

Exploring General Science Questions of Secondary School Certificate (SSC) Examination: Assessment Effects on Students Learning

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Abstract

Creative question is generally considered as a tool to measure students' various levels of learning. The study focused on exploring the present situation of General Science test items/creative questions in Bangladesh. This descriptive study was conducted using a concurrent triangulation research design. To conduct this study both quantitative and qualitative data were collected. 16 test of General Science test items/creative question papers of 2015 or 2016 were selected purposively as sample from all educational boards. 48 students were selected conveniently for interview from those who had been passed the SSC examination of 2015 or 2016. For collecting data from these sources test analysis protocol and interview protocol were used as research tools. Test analysis protocol was consisted of two criteria; wording criteria and practicing criteria. Selected test items were analysed based on these two criteria and Bloom's cognitive domain. The study revealed that major test items were developed in a way which direct students towards lower level learning. Few test items were focused to students understanding, application and higher order learning. In practice, students were engaged to only memorization and understanding through SSC examination assessment. Few test items were devoted to application level learning of students. Higher order learning was totally ignored in SSC examination questions.

Keywords: General Science, Examination, Assessment, SSC, Students Learning, Secondary Education

1. Introduction

Assessment is the central part of formal education. Assessment is a tool or method of obtaining information from tests or other sources about the achievement or abilities of individuals. According to Earl and Katz (2006), assessment is a mechanism for making decisions about future programs and providing information to parents about their children's learning. Assessment allows one to collect and assess learning evidence which helps them to make judgements about learner's achievement. The assessment result can be used by different people for different purposes. This indicates that assessment has a "direct relationship with students learning" (Begum, 2007).

Generally, assessment can be divided into two forms; formative and summative assessment. Formative assessment is usually done in the classroom while the summative assessment is done after the completion of a particular unit of a course or at the end of a course (Rahman, 2018). In Bangladesh, one of the main summative assessment occurs at the end of secondary education named as "Secondary School Certificate" (SSC) examination. Summative assessment typically comes at the end of the course which is designed to determine the extent to which the instructional goals have been achieved and is used primarily for assigning course grades or certifying students' achievement (Miller, Linn & Gronlund, 2009).

Through assessment an assessor mainly assess some learning objectives. A classification of learning objective was developed by a group of educational psychologist led by Benjamin Bloom. Bloom divided the educational objectives mainly into three parts. They are- cognitive domain, affective domain and psychomotor domain. Cognitive domain has six sub domains. They are- knowledge, comprehension, application, analysis, synthesis and evaluation (Bloom, 1956). Our secondary curriculum is prepared based on these learning objectives. So, the Assessment should be focused on these learning objectives.

The Government of Bangladesh, in collaboration with Asian Development Bank (ADB), undertook project called the Secondary Education Sector Improvement Project (SESIP) from 1999 to June 2007 aiming to reform the SSC examination system. The Secondary Education Sector Investment Program (2013-2023) in Bangladesh was designed with the assistance of ADB to achieve a more relevant secondary education in terms of quality, efficiency and equity through developing the secondary education sector as a whole. The program is prepared to facilitate the implementation guidelines and directives regarding secondary education as set forth in the National Education Policy 2010 as well as in achieving the targets predetermined in Vision 2021. It was the introduction of Skill-based Structured Questions (SQ) in the Secondary School Certificate (SSC) examination to enhance its validity and reliability. The Structured Question was then renamed as Creative Question (Hossain, 2009). To meet this goal, creative question was incorporated into SSC examination intended to test a range of cognitive skills including knowledge, comprehension, application, and higher order thinking (analysis, synthesis and evaluation). Our creative question follows four parts- knowledge, understanding, Application and higher order thinking is made up with analysis, synthesis and evaluation (Manik, 2011). Though creative question was introduced in 2010 in other subjects, Creative Question in General Science is included in 2011. Currently, all 29 subjects at SSC level

have creative questions. The structure of creative question is fixed to reduce the memorization tendency of students and inspire them to understand so that they can apply or evaluate it in any situation. It is a matter of thinking that whether our purpose has been fulfilled or not after introducing this new pattern of question. This study is a pointer to examine the nature of General Science test instruments at SSC level and its implication for the type of learning in which the students are being engaged. This study is a little attempt to explore the real scenario of assessment system of Bangladesh. The structure of creative question is fixed to reduce the memorization tendency of students and inspire them to understand so that they can apply or evaluate it in any situation.

2 Statements of the problem

Students' learning is heavily shaped by assessment approaches. It is the assessment that suggests what is important to the students and how students spend their time (Santhanam, 2002). That is students' learning is closely linked to assessment as Gipps (1994) suggests that "assessment affects ... what and how [students] learn" (p. 18). Therefore, the quality of learning depends on the quality of assessment (Khan, 2012). Effective assessment tools or tests are responsible for effective learning.

For secondary students, taking part or participating in SSC examinations is crucial. Successful completion of SSC examinations, make students eligible for higher secondary education or competent person for employment (if anyone want to terminate further formal education). Therefore it is important that the SSC tests are appropriate assessment tools for effective learning. Research indicates that tests usually play limiting role for students' learning as the tests mainly focus on cognitive dimensions of learning ignoring other skills (NCTE, 2014). In Bangladesh, the system of education has always been guided by curriculum though the system only covered learners' ability of memorization and comprehension skills (Begum & Farooqui, 2008). The Previous research indicates that majority of SSC test items were appropriate for assessing lower level cognitive learning (Ahmed, 2002; Begum & Ahmed, 2007). That is, with regard to Bloom's taxonomy of learning, the examination test items are merely able to assess remembering, understanding and application ability (lower order learning) rather than ability to analyze, evaluate and synthesize (higher order learning). It is argued that in order to cope up with the SSC examinations, secondary students usually memorize and reproduce a great deal of learning materials (Ahmed, 2002). As reported by Begum and Mullick (2005), majority of SSC questions (over 90%) were found to be capable of demanding recall or knowledge based learning.

In the recent past (since 2011), a change was introduced in the questioning pattern of SSC examination of general science subject also among with others. The new questioning consists of multiple choice items and creative questions. The purpose of new assessment questioning was to improve students learning by reducing memory-laden questions and increasing critical thinking or higher level questions, especially based on Bloom's subdomains of cognitive learning (SESDP, 2010). Therefore, it is necessary to investigate whether new pattern of questioning is aligned with the purpose stated above. This study aimed at investigating the new SSC examination questioning pattern of General Science subject following Bloom's framework of cognitive learning. The aim of the study is to examine the test item's wording or action words as well as the corresponding actual practice of learning in attempting the item.

The main purpose of the study is to analyze the SSC General Science Creative question on the basis of Blooms Taxonomy. To achieve this purpose the following specific research questions was addressed:

1. How do the wordings of General Science SSC questions mirror the potentiality of assessing different levels of cognitive Learning?
2. To what extent the wording of general Science SSC questions actually engage students with different levels of learning domain?

3 Conceptual Framework

Figure 1 represents the conceptual framework of the study. The conceptual framework clarifies the total study process including the methodology followed. In this study, SSC examination question papers of General Science subject were analyzed to examine the reflection of the subdomains of Bloom's cognitive learning taxonomy. Students' interview showed that to what extent in reality questions were engaging students in learning different level of cognitive learning.

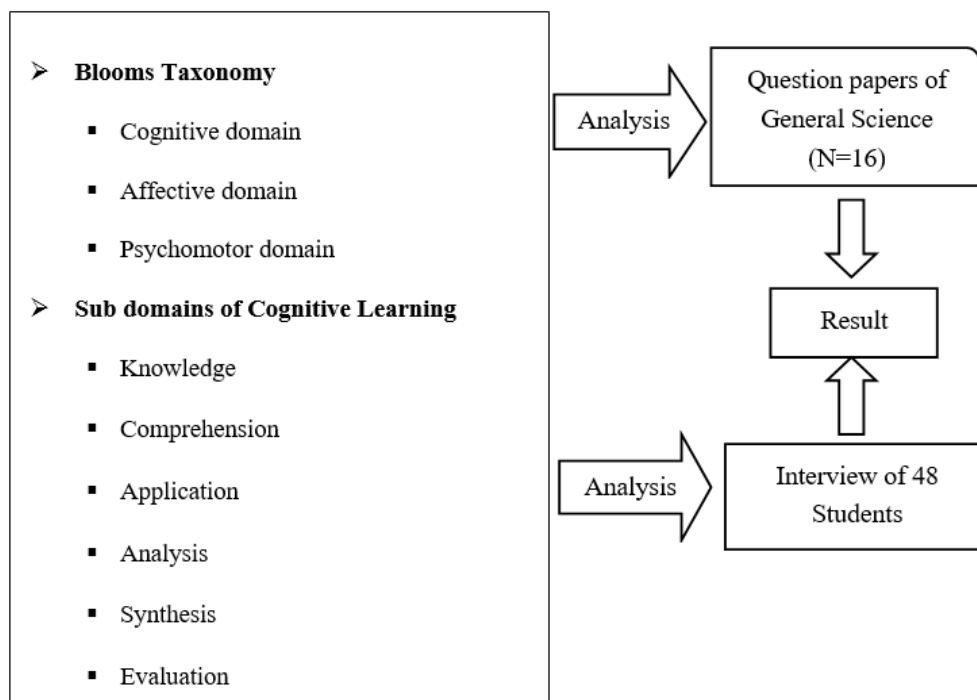


Figure 1. Conceptual Framework of the study

4 Literature Review

4.1 Definition of operational Terms

a) Wording Criteria: It is the criteria of a test item that points to the verbatim meaning of the language used in the item of the content. It represents the nature of the verbs or language of the item (action verb). It means what kind of learning is been demanded by the test items. The surface structure of an item gives a clear conception about the action verb to the reader which is recognizable.

b) Practicing Criteria: Practicing criteria is actual learning process in which learners are engaged in reality to respond to the task demanded by the test items. It indicates the current practice of creative question in SSC examination. It indicates that what a student have to do for answering an item, like recalling or memorizing, understanding or higher order learning.

4.2 Purpose of Assessment

Rawntree (1987) pointed out six arching purposes of assessment. The purposes of assessment are – selection by assessment, maintaining standards, motivation of students, feedback to students, feedback to teachers and preparation for life.

According to National policy of Bangladesh (2010), “The aims and objectives of examination and evaluation are:

- To initiate a creative method that seeks to evaluate the students’ acquisition of the course contents and not rote learning;
- To formulate regulation to prepare some uniform strategies to determine the methods and levels of examination and evaluation;
- To prepare rules and principles of developing textbooks and paper-setting to facilitate proper evaluation and suggest ways of easy comprehension that are applicable both to the paper setters and examinees and to make them aware of those.” (p.51)

4.3 Assessment system

For many years, the main goal of academic education has been to make students knowledgeable within a certain domain. The core issue was to building a basic knowledge store then. Recent developments in current society have changed these goals. Now, the emphasizes are on producing high knowledgeable individuals, but also enhancing problem solving skills, professional skills and authentic learning, i.e. learning in real-life contexts: successful functioning in this era demands an adaptable, thinking, autonomous person, who is a self-regulated learner, capable of communicating and cooperating with others (Dochy, 2001).

This assessment system is sometimes referred to as a ‘testing culture’ (Kleinasser, Horsch, & Tastad, 1993). It has the following Characteristics:

- Instruction and assessment were considered separate activities, the former being the responsibility of the teacher and the latter was the responsibility of the measurement expert.
- The test plan, the item writing as well as the development of criteria for evaluating test performance and the scoring process were not usually shared with the students and remain a mystery to them.
- The items/tasks were often synthetic in as much as they were unrelated to the student's life experience.
- The majority of the test items were of the choice format, examining knowledge of decontextualized, discrete units of the subject matter.

The tests were usually of the paper and pencil type, administered in class under time constraints and forbidding the use of helping materials and tools.

4.4 Creative Question

Creative question is generally considered as a tool to measure students' various levels of cognitive learning. It is used to expand students' thinking in depth, to encourage students' curiosity and to enhance their motivation to inquire. The questions cover a range of cognitive skill, i.e. knowledge, comprehension, application and the group of skills referred to as higher abilities; such as analysis, synthesis and evaluation (Hossain, 2009). It was the introduced as Skill-based Structured Questions (SQ) in the Secondary School Certificate (SSC) examination to enhance its validity and reliability. Finally, the Structured Question was then renamed as Creative Question (Hossain, 2009).

4.5 Characteristics of Creative Question

The question should start with an introductory statement followed by an original imagery or a brief paragraph which cannot be taken from text book and this part is called stem. For every creative question there are 10 marks. Under every stem, it will then follow questions in four groups (NCTB, 2012; Rahman, 2010). Stem should follow some rules-

- Stem should be unique, it should not be direct from the textbook.
- It should be related to textbooks content.
- Stem should be interesting and make students curious.

If questions can be answered without stem, then the stem is not properly constructed (NCTB, 2012). Under every stem, there are four questions. These questions should assess four different skills. This is introduced based on Bloom's taxonomy/ Anderson's modification (Malek, Begum, Islam & Riyad, 2012). These four parts are given below hierarchically: (a) Knowledge, (b) Comprehension, (c) Application, (d) Higher order skills.

Descriptive Question (60% marks) i.e. essay type creative question (CQ) is prepared maintaining a structure. Each CQ has two major parts: (a) a Stem and (b) a set of four questions. The questions are arranged hierarchically following Bloom's taxonomy of cognitive learning. Table 1 represents the cognitive learning areas that are measured by the four questions from lower order to higher order learning.

Table 1. Learning areas based on Bloom's cognitive domain

Learning areas based on Bloom's cognitive domain	Description	Marks distribution
Part a: Knowledge	Assesses ability to recall/remember	01
Part b: Comprehension/ Understanding	Assesses ability to grasping the meaning	02
Part c: Application	Assesses ability to apply learned materials to ne situation	03
Part d: Higher order learning	Ability to analyze, evaluate and synthesize information	04

The main structure of creative questions are same in all science subjects (Tithi, 2017).

4.6 Importance of creative question in Bangladesh

Creative question was introduced to get some benefits. There are some advantages of creative questions. Such as it assesses different skills and starts with easy to harder question. It can also differ between good and weak students carefully (Khatun, 2012). Four questions under a stem are interrelated and help to get an in-depth knowledge about a topic from students. All questions follow the same rule. So all question papers maintain the same quality (NCTB, 2012). Creative questions provide sufficient support for students to start solving a problem. Test several skills within a single context, one question can assess a range of skills. The idea of creative questioning will discourage mindless memorizing, a common situation in our country and encourage students to exercise their creative facilities (Rahman, 2010). In this creative question system, validity and reliability should be ensured. For this teachers have to emphasize on the objectives of curriculum, steps of thinking ability, marking on an answer.

4.7 Bloom's Taxonomy of Educational Objectives

Taxonomy is the science of Classification. Usually it deals with the study of identifying, grouping and naming of content. Originally taxonomy refers to Classification of organisms, things or concepts as well as to the principles underlying such a classification (Clausewitz, 1982 cited in Tujjahan, 2017).

Blooms Taxonomy is about the classification of the goals of educational objectives. It was expected that it will be of general help to all teachers, administrators, professional specialists and research workers who deal with curricular and evaluation problems. American psychological association was first formed the idea of this type of classification in 1948. As educational objectives provide the basis for building curriculum and tests and students learn on the basis of the curriculum and test, a theoretical framework must be obtained through a system of classifying the goals of the educational process. For this objective, they were motivated. The committee then organized and wrote the various portion of the "cognitive" part of the taxonomy. Then they developed the "Affective" part of the taxonomy (Bloom, 1956).

There are three main parts in Blooms taxonomy of educational objectives. They are

- a) Cognitive Domain
- b) Affective Domain
- c) Psychomotor Domain

Cognitive domain: Cognitive Domain deals with a person's ability to process and utilize information in a meaningful way. It mainly relates with recall and recognition of knowledge as well as the intellectual development of skills and abilities. It proceeds to divide cognitive objective into sub divisions from the simplest behavior to the most complex. This domain is mostly emphasized in most recent. It is the domain in which most of the work in curriculum development has taken place and where the clearest definitions of objectives are to be found phrased as well as descriptions of students' behavior (Khatun, 2012).

Bloom, Engelhart, Furst & Karthwohl (1979) described six parts of cognitive domain. A hierarchy of six levels is given below:

Knowledge: the recall of specific items. It is related to remember.

Comprehension: can recall, but can do a little more such as paraphrase, define, discuss to some extent about a topic.

Application: all of the above, But can take information of an abstract nature and use it in concrete situations actually apply in a given context.

Analysis: can break down a communication into its constituent parts, revealing the relationships among them.

Synthesis: can pull together many disorganized elements or parts so as to form a whole, just opposite of analysis.

Evaluation: makes judgments about the value of materials or methods. Describe one statement or a topic from personal view.

5 Methodology

5.1 Research Design and Sampling

This is a descriptive study which was conducted using a concurrent triangulation research design. Under this design both quantitative and qualitative data were collected and analyzed concurrently emphasizing the quantitative one. Data was collected from two sources; one source was public examination question papers and the other source was students who participated in the SSC examinations held in 2015 and 2016. SSC examination question papers of General science were administered in the year of 2015 and 2016 for the candidates of eight Education Boards in Bangladesh. The education boards are known as Board of Intermediate and Secondary Education (BISE). They are Barishal BISE, Dhaka BISE, Cumilla BISE, Chattogram BISE, Dinajpur BISE, Jashore BISE, Rajshahi BISE and Sylhet BISE. A total of 16 question papers, one from each BISE and each year were chosen purposively. Each question paper can be divided into two major sections. In section one, a set of 40 multiple choice questions (MCQs) and in the second section a set of nine Creative Questions (CQs) are included. In this study, both types of questions were considered as unit of analysis. A sample of 48 students were selected conveniently from those who were passed in their SSC examinations (that included General Science question papers as well) either in 2015 or 2016. The students were located conveniently from 10 intermediate colleges from Dhaka, Sylhet, Jhenaidah and Kushtia districts.

5.2 Instrumentation

Two instruments were used for collecting the necessary data. They include –

- (a) Question wording classification protocol: This protocol was used to classify the wording used in each question of General Science subject. The protocol followed the Bloom's taxonomy of cognitive learning. The classification protocol was applied to each items of the sampled General Science SSC question papers for deciding about the item's demand on students' levels of learning following Bloom's taxonomy of cognitive learning.

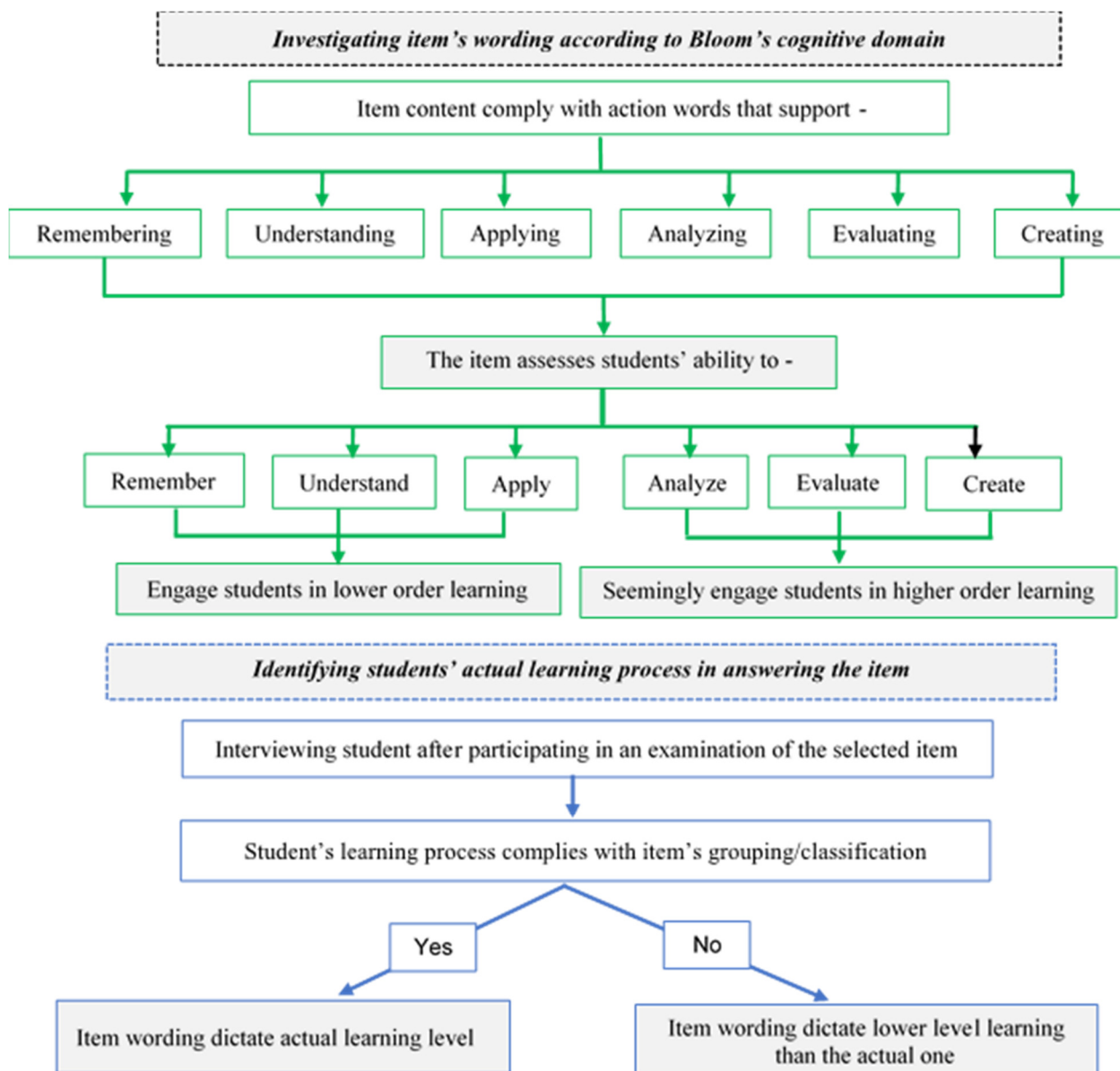


Figure 2. Decision making process of an item's ability to assess different levels of learning based on Bloom's framework

(b) **Semi-structured interview protocol:** a semi-structured interview was conducted with students on the answering process of selected questions followed by their answering activities on selected questions. This generated qualitative data by identifying students' actual learning practice encouraged by the SSC examination questions. This semi structure interview schedule consists of 22 questions regarding the actual practice of creative questions. 576 test items (16 question papers; every question paper consists of 36 items) was administered on 48 students. Each of the question papers was given to three students to answer in the fixed time. After taking the test, students were asked for the interview questions.

(c) **Inter-coder agreement:** To examine the reliability of the data obtained through question wording classification protocol, coding consistency was examined by calculating inter-coder agreement. Inter rater/coder agreement is the extent to which more than one coders assign exactly the same code/rating to each object being coded or rated (Tinsley & Weiss, 2000). According to Lavrakas (2008), inter coder reliability is critical for objective and valid interpretation of data. A high inter rater agreement indicates that the coders or judges assigned exactly the same codes or numerical values to the concerned object of rating.

For examining the reliability of the question wording classification protocol, two independent coders: researchers and an independent coder were involved in the coding process of a general science question paper. The researchers were played as coder 1. Another independent coder was selected purposefully by the researchers.

The researchers and the independent coder coded the items of the selected question papers separately. The independent coder submitted her/his codes to the researchers. The researchers then calculate the inter coder

agreement. In calculating the inter coder agreement – (i) first the codes of the two raters for each item were tabulated. Then for each item the codes were inspected and assigned 1 for same codes of coder 1 and coder 2 and zero (0) for differed codes. After inspecting the matching of the codes total number of agreed codes was calculated. Finally, the percentage of agreement was calculated dividing the total number of agreed codes by the total number of all codes and multiplying the fraction by 100. The calculated inter-rater agreement for the question wording classification protocol was 85.71% which was quite high. Following a rules-of-thumb for percent agreement, this value i.e., 85.71% is much higher than “minimal agreement” (75%) and nearer to “high agreement” (90%) category. Thus, the value of percent agreement for the question wording classification protocol satisfied the ‘adequate level of agreement’ criteria. Therefore, the protocol produced a reliable result.

5.3 Data Analysis Technique

Quantitative were collected from the question wording classification protocol which were applied to the General Science SSC examination questions. The quantitative data were analyzed using descriptive statistics which included simple percentage and arithmetic mean. Percentages provides an overall scenario and arithmetic means were determined to find out the center of the data set. The results were presented through tables, charts and graphs. Qualitative data were collected from semi-structured interview of students. Thematic analysis technique was used to analyze the qualitative data.

6 Results of the study

6.1 Question wording classification protocol

The test items of SSC General Science have been analyzed here yearly. The analysis has been shown with table and graph.

Table 2. Matching between question wording and actual learning practice (Dhaka board 2016)

Question and options in sample CQs	Bloom’s level of cognitive learning based on	
	Question wording (researcher)	Actual practice (students)
Question no 1		
a.	Knowledge	Knowledge
b.	Understanding	Knowledge
c.	Application	Understanding
d.	Analysis	Understanding
Question no 2		
a.	Knowledge	Knowledge
b.	Understanding	Knowledge
c.	Application	Understanding
d.	Analysis	Understanding

The above table shows the matching between questioning wording and actual learning practice of selected test items. At first researcher selected the test items by wording criteria, then researcher asked the students how he/she solved this task/test items. Based on students response researcher recognized the actual learning practice.

6.2 Analysis of 2015 Questions

6.2.1 Analysis of (2015) MCQ questions

Eight (08) tests of 2015 have been selected for this analysis. There are two types of test items, CQ and MCQ. Every CQ is consists of thirty six (36) items and MCQ Questions consists of forty (40) items. MCQ items were analyzed by wording and practicing criteria. From figure-4 it is clear that, among 320 MCQ items the wording criteria shows that knowledge based questions are 49.37%, 30.31% questions are understanding based, 7.81% questions are application and the rest 12.50% questions are focused to higher order learning. But in case of preparing MCQ questions, it is mandatory that 70% MCQ questions should focus knowledge and understanding level and 30% should be application and higher order learning based questions (SESDP training manual 2010).

In case of practicing criteria, 91.87% MCQ questions are engaging students’ knowledge level, 0.31% questions are understanding and the rest 7.81% questions are focused to students application level learning. It is very clear from the analysis that higher order learning is totally absent in 2015 MCQ questions.

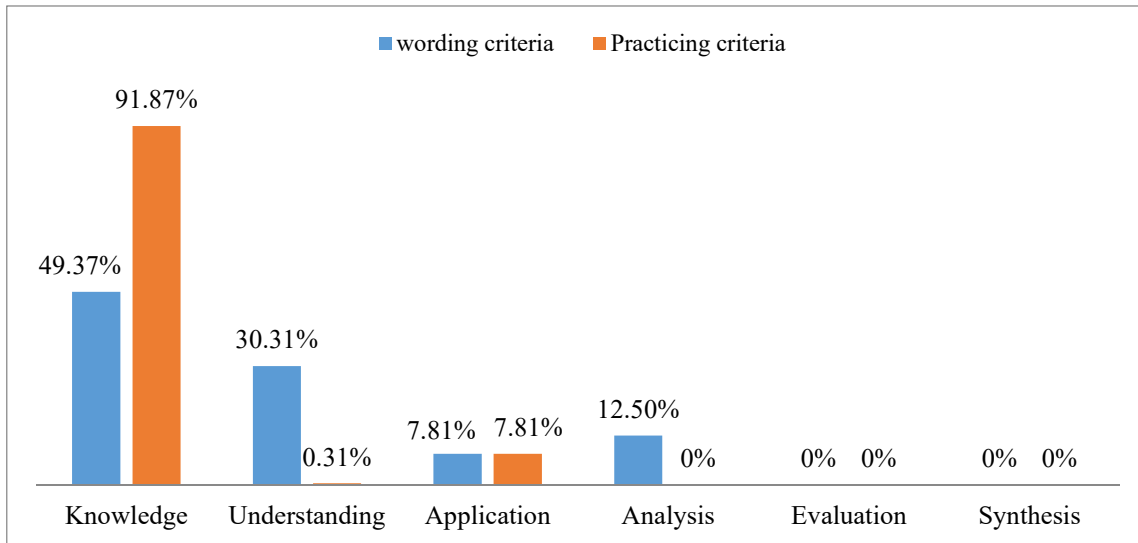


Figure 3. Analysis of MCQ (2015) questions by learning domain and two criteria

6.2.2 Analysis of (2015) CQ questions

From figure-4 the analysis of CQ items by wording criteria shows that knowledge based questions are 31.25%, understanding level questions are 29.16%, application level questions are 17.70%, analysis based questions are 15.97%, evaluation based questions are 5.55% and synthesis based questions are only 0.34% which is nearly ignorable.

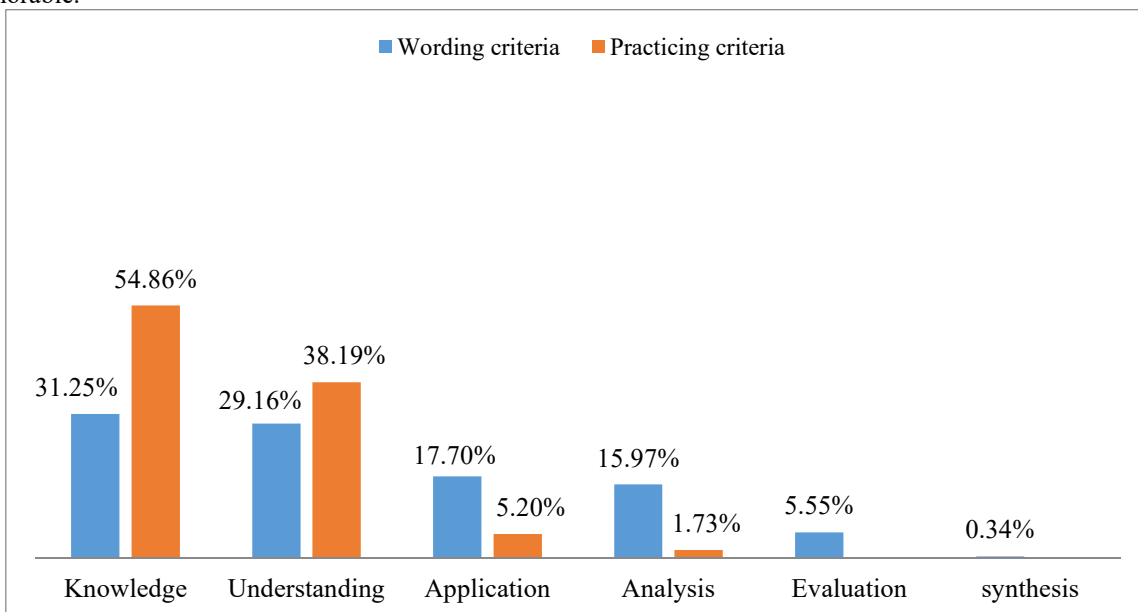


Figure 4. Analysis of CQ (2015) by learning domain and two criteria

In terms of practicing criteria, 54.86% questions are knowledge based, 38.19% questions are understanding, 5.20 % questions are application and only 1.73% items promote higher order learning.

6.3 Analysis of 2016 Questions

6.3.1 Analysis of (2016) MCQ questions

From figure-5, the wording criteria of MCQ items shows that knowledge based questions are 49.68%, 31.56% questions are understanding level, 6.25% questions are application and the rest 12.50% questions are focused to higher order learning. In case of practicing criteria, 93.12% MCQ questions are engaging students' knowledge level, 0.93% questions are understanding and the rest 5.93% questions are focused to students application level learning. It is very clear from the analysis that higher order learning is totally absent in 2016 MCQ questions.

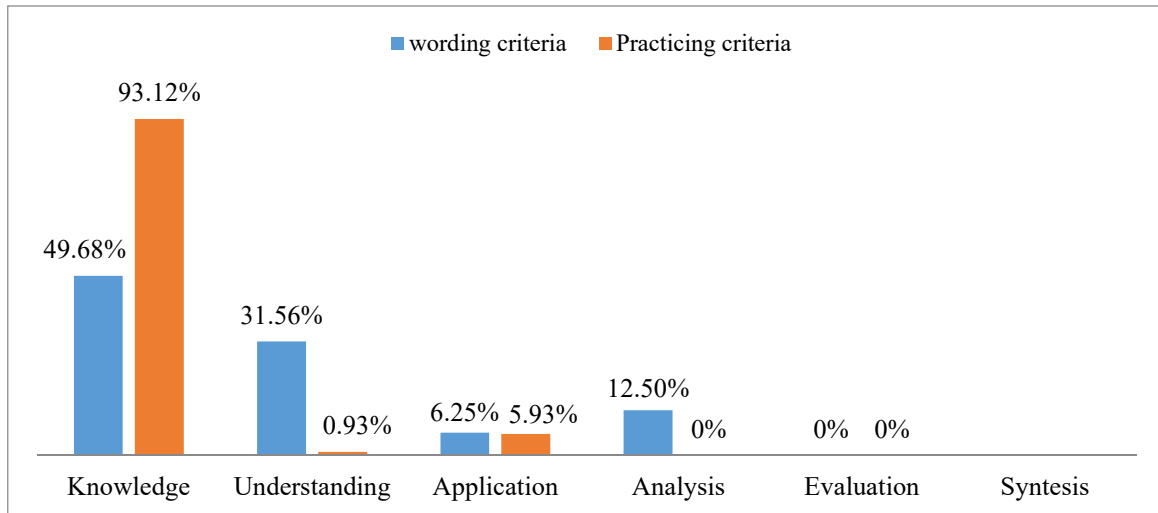


Figure 5. Analysis of MCQ (2016) by learning domain and two criteria

6.3.2 Analysis of (2016) CQ questions

From figure-6 the analysis of CQ items by wording criteria shows that knowledge based questions are 25%, understanding level questions are 44.79%, application level questions are 4.51%, analysis based questions are 18.40%, evaluation based questions are 7.29% and no questions were synthesis level questions.

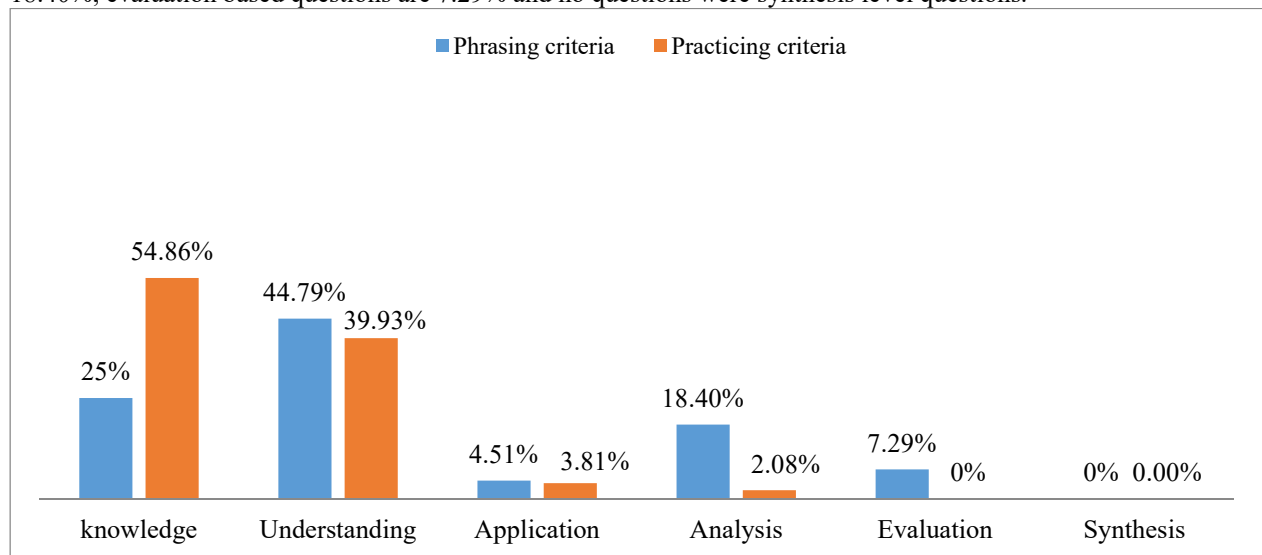


Figure 6. Analysis of CQ (2016) by learning domain and two criteria

In terms of practicing criteria, 54.86% questions are knowledge based, 39.93% questions are understanding, 3.81 % questions are application and only 2.08% items promote higher order learning.

In case of wording criteria there is a little change in CQ question items (2016) as understanding level questions (44.79%) are higher than knowledge level questions (25%) but there is no change in practicing criteria.

6.4 Trends of MCQ and CQ (2015 & 2016) Questions

From the analysis of these two years MCQ questions, we can see that these questions consists of total 640 items. From wording criteria perspective in figure-7, it shows that 49.53% questions promotes knowledge level, 30.93% questions promotes understanding, 7% questions are application level and 13% questions are focused to higher order learning.

In practicing criteria, 92.49% questions are knowledge level, 0.62% questions understanding, and 6.87 % questions are application level. Higher order learning level questions are totally absent in practicing criteria.

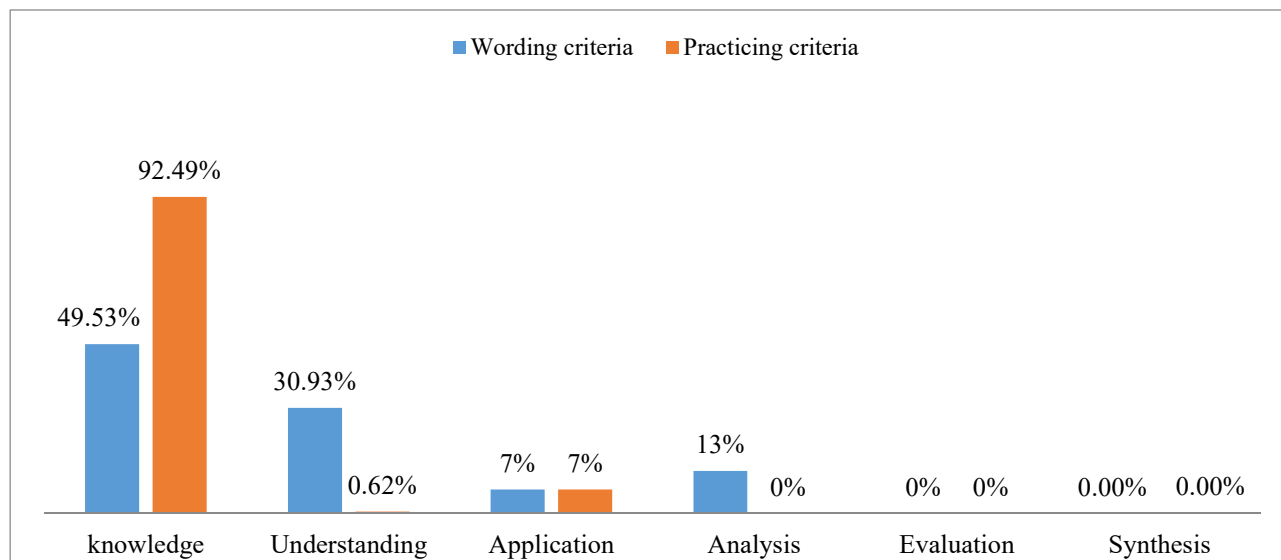


Figure 7. Analysis of MCQ (2015 & 2016) by learning domain and two criteria

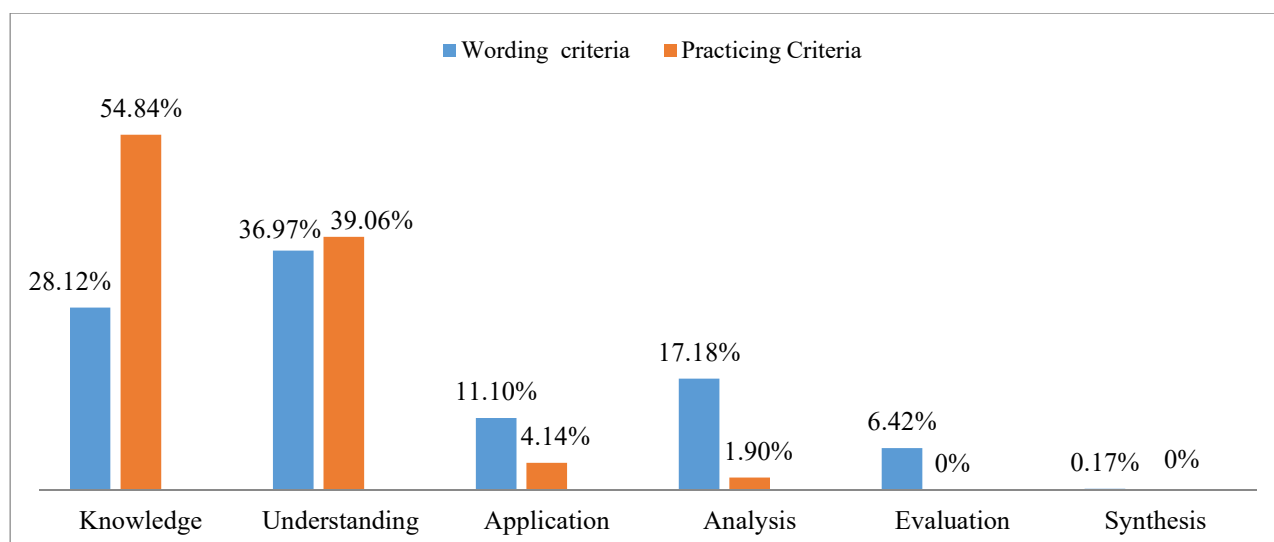


Figure 8. Analysis of CQ (2015 & 2016) by learning domain and two criteria

Figure-8 shows the analysis of the two years creative questions. From the wording criteria perspective, 28.12% questions promotes knowledge level learning, 36.97% questions promotes understanding level, 11.10% questions are application level, 17.18% are analysis level, 7.29% questions are evaluation level and 0.17% are synthesis level learning.

In case of practicing criteria, 54.84% questions are knowledge based, 39.06% questions are understanding level, 4.14% questions are application and only 1.90% questions are focused to analysis level learning. Similar to MCQ questions, CQ questions practicing criteria ignored higher order learning of students.

6.5 Analysis of students' opinion about actual practice of examination

Students were asked about the actual practice of questions in SSC examination with selected test items. Their responses were analyzed thematically to draw the inner meaning from it.

A) Answering CQ questions part-a: All students told that they answer these questions from memorization. As these questions are knowledge based question, all the students answer it through memorization. Students prefer text books for main reading source. Besides they took help from many guide books, coaching sheet etc. Here, the result of wording and practicing criteria are similar.

B) Answering CQ questions part-b: All the students said that they answer these questions from memorization. They memorize it from text books. Some students mentioned that when they cannot understand these questions, they memorize the answer. Creative Questions part-b should focused to understanding level of students. These questions should increase students understanding level about any topics. But in practice, it is found that, these questions provoke only students' memorization because these answers were available in text books, guide books

and coaching sheets. Teachers and parents are influencing students for going to coaching center for regular reading and writing practice.

C) Answering CQ questions part-c: Most of the students mentioned that they solve the mathematical problem with application in this part. But whenever they answer any questions in this part, they can answer it with their memorization. Some students said that, they took help from the Stem to answer the questions but this help is ignorable. Part-c questions are application level which increases students' application ability. But in reality it is found that this is little attempt to engage students for applying knowledge because every answer is available in the guide books and other sources.

D) Answering CQ questions part-d: Part-d of CQ questions should focus on higher order learning of students. But in reality every student answer these types of question from memory and understanding. They answer the questions from text books. As one student (S₃) mentioned that, *"I answer all the questions by the help from text books and guide books such as Pan Jeri guide, song shod guide, Lecture guide etc."* Another student S₁₂ said that, *"she answers the questions from teachers hand notes and coaching sheets, because every types of answers are supplied from the coaching center."* Most of the students (30 out of 48) go to coaching center for mentoring and guidance of teachers. Students also told that in coaching teachers teach as well as guide them how to answer the creative questions in the examinations.

E) Book Questions are answered by memorization: It is found that questions which are literally from the books, students just write it from their memory. Most of the students say that, *"We just answer it from our memory, because we have practiced it before."* One students S₈ said that, *"Firstly I try to remember. Then if I have practiced it before then it is saved in my memory. And if it appears in the examination then I write it from my memory."*

F) Little bit changed Questions promote understanding: Just little bit changed questions are promoting students understanding level of learning. Most of the students told that, *"When the questions have changed a bit, we are facing to many problems, but we can solve this questions with our understanding of topics."* Students answer these types of questions by the help of stem.

G) Answering questions outside of the books: When students answer questions which were not from the books, then they faced a lot of difficulty to answer the questions. Sometimes they cannot answer it appropriately. Three students told that they answer this types of questions with their critical thinking. One of the student S₁₂ has told that, *"I think this types of questions are wasting our time in exam hall. When this types of question arises, I just try to understand and get help from stem to answer it but I don't know whether my answer is appropriate or not."* Most of students (30 out of 48) are not satisfied with creative questions. They think it is very difficult to understand all the topics. It takes more time to read a creative question. Similarly, S₁₃ mentioned that *"I don't like creative questions, because it is very difficult to understand all the topics"*. They think that it increases our memorization ability only. Very few students (7 out of 48) are satisfied with creative questions. They think that students can easily answer the creative questions and they don't not needs to memorize everything. One students S₇ told that, *"I like creative questions, because it helps me to get a good grade"*. Few students think that CQ is helpful for them to get good results.

7 Discussion of the study

The analysis of the selected test items of general science from different education boards and academic years have drawn our attention to the nature of tests (assessment) with Bloom's cognitive domain. It has two aspects- one is theoretical and another is practical implications. Most of the test items wording criteria were focused to lower level learning of students. Few test items wording were engaged to students understanding, application and higher order learning. In practice the scenery was totally different. Only memorization and understanding level questions can be found in the question papers. Very few test items were devoted to application based learning of students. Higher order learning was absolutely absent in practice. Ahmed (2002) examined both MCQ and essay types questions against Bloom's definition of cognitive learning in six hierarchical stages. He showed that 99% of the essay items of science were belonged to knowledge sub domain. All the test items were knowledge based for Bangla and social science subjects also. Similarly, Jony (2009) found that, 40.59% questions focused to knowledge level, 33.53% understanding, 5.29% application and 14.51% questions promoted analytical ability of the students. So, it can be concluded that the construction of questions are very imbalanced. Higher order learning should be increased as per as the lower orders learning in the SSC examination.

This study revealed that in practicing criteria 54.84% questions were knowledge based, 39.06% were understanding, 4.14 % application and only 1.90% questions promoted analysis (higher order learning) level of students. It means SSC examination assessment encourages the lower order learning. Khatun (2012) also found that 40% question could assess higher order learning and 26% questions could assess understanding type learning of students. But in terms of actual practice there was no higher order learning type question. Mannan, Uddin and Azad (2007) showed that 91% questions of physics assess only recall type learning and 6% assess application based learning. From an analysis on SSC board questions it was found that more than 90% questions are knowledge based learning. (Begum & Mullick, 2005).

On the contrary, wording criteria of mathematic subject provoke application level learning mostly but it is poorer in practice. Tujjahan (2017) found that in wording criteria only 12.7% test items can assess higher order learning, 22.2% question can assess lower order learning and 65.1% items are highly application based. In practicing criteria she showed that 66% questions are focused to application level and the rest 43% questions promotes lower order learning. This evidence is totally opposite to this study's findings. In SSC examination, questions should be balanced and higher order learning type questions should be increased. It is needed to focus on making the questions orderly.

Main focus of the creative question is to assess students' different skills including knowledge, understanding, application and higher order thinking and reduce the memorizing tendency of the students and thus they will be creative (Rahman, 2010). But as questions fail to assess different skills properly, it is a matter of thinking that is it really making the students creative? (Khatun, 2012)

This study revealed that creative questions in general science are time consuming. Students believed that reading the CQs (both stems and questions) are a time-consuming process. Part –a, b and c questions can be answered from memory. To answer part-d questions students need help of their understanding skills. Only math type questions engaged students' application level learning. It is also found that most of the questions are literally copied from the book and students can answer it from their memory. The stems of CQs in the selected SSC question papers were known to the students as those matched with the CQs in the guide books, text books and coaching sheets. However, the questions that require students to apply their learned knowledge in a new situation are usually new and not copied or altered from text or guide books. Few questions are little bit changed from books and those can be answered by their understanding.

On the other hand, students could not answer those questions properly which were not from the books. Students thought that contents of the CQs were difficult to understand. On the contrary, very few students were satisfied with creative questions as it is easy to answer those questions and make a good result in SSC examination. Every CQ question consists of four parts that are supposed to engage students both in lower and higher order learning. But in reality, students were engaged to only lower order learning that basically encouraged understanding and application ability. However, students were lacking in practicing higher order learning. So, students were dissatisfied with creative questions. The overall practice shows that, only students' memorization skill is being assessed through SSC test items.

According to Bloom (1956) learning does not mean simply knowing something, learning involves acquiring knowledge and skills as well as the ability to apply the knowledge properly. The main objective of an assessment system is to judge the learning of the students that is related directly to the teaching-learning process. The curriculum includes assessment techniques so that students learning progressions can be measured. There is a strong relation between assessment and students learning. Assessment helps to reshape and direct contents, process and quality of learning. It works as a driven force for education. Assessment is the process of documenting, usually in measurable terms, knowledge, skills, attitudes and beliefs. Assessment influences students learning more than teaching. Learning is heavily dependent on assessment system and it can play an important role in students learning (Begum & Ahmed, 2007). It is essential to bring qualitative change to assessment items of SSC examination. The tests used in secondary level examinations need to be improved so that students are engaged in a learning process which develops higher order learning skills among the students. Assessment and learning are seen as inextricably linked and not a separate process. Assessment should able to find out students' current level of performance on any task and sharing with them possible ways in which their performance might be improved on a subsequent occasion (Holt & Willard-Holt, 2000). So, students should be engaged in a learning process where students prior knowledge is recognized, students are encouraged to think alternatively, put forward their own view and they need to be grown up as an independent thinker rather than to be dependent on readymade notes or guidebooks. Teachers should be sincere in making the proper question through following the rules and regulation of creative questions manual. Contents or stems should be more creative. The test items should not be like that in which the students are not engaged in findings the answers from some source and memorize it. The items should be designed in such a way that it encourages students self-thinking ability.

8 Conclusion

The study revealed that in case of wording criteria most of test items demanded lower order learning. Evaluation and synthesis level learning questions were totally absent. In practice students are only encouraged for memorizing the content which hampers students learning. These types of assessment decreases students' creativity. Because readymade answer are available to the guide books, coaching sheets, and hand note. The items of the general science were designed in such a way that students don't feel the need to learn higher order learning skills. It is very clear that SSC examination system of our country focuses to only giving good marks to the students' performance rather than acquiring the higher order learning skills. The Findings of the study will be significant for policy makers, teachers, teacher educators, curriculum developers, research students and other stakeholders to improve the questioning system of our country.

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