

Levels of Cognition in Reading Text National Examination Year 2005-2011 Based on Bloom's Taxonomy

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Levels of Cognition in Reading Text National Examination Year 2005-2011 Based on Bloom's Taxonomy

Bertaria Sohnata Hutauruk
Universitas HKBP Nommensen
rianahutauruk@yahoo.com

Abstract

This study was conducted to identify and analyze the level of cognition in reading section of national examination 2005-2011 for Vocational School. The problems of this study were formed as follows: (1) How is the percentage of the level of cognition in reading section of national examination 2005-2011 for Vocational School? (2) What level of cognition is dominantly examined for reading section of national examination 2005-2011 for Vocational School? To solve the problems, the writer used Bloom's taxonomy (1956), Krathwohl (2002), Sternberg & Williams (2009), Henning (2001), and Gronlund (1985). This study was a qualitative research which was conducted by applying documentation analysis. The subjects of this research were the documents of national examination questions for Vocational School (SMK) from year 2005 to 2011. The object of this research was the level of difficulties of reading section questions. The writer finds out that the levels of cognition, which are examined for reading section of national examination from year 2005-2011, are comprehension for 55,8%, analysis for 25%, and knowledge for 19,2 %. Other levels such as: application, synthesis, and evaluation are null. This also means that comprehension is the most dominant level of cognition that has been examined in National Examination. In conclusion, this study shows that application is more suitable for performance test. Synthesis and evaluation are more appropriate if they are tested in form of essay because those kinds of question need to be elaborated with some examples and opinion. The researcher suggests the English teachers, especially those who teach the last year students to guide and motivate the students to prepare themselves before taking examination.

Keywords: *cognition, examination, reading text*

1. Introduction

National Examination is a standard evaluation system of primary and secondary education in Indonesia and the equation of quality of education levels among the areas that conducted by the Center for Educational Assessment. There are five subjects for Vocational High School (Sekolah Menengah Kejuruan-SMK) students to be examined by the government, namely: Bahasa Indonesia, English, Mathematics, Theory and Practice for Vocational Competency. These subjects

were examined in two stages, at first, examination of Practice for Vocational Competency which was held by each school and evaluated by both teachers and industry partners. Secondly, the main examination includes Indonesian Language, English Language, Mathematics, and Theory for Vocational Competency. The type of test for English subject in Indonesia's national examination is multiple-choice. Multiple-choice test is part of objective test. Its item consists of a problem and a list of suggested solutions. The problem may be stated as a direct question or an incomplete statement and is called the *stem* of the item. The list of suggested solutions may include words, numbers, symbols, or phrases and are called *alternatives or choices or options*.

The material of the examination is prepared by the central government; however, the multiplication of the items as well as the scoring of the results is done by the provincial government. The scoring is computerized and also handled by the provincial government. During the examination the students are watched by teachers from other schools. There are two teachers in one classroom watching the students do the examination. The teachers from the students' own schools are not allowed to be inside the room where the students are doing the examination because there might be a possibility that the teachers will help the students do the examination. In addition to the availability of local teachers there is also an independent team whose duty is to control the process of the examination. The independent team has to make sure that the examination runs well i.e. no cheating happens either by the students or by the teachers in the school. As soon as the students finish doing the National Examination, the answer sheets are put in and sealed correctly and honestly into the envelope and delivered to the committee of the examination. The English subject which is examined in national examination has been focused on listening and reading skills. The number of listening test is less than reading test. There are usually 15 multiple-choice questions for listening test, and the rest 35 questions in multiple-choice form are for reading test.

Since the reading test is more numerous (approximately 70% from the whole questions) than listening test, then it is very crucial for English teachers to give more reading exercises to their students to enable them facing the national

examination. But it is not an easy task for teachers, they need to figure and analyze the level of cognition used in reading section of national examination. So that, after they reveal the level of cognition, they will know which level of cognition should be given more in the students' reading exercises. There are six levels of cognition (Bloom et al, 1956), namely: knowledge, comprehension, application, analysis, synthesis, and evaluation. In order to help the English teachers of Vocational High School in identifying and analyzing the cognition levels (level of difficulties) of reading section in national examination, the writer designs a research about "the levels of cognition in reading text in national examination for Vocational High School year 2005-2011 based on Bloom's taxonomy". In line with the background, the problems of this research can be constructed as follows: (1) How is the percentage of the level of cognition in reading section of national examination 2005-2011 for Vocational School? (2) What level of cognition is dominantly examined for reading section of national examination 2005-2011 for Vocational School? The purpose of this research can be stated as below: (1) To find out the percentage the levels of cognition in reading section of national examination 2005-2011 for Vocational School. (2) To find out the level of cognition that is dominantly examined for reading section of national examination from year 2005-2011.

In order not to be broadly discussed, the writer makes some scopes for this research. Firstly, the level of difficulties of reading text (or it is called as level of cognition) refer to knowledge, comprehension, application, analysis, synthesis, and evaluation (based on Bloom's taxonomy). Secondly, there are two skills that have been examined in national examination: listening and reading. So, the focus of this research is only in reading section of national examination. Thirdly, the questions for English subject of national examination that will be analyzed are limited from school year 2005 to 2011. These 7 documents are considered appropriate to prepare the students' cognition in facing national examination.

2. Literature Review

2.1. Indonesia's National Examination

National Examination (commonly abbreviated as UN, UNAS) is a test to measure and evaluate the students' competence nationally by the central government after the process of teaching and learning (Peraturan Menteri Pendidikan, 2005, p. 1). It is a standard evaluation system of primary and secondary education in Indonesia and the equation of quality of education levels among the areas that conducted by the Center for Educational Assessment. Depdiknas in Indonesia based on Undang-Undang Republik Indonesia nomor 20 tahun 2003 states that in order to control the quality of education nationwide to be evaluated as a form of accountability of education providers to the parties concerned. Further stated that the evaluations conducted by independent agencies on a regular basis, comprehensively, transparently, and systematically to assess the achievement of national education standards and the monitoring process evaluation should be done continuously. Evaluation of the monitoring process is carried out continuously and continuous in the end will be able to fix the quality of education.

The main goal of the National Examination is to measure and assess the students' knowledge and competence in particular subjects they have learned. It is also going to be used as one of consideration for four purposes: first, as a means of mapping Indonesia's national education quality; second as a basis to determine whether students can pass and proceed from one educational level to another level; third, as the main consideration on whether to accept new students in the upper levels of education; fourth, as a basis to supervise and assist particular schools in order to achieve the quality of national education. There are five subjects for Vocational High School (Sekolah Menengah Kejuruan/SMK) students to be examined by the government, namely: Bahasa Indonesia, English Language, Mathematics, Theory and Practice for Vocational Competency. These subjects were examined in two stages, at first, examination of Practice for Vocational Competency which was held by each school and evaluated by both teachers and industry partners. Secondly, the main examination includes Indonesian Language, English Language, Mathematics, and Theory for

Vocational Competency. Improving the quality of education begins with the determination of the standard. Determination standards continue to rise is expected to encourage increased quality of education, which is the determination of educational standards is the determination of the limit value (cut-off score). Someone said to have passed (competent) when it has passed the limit value of the boundary between learners who have mastered certain competencies with learners who have not mastered certain competencies. When that happens on the national exam or school then the boundary value function to separate the students who graduated and did not pass is called the limit of graduation, graduation delimitation activities called standard setting. Benefits of standard setting final exam are: (1) the limit of graduation each subject in accordance with the demands of minimum competency, and (2) the same standards for each subject as a minimum standard of competency achievement. The standard score of national examination from year 2005-2011 can be seen from table below:

Years	Minimum Score	Minimum Average
2005	4,25	5,25
2006	4,25	4,50
2007	5,00	5,00
2008	4,25	5,25
2009	4,25	5,50
2010	4,25	5,50
2011	4,25	5,50

During this national exam graduation delimitation is determined by agreement between the decision-makers only. Limit is determined the same grade for each subject whereas the characteristics of subjects and skills students are not the same. It was not a consideration of education decision-makers. Not necessarily in a certain education level, each subject has the same standard as a minimum standard of competency achievement. There are subjects that require a high minimum competency achievement, while other subjects did not specify that high. This situation becomes unfair for students because the required capacity exceeds the maximum capability.

2.2. Bloom's Taxonomy in Cognitive Domain

The cognitive domain, described by Dr. Benjamin Bloom, is one of the best known educational domains. It contains additional levels of knowledge and understanding and is commonly referred to as Bloom's taxonomy of educational objectives. The cognitive domain (Bloom, 1956) involves knowledge and the development of intellectual skills. This includes the recall or recognition of specific facts, procedural patterns, and concepts that serve in the development of intellectual abilities and skills. There are six major categories, which are listed in order below, starting from the simplest behavior to the most complex. The categories can be thought of as level of difficulties. That is, the first one must be mastered before the next one can take place. Bloom's Taxonomy (1956) in cognitive domain consists of: (1) Knowledge (2) Comprehension (3) Application (4) Analysis (5) Synthesis and (6) Evaluation. Below is a chart of level of difficulties (level of cognition) in which describes from lower level to the higher level.

Bloom (1956, p. 62) defined knowledge as those behaviors and test situations which emphasize the remembering, either by recognition or recall, of ideas, material, or phenomena. The behavior expected of a student in the recall situation is very similar to the behavior he was expected to have during the original learning situation. In the learning situation the student is expected to store in his mind certain information, and the behavior expected later is the remembering of this information. Although some alterations may be expected in the material to be remembered, this is a relatively minor part of the knowledge behavior or test. The process of relating and judging is also involved to the extent that the student is expected to answer questions or problems which are posed in a different form in the test situation than in the original learning situation. Have a look at the following example.

In April 2005 the number of people killed in December 26 tsunami disaster which devastated 11 Indian Ocean Countries has been revised down to 217,000 after Indonesia drastically reduced its number of missing. Indonesia remains the worst hit country. According to the National Disaster Relief Coordination Agency, the number confirmed dead was 126,915 people while 37,063 were listed as" missing. Officials said the figure had

been reduced because many people listed as missing had now been identified among more than half a million homeless people living in the temporary camps or other shelters. The toll in Sri Lanka, which was second hardest hit by the catastrophe, was 30,957, according to The Center for National Operations. The number of people listed as missing was 5,637, but many were expected to be among those never formally identified, hurriedly buried and included in the confirmed death toll.

What disaster does the text talk about?

- a) Avalanches
- b) Tornados
- c) **Tsunami**
- d) Earthquake

*It is **knowledge** since the question asks to recall the type of disaster occurs. The correct answer is C. Tsunami.*

Bloom (1956, p. 89) explained although the term "comprehension" has been frequently associated with reading, e. g., reading comprehension, the use to which it is being put here is a somewhat broader one in that it is related to a greater variety of communications than that encompassed by written verbal materials. In an-other sense, the use of the term here is somewhat more limited than usual, since comprehension is not made synonymous with complete understanding or even with the fullest grasp of a message. Here using the term "comprehension" to include those objectives, behaviors, or responses which represent an understanding of the literal message contained in a communication. In reaching such understanding, the student may change the communication in his mind or in his overt responses to some parallel form more meaningful to him. There may also be responses which represent simple extensions beyond what is given in the communication itself. Have a look at the following example.

According to the National Disaster Relief Coordination Agency, how many victims are totally counted in Indonesia?

- a) 217,000
- b) 163.978
- c) 126,915
- d) 37,063

*It is **comprehension** because the question asks to sum up the number of dead and missing of Indonesian people. Here the students should understand the meaning of victims as dead and missing people. So $126.915 + 37.063$ is B. 163.978.*

Application refers to the ability to use learned material in new and concrete situations after comprehension has been mastered. This may include the application of such things as rules, methods, concepts, principles, laws, and theories (Bloom, 1956, p. 120).

The application category follows rule in that to apply something requires "Comprehension" of the method, theory, principle, or abstraction applied. Teachers frequently say, "If a student really comprehends something, then he can apply it." Have a look at the following example.

In re-installing procedures, we need to install software to the computer. Which program would take the longer time?

- a) Windows
- b) Microsoft office
- c) Photoshop
- d) Corel Draw

*It is **application** because the students need to practice the re-installing procedures before so that they can compare the time used in those four programs. So the correct answer should be A. Windows.*

Bloom (1956, p. 144) stated that "Analysis" emphasizes the breakdown of the material into its constituent parts and detection of the relationships of the parts and of the way they are organized. It may also be directed at the techniques and devices used to convey the meaning or to establish the conclusion of a communication. Although analysis may be conducted merely as an exercise in detecting the organization and structure of a communication and may therefore become its own end, it is probably more defensible educationally to consider analysis as an aid to fuller comprehension or as a prelude to an evaluation of the material. Skill in analysis may be found as an objective of any field of study. It is frequently expressed as one of their important objectives by teachers of science, social studies, philosophy, and the arts. They wish, for example, to develop in students the ability to distinguish fact from hypothesis in a communication, to identify conclusions and supporting statements, to distinguish relevant from extraneous material, to note how one idea relates to another, to see what un-stated assumptions are involved in what is said, to distinguish dominant from

subordinate ideas or themes in poetry or music, to find evidence of the author's techniques and purposes. Have a look at the following example.

Which of the following sentences is general truth?

- a) Males are more aggressive than females
- b) Computer is affordable for all people
- c) **The sun rises on the east and sets on the west**
- d) the higher the price of a product, the less of people would be prepared to buy of it

*It is **analysis** since the question asks to distinguish between fact and opinion. So the correct answer is C. The sun rises on the east and sets on the west.*

Bloom (1956, p. 162) defined "Synthesis" here as the putting together of elements and parts so as to form a whole. This is a process of working with elements, parts, etc., and combining them in such a way as to constitute a pattern or structure not clearly there before. Generally this would involve a recombination of parts of previous experience with new material, reconstructed into a new and more or less well-integrated whole. This is the category in the cognitive domain which most clearly provides for creative behavior on the part of the learner. However, it should be emphasized that this is not completely free creative expression since generally the student is expected to work within the limits set by particular problems, materials, or some theoretical and methodological framework. Comprehension, application, and analysis also involve the putting together of elements and the construction of meanings, but these tend to be more partial and less complete than synthesis in the magnitude of the task. Also, there is less emphasis upon uniqueness and originality in these other classes than in the one under discussion here. Have a look at the following example.

Use the following verbs to your own sentences of simple past form.

- a) Clarify
- b) Develop
- c) Blow
- d) Mix
- e) Abuse

*Questions no. 5 is **synthesis** since both ask to create the new form by using students' own creativity.*

Bloom (1956, p. 185) stated that evaluation is defined as the making of judgments about the value, for some purpose, of ideas, works, solutions, methods, material, etc. It involves the use of criteria as well as standards for appraising the extent to which particulars are accurate, effective, economical, or satisfying. The judgments may be either quantitative or qualitative, and the criteria may be either those determined by the student or those which are given to him. Evaluation is placed at this point in the taxonomy because it is regarded as being at a relatively late stage in a complex process which involves some combination of all the other behaviors of Knowledge, Comprehension, Application, Analysis, and Synthesis. What is added are criteria including values. Evaluation represents not only an end process in dealing with cognitive behaviors, but also a major link with the affective behaviors where values, liking, and enjoying (and their absence or contraries) are the central processes involved. However, the emphasis here is still largely cognitive rather than emotive. Have a look at the following example.

Write down your opinion towards this statement: "Women are just as good as men at driving a car"

*This is an **evaluative** question because it needs the students' point of view or judgment towards the statement.*

2.3. Summary of Level of Difficulties Based on Bloom's Taxonomy

Below is the summary of Bloom's Taxonomy in cognitive domain. The table shows each category with its examples and key words.

Category	Example and Key Words
Knowledge: Recall data or information.	Examples: Recite a policy. Quote prices from memory to a customer. Knows the safety rules. Key Words: defines, describes, identifies, knows, labels, lists, matches, names, outlines, recalls, recognizes, reproduces, selects, states.
Comprehension: Understand the meaning, translation, interpolation, and interpretation of instructions and problems. State a problem in one's own words.	Examples: Rewrites the principles of test writing. Explain in one's own words the steps for performing a complex task. Translates an equation into a computer spreadsheet. Key Words: Comprehends converts, defends, distinguishes, estimates, explains, extends, generalizes, gives Examples, infers, interprets, paraphrases, predicts, rewrites, summarizes,

	translates.
Application: Use a concept in a new situation or unprompted use of an abstraction. Applies what was learned in the classroom into novel situations in the work place.	Examples: Use a manual to calculate an employee's vacation time. Apply laws of statistics to evaluate the reliability of a written test. Key Words: applies, changes, computes, constructs, demonstrates, discovers, manipulates, modifies, operates, predicts, prepares, produces, relates, shows, solves, uses.
Analysis: Separates material or concepts into component parts so that its organizational structure may be understood. Distinguishes between facts and inferences.	Examples: Troubleshoot a piece of equipment by using logical deduction. Recognize logical fallacies in reasoning. Gathers information from a department and selects the required tasks for training. Key Words: analyzes, breaks down, compares, contrasts, diagrams, deconstructs, differentiates, discriminates, distinguishes, identifies, illustrates, infers, outlines, relates, selects, separates.
Synthesis: Builds a structure or pattern from diverse elements. Put parts together to form a whole, with emphasis on creating a new meaning or structure.	Examples: Write a company operations or process manual. Design a machine to perform a specific task. Integrates training from several sources to solve a problem. Revises and process to improve the outcome. Key Words: categorizes, combines, compiles, composes, creates, devises, designs, explains, generates, modifies, organizes, plans, rearranges, reconstructs, relates, reorganizes, revises, rewrites, summarizes, tells, writes.
Evaluation: Make judgments about the value of ideas or materials.	Examples: Select the most effective solution. Hire the most qualified candidate. Explain and justify a new budget. Key Words: Appraises compares, concludes, contrasts, criticizes, critiques, defends, describes, discriminates, evaluates, explains, interprets, justifies, relates, summarizes, supports.

2.4. Krathwohl's Model as Revision to Bloom's Taxonomy

Krathwohl (2002) in his seminal paper gave revision to the Bloom's taxonomy. Like the original Taxonomy, the revision is a hierarchy in the sense that the six major categories of the Cognitive Process dimension are believed to differ in their complexity, with *remember* being less complex than *understand*, which is less complex than *apply*, and so on. However, because the revision gives much greater weight to teacher usage, the

requirement of a strict hierarchy has been relaxed to allow the categories to overlap one another. This is most clearly illustrated in the case of the category Understand. Because its scope has been considerably broadened over Comprehend in the original framework, some cognitive processes associated with Understand (e.g., Explaining) are more cognitively complex than at least one of the cognitive processes associated with Apply (e.g., Executing). If, however, one were to locate the "center point" of each of the six major categories on a scale of judged complexity, they would likely form a scale from simple to complex. In this sense, the Cognitive Process dimension is a hierarchy, and probably one that would be supported as well as was the original Taxonomy in terms of empirical evidence.

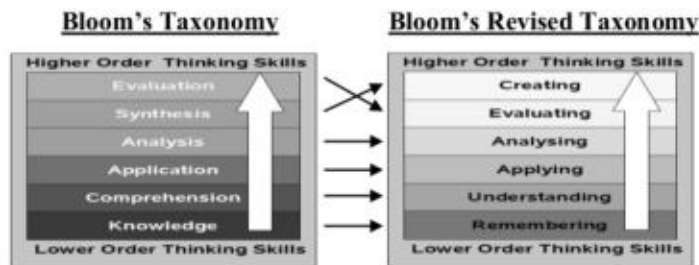


Figure 1. Difference of Bloom's Taxonomy and its Revision

The revision of the original Taxonomy is a two-dimensional framework: Knowledge and Cognitive Processes. The former most resembles the subcategories of the original Knowledge category. The latter resembles the six categories of the original Taxonomy with the Knowledge category named Remember, the Comprehension category named Understand, Synthesis renamed Create and made the top category, and the remaining categories changed to their verb forms: Apply, Analyze, and Evaluate. They are arranged in a hierarchical structure, but not as rigidly as in the original Taxonomy.

3. Methodology

This study is a qualitative research and conducts documentary analysis. A qualitative research is concerned primarily with process, meaning, and

understanding, rather than outcomes or procedures (Creswell, 1994, p. 145). This research concerns with the understanding towards level of cognition from English reading section in National Examination and ignores the students' outcomes or results during the examination. A documentary analysis represents data that are thoughtful in that informants have given attention to compiling (Creswell, 2003, p. 150). The document which is used in this research is the national examination questions for English subject from year 2005-2011. The subject of this research is the document of national examination questions for Vocational High School (SMK) from year 2005 to 2011. The questions mentioned before refer to reading section. There are approximately 35 questions for each year, so there will be 210 questions that will be analyzed. The object of this research is the level of difficulties of reading section questions. The level of difficulties is also known as level of cognition, namely: knowledge, comprehension, application, analysis, synthesis, and evaluation (based on Bloom's taxonomy). The writer collected the data by downloading the national examination questions from internet (which are available in numerous websites).

The data analyzed by conducting documentary analysis with regard to Bloom's taxonomy in cognitive domain. Each question is analyzed based on its level of difficulties. After all questions have been classified based on its cognition level, then the writer tabulated the percentage of each questions based on its year. Lastly by showing the percentage, the researcher determined which cognition level is dominantly examined.

4. Findings and Discussion

4.1. Research Findings

The percentage of cognition levels for reading section of national examination from school year 2004/2005 to 2010/2011 can be described into several points below:

- a. In National Examination for school year 2004/2005, knowledge is tested for 3 questions (10%), comprehension for 17 questions (56,7%), and analysis for 10 questions (33,3%).

- b. In National Examination for school year 2005/2006, knowledge is tested for 10 questions (28,6%), comprehension for 13 questions (37,1%), and analysis for 12 questions (34,3%).
- c. In National Examination for school year 2006/2007, knowledge is tested for 9 questions (25,8%), comprehension for 13 questions (37,1%), and analysis for 13 questions (37,1%).
- d. In National Examination for school year 2007/2008, knowledge is tested for 5 questions (14,3%), comprehension for 20 questions (57,1%), and analysis for 10 questions (28,6%).
- e. In National Examination for school year 2008/2009, knowledge is tested for 6 questions (17,1%), comprehension for 24 questions (68,6%), and analysis for 5 questions (14,3%).
- f. In National Examination for school year 2009/2010, knowledge is tested for 6 questions (17,1%), comprehension for 24 questions (68,6%), and analysis for 5 questions (14,3%).
- g. In National Examination for school year 2010/2011, knowledge is tested for 7 questions (20%), comprehension for 23 questions (65,7%), and analysis for 5 questions (14,3%).

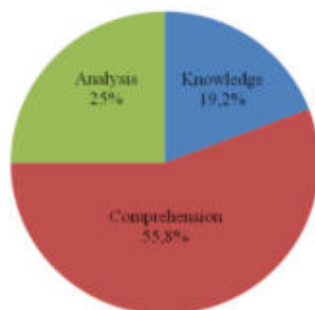
The description above can be simplified into a table below:

Level of Cognition	Number of Questions in School Year:							Total
	2005	2006	2007	2008	2009	2010	2011	
1. Knowledge	3	10	9	5	6	6	7	46
2. Comprehension	17	13	13	20	24	24	23	134
3. Application	0	0	0	0	0	0	0	0
4. Analysis	10	12	13	10	5	5	5	60
5. Synthesis	0	0	0	0	0	0	0	0
6. Evaluation	0	0	0	0	0	0	0	0
Total	30	35	35	35	35	35	35	240
Percentage (%) of Cognition Level								
1. Knowledge	10,0	28,6	25,8	14,3	17,1	17,1	20,0	19,2
2. Comprehension	56,7	37,1	37,1	57,1	68,6	68,6	65,7	55,8
3. Application	0	0	0	0	0	0	0	0
4. Analysis	33,3	34,3	37,1	28,6	14,3	14,3	14,3	25,0
5. Synthesis	0	0	0	0	0	0	0	0
6. Evaluation	0	0	0	0	0	0	0	0
Total	100	100	100	100	100	100	100	100

Table of percentage above shows the dominant level of cognition, which is examined for reading section of national examination from year 2005-2011, is comprehension for 55,8 %. It also shows that analysis and knowledge for 25% and 19,2 % while others (application, synthesis, and evaluation) are null.

4.2. Discussion

The absence of application, synthesis, and evaluation can be explained because they are not suitable for multiple-choice form of question. Application is more suitable for performance test. Synthesis and evaluation are more appropriate if they are tested in form of essay because those kinds of question need to be elaborated with some examples and opinion. Cognition level such as synthesis and evaluation are usually tested in examination for university students.



5. Conclusion

The conclusions or brief description of this research can be drawn as follow:

- This writer is about identifying and analyzing the cognition levels of reading section in national examination for Vocational High School (SMK) year 2005-2011 based on Bloom's taxonomy.
- Bloom's taxonomy is knowledge, comprehension, application, analysis, synthesis and evaluation.
- Knowledge is defined as the remembering, recalling, or reciting of previously learned material. Comprehension is defined as the ability to grasp the meaning of material. Application refers to the ability to use learned material in new and concrete situations. Analysis refers to the ability to break down material into its component parts so that its organizational structure may be understood. Synthesis refers to the ability to put parts together to form a new whole. Evaluation is concerned with the ability to judge the value of material for a given purpose.
- The finding shows that the levels of cognition, which are examined for reading section of national examination from year 2005-2011, are comprehension for 55,8%, analysis for 25%, and knowledge for 19,2 %. While others (application, synthesis, and evaluation) are null. This also means that comprehension is the most dominant level of cognition that has been examined in National Examination.

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