the use of information that is implemented in different situations. Students can apply problem-solving techniques in their given context from the lessons they have learned in the classroom. It encourages them to implement the theory practically in daily life situations, e.g., writing a letter.

Analyzing

It means to break down concepts into parts and compare them with each other to understand the structure of ideas. This level differentiates between facts and interpretations to explore the connections in organized patterns. The information gets arranged logically after categorizing it into components, which include tasks like comparing, outlining, and structuring.

Evaluating

This level requires making judgments and critiques based on the standards. Students judge and assess the idea using logical reasoning. It involves developing opinions and conclusions to resolve the problem through evaluation. The questions under this domain are usually designed to ask for solutions, judge, or criticize the provided material.

Creating

It is the highest level in revised Bloom's Taxonomy, which produces a new writing style to express ideas and thoughts to enhance cognitive thinking skills. This level emphasizes creating a new meaning and writing creatively to express complex concepts. It promotes generating innovative solutions through imagination, such as story writing.

Scope of the Study

The present study focuses on the subjective type of questions in the English subject from the batches 2014-2015 and 2024-2025. It specifically examines the low-order thinking skills and high-order thinking skills through the six domains of the revised model. The research deals with improving the testing system to enhance critical thinking skills among the students.

Theoretical Framework

The theoretical framework for this research is based on the revised version of Bloom's Taxonomy, which was introduced by Anderson (2001). The six levels provide the criteria to assess and evaluate the English subjective type questions. These level ranges from low-order (remembering, understanding, applying) to high-order (analyzing, evaluating, creating). This theory can be applied to analyze the domain of questions, which are designed by the exam setters.

Population

The target population of the study deals with the Matriculation examination system in Punjab, Pakistan, which is further narrowed down to the boards of South Punjab (i.e., Multan Board). The study aims to analyze the subjective type questions to assess and evaluate critical thinking skills.

Sampling

The purposive sampling technique has been used in this research because it primarily examines the subjective type of English exams at the SSCE level in Multan from the batches 2014-2015 and 2024-2025. The comparative analysis has been selected to identify the design of questions following the revised levels of Bloom's Taxonomy.

Data Collection

The data has been collected through the subjective type of English exams conducted at BISE Multan, including group A and group B from the years 2014-2015 and 2024-2025. The annual exams, combined with both groups, consist of 16 questions per paper for short answers. These questions are categorized into the cognitive domains of Revised Bloom's Taxonomy, which are represented in percentages in tabular form. The research analyzes the category of the questions, whether they fall under low-order or high-order thinking skills. The study seeks to find any change in designing these subjective questions in these two batches.

Quantitative Data Analysis

The analysis of the subjective type of the English exams at the matriculation level explains the division of exam questions into six domains of the model. The section deals with analyzing sixteen questions from each year and then compares the design of exam questions related to Revised Bloom's Taxonomy to examine the difference between batches 2014-2015 and 2024-2025 with a gap of ten years. The data have been analyzed through the Statistics Package for Social Sciences (SPSS) and presented in tabular form and graphs. The tables demonstrate the percentages of each level, and the graphs portray the frequency of each level.

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Tables and graphs describe the analysis as given below:

	Frequency	Percent	Valid Percent	Cumulative Percent
Remembering	2	12.5	12.5	12.5
Understanding	7	43.8	43.8	56.3
Applying	1	6.3	6.3	62.5
Analyzing	4	25.0	25.0	87.5
Evaluation	2	12.5	12.5	100.0
Total	16	100.0	100.0	

Table 1. Percentage of Each Level of Bloom's Taxonomy in Subjective Type Questions 2014

Data from 2014 in tables 1 and 2 reveal that most questions are frequently asked in the levels of low-order thinking skills. It depicts percentage of low-order questions is higher, while on the contrary, questions are not focused much on the level of high-order thinking skills. The questions in the low-order category are mostly related to the understanding level, with 43.8%, whereas none of the questions are related to the creating level. The paper setter has only focused on the analysis level. Overall, the proportion of low-level questions is compared to high-level questions.

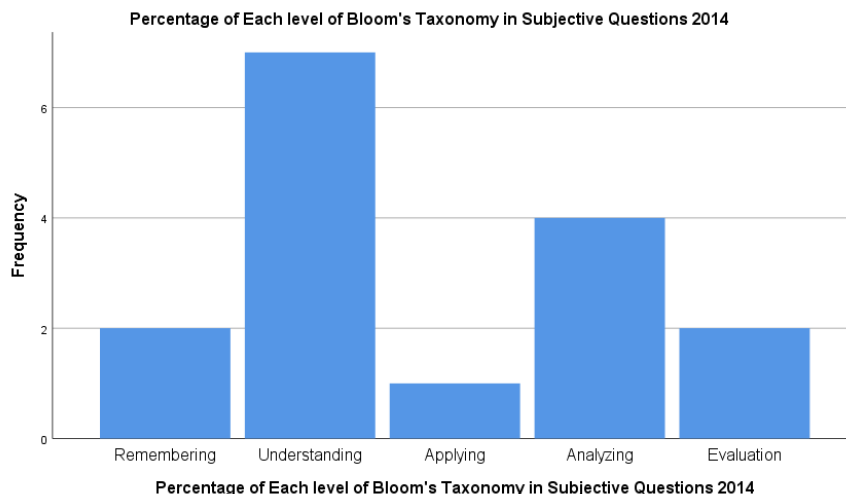


Table 2. Frequency of Each Level of Bloom's Taxonomy in Subjective Type Questions 2014

	Frequency	Percent	Valid Percent	Cumulative Percent
Remembering	3	18.8	18.8	18.8
Understanding	4	25.0	25.0	43.8

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Applying	1	6.3	6.3	50.0
-Analyzing	4	25.0	25.0	75.0
Evaluation	3	18.8	18.8	93.8
Creating	1	6.3	6.3	100.0
Total	16	100.0	100.0	

Table 3. Percentage of Each Level of Bloom's Taxonomy in Subjective Type Questions 2015

The data in Tables 3 and 4 represent a balanced proportion of low and high-order questions. The subjective section of the 2025 English exam carries 25% of questions under the domain of understanding, while 25% questions fall under the domain of analysis. However, the ratio of evaluating and creating is lower. The balance is created when the questions are equally designed to test the critical thinking skills of the students, instead of focusing on cramming.

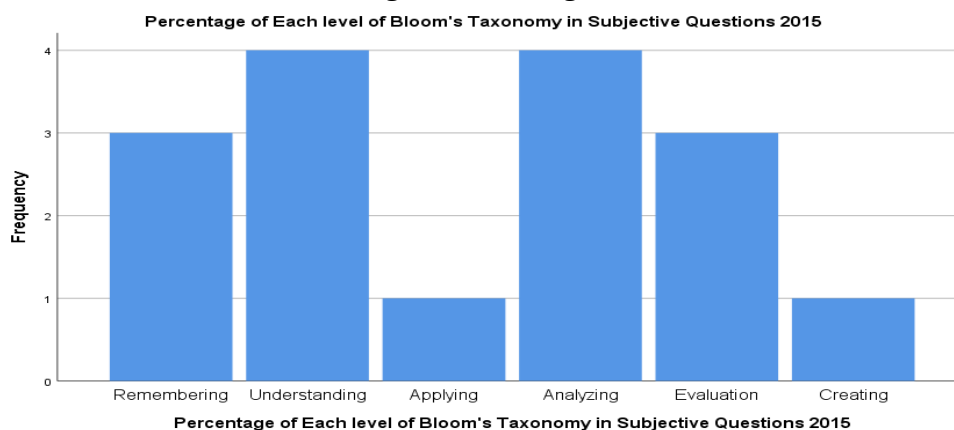


Table 4. Frequency of Each Level of Bloom's Taxonomy in Subjective Type Questions 2015

	Frequency	Percent	Valid Percent	Cumulative Percent
Remembering	3	18.8	18.8	18.8
Understanding	6	37.5	37.5	56.3
Applying	1	6.3	6.3	62.5
Analyzing	4	25.0	25.0	87.5
Evaluation	2	12.5	12.5	100.0
Total	16	100.0	100.0	

Table 5. Percentage of Each Level of Bloom's Taxonomy in Subjective Type Questions 2024

Data analysis from the questions of the year 2024 is displayed in Tables 5 and 6. It also follows the similar patterns of the previous exams, as the major percentage of questions is related to understanding 37.5% and analyzing 25%. These two domains are highly prominent in the statistical analysis provided below. It indicates that the questions are not changing the category, and they are getting repeated under the same category.

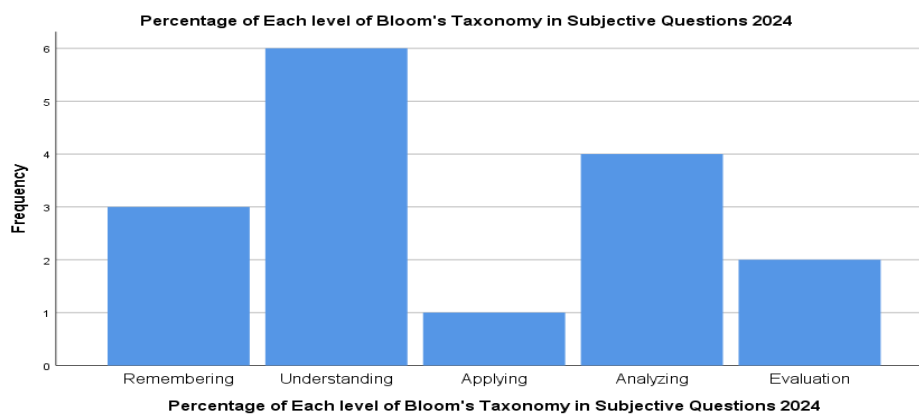


Table 6. Frequency of Each Level of Bloom's Taxonomy in Subjective Type Questions 2024

	Frequency	Percent	Valid Percent	Cumulative Percent
Remembering	1	6.3	6.3	6.3
Understanding	4	25.0	25.0	31.3
Applying	2	12.5	12.5	43.8
Analyzing	3	18.8	18.8	62.5
Evaluation	6	37.5	37.5	100.0
Total	16	100.0	100.0	

Table 7. Percentage of Each Level of Bloom's Taxonomy in Subjective Type Questions 2025

Data collected from the English exam 2025 shows that the frequency of questions is higher in the evaluation category, displayed in Tables 7 and 8. However, the second and third most occurring questions are related to the domain of understanding, 25 %, and analysis, 18.8%. The category of creation has remained untouched by the paper setters.

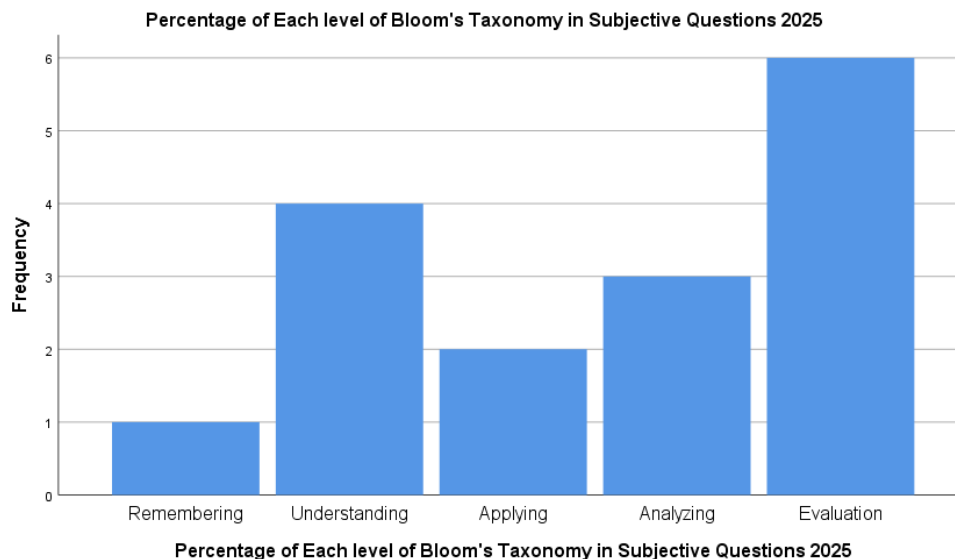


Table 8. Frequency of Each Level of Bloom's Taxonomy in Subjective Type Questions 2025

Qualitative Analysis

The qualitative analysis of the study only focuses on the written content (i.e., examination questions) of the data. The overall analysis of English examination questions conducted at the Matriculation level by BISE Multan in the years 2014-2015 and 2024-2025 claims that the questions are not equally grounded on the model's revised version. The data reveals that the questioning system of board exams highly focuses on low-order questions, instead of highlighting high-order questions. It promotes rote learning, and students follow the cramming and memorization technique to pass the exams. Paper setters at BISE Multan are more inclined towards selecting the questions from the levels of understanding and analyzing, instead of evaluation and creation, which may benefit the learners to enhance their critical thinking skills. The following questions fall under the domain of understanding:

“Why did Quraish think that the Holy Prophet (PBUH) would favor them?”

“Why is the Chinese New Year never on the same day each year?”

The first question was selected from Group I of 2014, and the second question was taken from Group II of 2015. Another example that follows the level of analyzing from the model has been mentioned here, which has been taken from Group I of 2024 and Group I of 2025, respectively:

“How does a viewer get restricted while watching TV news?”

“How does a book connect the reader and the writer?”

Students memorize the answers from the selected question patterns and attain marks, which is not enough to judge their intelligence. For example, the question that was asked in 2014 was also included in 2024:

“Why do Chinese families do a thorough cleaning of their houses before New Year's Day?”

Similarly, the second example of repetition has been highlighted here:

“How did the Holy Prophet (PBUH) set high and noble ideals for all mankind?”

These questions were part of Group I in 2014 and 2024.

The comparison between the questions from 2014-15 and 2024-25 shows that the subjective questions are frequently repeated from the same domains, and minute changes have been made to change the number of questions in other domains. But the evaluation and creation levels have been ignored over these years, and the prominent levels, such as understanding and analyzing, are represented in the graphs. This analysis observed that the subjective type of the exams, consisting of short answers, does not involve every level of Revised Bloom's Taxonomy equally because it mainly focuses on only two domains, which are not satisfactory to test the intelligence level and to develop the critical and analytical thinking skills among the students.

Findings and Discussion

The study focused on comparing the subjective type of English exams to evaluate the difference in designing questions based on Bloom's Taxonomy. The main purpose was to investigate the proportion of lower-level questions and higher-level exam questions. It also examined the alignment of these questions with the six levels of the revised model.

The aim of conducting examination should not only be limited to check the intelligence of the students because usually questions are designed in such a way that they can easily remember the given facts and data in the textbooks using their cramming skills, which does not teach them any moral lesson or any kind of practicality to apply in real life situation. Several studies have criticized the examination system as they do not meet the criteria of developing critical, analytical, and evaluative skills in students (Chandio, 2016). Teachers pay more attention to completing their curriculum syllabus and direct them towards past papers or the most frequently occurring questions in the board exams.

The achievement of the learners is dependent upon the score rates. The educational institutions also remain focused on the high-scoring students, as they are only concerned with their reputation for posting their top grades. The repeating cycle of questioning makes students focus on obtaining the marks and does not show active participation in polishing their skills. Assessment should be objective or reliable, rather than superficial, according to (Gipps, 1996). The design of the questions proves that it gives rise to the trend of rote learning and cramming. Students are encouraged to memorize the answers to get high scores and attain positions in the board examinations. The textbooks do not fulfill the criteria of developing the cognitive skills among the learners (Hayes, 1987).

The questions follow a similar pattern and do not entirely follow the higher domains of the model. They are mainly selected from the same chapters in 2014-15 and also in 2024-25. It denotes that the system is lacking in designing effective questions that deal with improving critical thinking skills. One of the reasons for including low-order questions is that the paper setters are not familiar with the six stages of revised Bloom's Taxonomy. A major stage of constructing exams is to have well-experienced and trained examiners who are experts in their field to organize the question paper in such a way that it balances low-order and high-order questions for the examinees. The study examined that the high levels, like evaluating and creating, are in far less ratio in comparison to the low levels, such as remembering and understanding.

The problem also arises when students come from a poor academic background, where teachers are not trained enough to teach them about analytical and critical writing. They only follow the pattern of past papers and rely on guess papers because they are more interested in attaining the marks or grades hence they neglect the importance of gaining knowledge, which can help them in practical life. The educational system in Pakistan works upon traditional methods and follows the ancient pattern of designing the questionnaire, whereas it should shift from closed-ended questions to open-ended questions, interconnected with enhancing analytical skills. Students learn deeply when they understand the concept, become able to interpret, and then apply it to their context (Harlen, 1997). Therefore, the secondary boards should hire the expert examiners who will design the exam questions according to the six stages of Bloom's Taxonomy, and emphasize evaluating critical thinking skills, rather than repeating the same questions.

Conclusion

It was concluded that the subjective portion of English exams at BISE Multan should be shifted from designing low-order to high-order questions to enhance critical thinking skills. The present study aimed at evaluating the question paper/s by applying Revised Bloom's Taxonomy, consisting of low orders such as remembering, understanding, applying, and high orders involving analyzing, evaluating, and creating. It compared question papers of the years 2014-2015 and 2024-2025, to find the use of these levels in exams. The results showed that the low-order percentage is more prominent than the high-order, represented in the tabular form and graphs.

According to Anderson (2001) the level of understanding means explaining and interpreting concepts that as student has grasped, whereas the level of analyzing deals with breaking material into components and exploring their relationship by organizing and comparing those parts to get the overall meaning. The highest frequency of questions has occurred in the domain of understanding and analyzing. It indicates that the target of developing critical thinking skills has not been achieved, as these questions are only associated with recalling the learnt answers through memorization. Most of the questions follow the same pattern, and some are even repeated over the years.

Chandio (2016) explains that the data gathered from the Sindh board, including major cities like Karachi, Hyderabad, and Sukkur, provides low degree questions in their examination system. The three boards have primarily focused on low levels as compared to higher stages of the revised model. The data analysis of this research concludes that the subjective section focuses on the domains of remembering and analyzing, rather than including questions from the higher domains, like evaluating and creating.

However, questions are not mentioned under the creating domain, the highest level of Bloom's Taxonomy. This level should be focused on when designing questions for the exams because it will increase the students' ability to improve analytical and cognitive skills to devise answers from their creative thinking skills and produce solutions and ideas. The trend of factual knowledge has been covering most of the questions in exams over the past years. Therefore, learning should be discouraged, and teachers should take initiative to enhance the problem-solving techniques among

the students to promote new methods of teaching and to make studying effective through practice.

Recommendations

The recommendations for improvement are given below:

The question papers should equally consist of both low levels and high levels of Bloom's Taxonomy.

Examiners should not repeat the same questions that fall under the same categories.

There is a dire need for training for exam setters to acquire an understanding of Bloom's taxonomy.

Questions that require only recalling the information should be avoided.

Students should be asked to apply the concepts in real-life scenarios and relevant contexts to develop their problem-solving skills.

Design questions that will allow students to express creative ideas.

The skill of improving cognitive skills for students should be developed by selecting questions from creating, the highest level of the model.

The teaching methods should be shifted from rote learning and cramming to the practical use of analytical knowledge.

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