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Analyses of interval range, divergent and convergent of English test items for Senior High School

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Abstract
Many English test items that constructed did not cover all the revised Bloom's Taxonomy. This investigation analyzed of interval range, divergent and convergent of English test items for senior high school. The qualitative method was applied in this study. There was an English test sheet used as the instrument consists of 50 items. The data were analyzed by codifying, classifying, analyzing and discussing. The results of the research showed that there was a significant interval among taxonomy. It indicated that the there was no balance interval between one taxonomy to another. The data showed that high order convergent was the highest percentage with 46%. Then it was followed by low order convergent with 44%. The low order divergent made 10% in the English test sheet. While, level IV was high order divergent was 0%. This indicates that there was no item which was categorized as level IV; high order divergent.

Keywords: cognitive, convergent, divergent, taxonomy, test

1. Introduction

Classroom tests are conducted for many purposes such as to assign scores, to determine how well each student has achieved the learning objectives, to diagnose student's problems and to determine where instructions need improvement. The function of test is to help the teachers to know whether the learning objectives have been reached and to what extent students master the materials taught. This statement make teacher to be able to construct good test items for his/her students. How good a test is? Brown (2004: 4) [4] explained that a well constructed test is an instrument that provides an accurate measure of the test taker's ability within a particular domain. Writing a good test requires good planning in which the teacher must determine the objective for the test, and carefully write appropriate test items to achieve the objectives. To achieve the learning objectives, it needs test to assess the students' ability; therefore, teachers must carefully plan and design the test. Developing good quality of test items is necessary for very tester or teacher to know. Good quality of test items must requires amount of requirements of language testing. As it is stated in Airasian and Russell, (2008:156) [3] that item should cover important objectives, bested clearly, and simply, contain misleading statements, confusing formatting, or excess verbiage.

In constructing test items in language assessment, teachers need to know what kind of test is used in classroom test. Many English teachers constructed the test just want to fulfill the requirement without considering the criteria of constructing test items. Therefore; choosing the kind of test is important for teachers in order to measure the objectives of teaching and learning in the classroom. English teachers need to consider the guidelines for constructing good test items in English. They must look at the criteria of developing test items which refer to language testing. Bloom (1956) [6] classified a way of thinking into six cognitive levels; from the basic to complex levels. Teachers consider the taxonomy of questions that cover knowledge, comprehension, application, analysis, synthesis and evaluation. Many test items do not match to the criteria of language testing. In some cases; the items do not cover all the taxonomy of question which proposed by Bloom (1956) [6].

The quality of the test items affects the students' achievement in learning process. Realizing how important of constructing good test items; thus teachers need to make quality of test items which are based on the revised Bloom's Taxonomy. Good test items require good planning. Questions are important to stimulate the students in classroom. Tofade, *et al*., (2013) [13] highlighted that questions are used to stimulate the recall of prior knowledge, promote comprehension, and build critical-thinking skills. Teachers need determine the objective of the test, and carefully construct appropriate test items to achieve that objective. Teachers must consider the criteria of constructing test items; so the learning objectives are achieved. In other hand; test is powerful to determine the learning achievement. This research was conducted to map the revised Bloom's taxonomy and to present the cognitive levels of revised Bloom's taxonomy which are in English Test sheet for senior high school. The objective was to analyze of interval range, divergent and convergent of English test items for senior high school based on revised Bloom's taxonomy. The result of this research informs the teachers on how to construct the questions or items which are based on revised Bloom's Taxonomy. In relation to the English Education, this study is expected to contribute a positive impact for English test models, particularly for applying revised Bloom's taxonomy.

Generally; test is a device to measure the students' ability in classroom. Brown (2003: 3) [5] defines test as a method of measuring a person's ability, knowledge or performance in a given domain. While; Hughes (2003: 3) [11] says that testing is the way in which information about people's language ability can be gathered. In general, the test is needed in many purposes but the important reason learning process is to measure whether or not the learning objectives have been reached. The purpose of making test is to achieve the

teaching and learning objectives. Test is use to measure whether or not teaching and learning objectives are achieved or not.

For this case; the major categories of questions in Bloom's Taxonomy (Bloom, 1956) categorized into knowledge, comprehension, application, analysis, synthesis and evaluation which discussed in the following section. In addition; Anderson, *et al*., (2001: 66-90) [2] revised the Bloom's Taxonomy that reflects different forms of thinking. They said that thinking is an active process therefore the verbs were used rather than the nouns. Amer (2006: 218) [1] explained that the most notable change in the revised taxonomy is the move from *one* dimension to two dimensions. The instructional objectives are formulated in verbs or nouns. Thus; he outlined the basic argument that the statements of objectives consist of (a) subject matter content (i.e. noun or noun phrase) and (b) a description of what is to be done with (i.e. verb or verb phrase). The following section explores more detail on revised Bloom's taxonomy.

i) Remembering

Remembering refers to memory of previous materials by recalling facts, terms, basic concepts, and answers. The action verbs refer to choose, define, find, label, tell, list, match, name, relate, select, recall, show, spell, what, where, when, which, who, why.

ii) Understanding

Understanding refers comprehending of facts and ideas by comparing, organizing, translating, describing, and stating main ideas. The action verbs are compare, contrast, classify, demonstrate, illustrate, explain, interpret, outline, relate, rephrase, show, summarize, and translate.

iii) Applying

Applying relates to problems solving of new situations by applying knowledge, techniques, facts, and rules in different method. The action verbs refer to build, apply, choose, construct, develop, experiment with, interview, make, identify, use of, model, organize, plan, select, solve.

iv) Analyzing

Analyzing refers examining and breaking information into parts by identifying motives to support generalizations. Analyzing demands the students to see the patterns that they can use in analyzing the problem. The action verbs refer to analyze, classify, assume, compare, contrast, categorize, conclude, distinguish, divide, discover, examine, inspect, list, survey, motive, simplify, and take part in,

v) Evaluating

Evaluating presents and defends opinions by making judgments or decision based on a set of criteria. In evaluating process, students are expected to assess information and come to a conclusion. The action verbs refer to agree, assess, choose, criticize, decide, deduct, defend, appraise, conclude, determine, estimate, explain, evaluate, compare, criteria, interpret, justify, judge, mark, measure, perceive, prioritize, recommend, prove, and rate.

vi) Creating

Creating refer combining information in different method by combining elements in a new pattern or alternative solutions. The action verbs of creating are change, build, choose, compile, combine, compose, create, construct, design, develop, elaborate, formulate, estimate, improve, make up, invent, modify, original, originate, propose, solve, suppose, test.

Furthermore, Harrison, *et al*., (2017: 5-6) [10] elaborated the revised Bloom's taxonomy into questions as follows:

Classes:	Example:
Remembering	: Who is the founder of Feedback Fruits?
Understanding	: Explain the concept of gravity!
Applying	: Calculate the hamming distance of string: 01010!
Analyzing	: Compare a linear SVM to a Naive Bayes classifier!
Evaluating	: Justify the use of force in peace keeping missions of the UN!
Creating	: Write a report for your bachelor end project!

The cognitive levels are initially divided into convergent and divergent, corresponding to a hierarchy of intended narrow and broad student thinking, and then each level is subdivided into low and high levels. The purpose of convergent questions is to determine basic knowledge, skills, and understanding in order to prepare students to apply learning. Divergent questions require the students to engage in critical thinking as process of information. Bloom (1956) [6] classified the level of convergent into four levels.

a) Level I Low Order Convergent

Questions require students to engage in reproductive thinking. The teachers demand the students to recall or recognize information based on students' memory, observation and responses.

b) Level II High Order Convergent

High order convergent questions require the students to engage in the first levels of productive thinking. The teachers ask the students to recall and demonstrate understanding of information. This level; students' responses still generally can be anticipated.

c) Level III Low Order Divergent

Questions expect the students to think critically about information. The teachers ask the students to analyze information and to discover reasons and draw conclusions or make generalizations to support opinions. In Higher-level; productive thinking involves the students' responses may not be anticipated.

d) Level IV High Order Divergent

Higher order questions require the students to perform original and evaluative thinking. The teachers ask the students solve problems, make predictions, and produce original communications, and judge ideas, actions, information, and aesthetic expressions based on internal or external criteria. Since; this level represents the highest level of productive thinking, students' responses generally cannot be anticipated.

Tangsakul, *et al*., (2017) [12] analyzed and compared the levels of reading comprehension questions using revised Bloom's Taxonomy found in Grade 9 English O-NET Tests academic years 2013-2016. In 2013, there were only three levels of questions found which were remembering

(46.67%), understanding (33.33%), and analyzing (20%) from the most frequency to the least found in the academic year 2014. In the test academic year 2014, remembering was the most level of questions found with 60%, followed by understanding with 40%. In the academic year 2015, the most level of questions found was remembering (60%), and followed by understanding (33.33%) and Analyzing (6.67%). In the academic year 2016, there were more various levels of questions, except creating. The most frequency level of questions found in this year was understanding (55%), followed by analyzing (25%) and remembering (10%). applying and evaluating were the least found with 5% for each.

2. Materials and Methods

The qualitative method was applied to analyze the interval range, divergent and convergent of the English tests for senior high school which are based on the revised Bloom's taxonomy. Creswell (2003: 180) [8] noted that qualitative procedures rely on text and image data, have unique steps in data analysis, and draw on diverse strategies of inquiry. The documentary data were used as the source of data in this research. Prior (2003) in Cohen 2007: 201) [7] stated that documents are useful in rendering more visible the phenomena under study. Furthermore; Creswell (2014: 234) [9] mentioned the sources of data in qualitative research are in multiple forms of data, such as interviews, observations, documents, and audiovisual information rather than rely on a single data source. The instrument of this research was English Test Sheet. The English test which was used by the English teachers for final semester test in senior high school of SMA Negeri 1 Kefamenanu in the school year 2017/2018. In analyzing the data; the researchers applied the following steps. 1) Codifying; in this part the researchers coded each test items which are used in the English test sheet. The researchers gave code on each question which is based on the revised Blooms' Taxonomy of education. 2) Classifying; the researchers classified the data into categories of test item. The focus on the level of revised Bloom's Taxonomy namely lower and higher level. 3) Analyzing; the researchers analyzed the data based on categories of revised Bloom's Taxonomy; remembering, understanding, applying, analyzing, evaluating and creating. 4) Discussing; the researchers discussed the results as the findings of the research which refers to problems of the research.

3. Results and Discussions

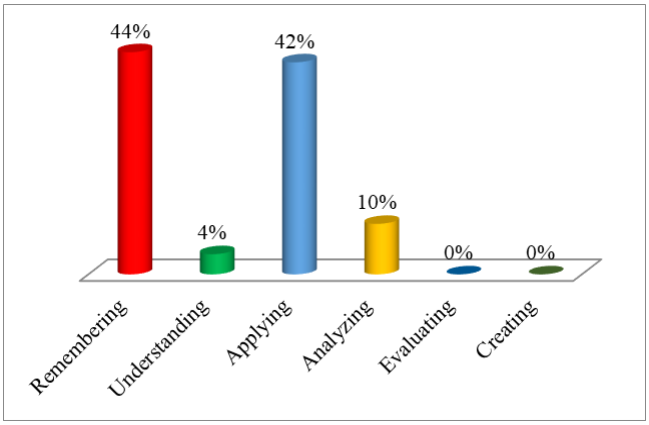
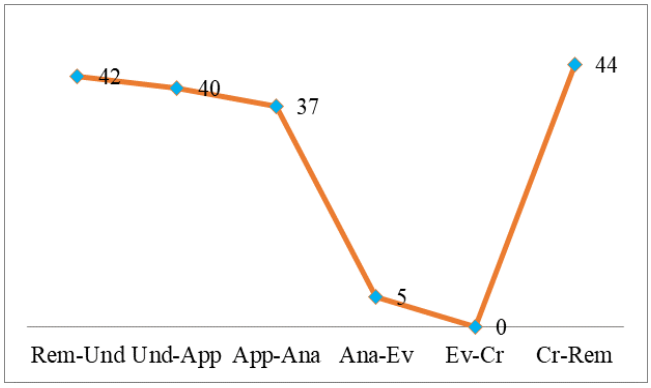


Fig 1: The Percentages of Revised Blooms' Taxonomy

The researchers spent couples of months to collect and analyze the data regarding to the English test for Senior High School. There was an English test sheet of class XI Science program which was used as the data. The test used for final semester test in SMA Negeri 1 Kefamenanu in the school year 2017/2018. The test consists of 50 items of multiple choice types. Then, they came to the data presentations which are presented in the following parts.

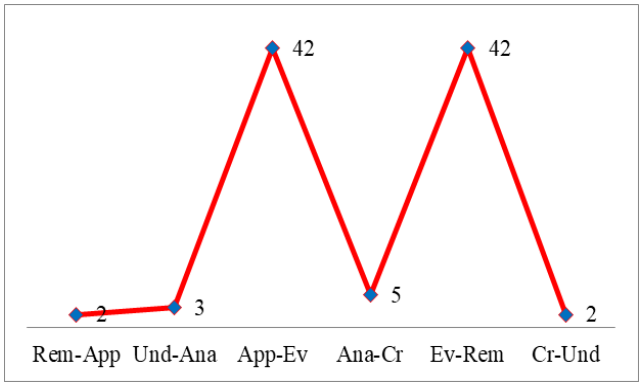
The Fig shows the comparison on each revised Bloom's Taxonomy found in the English test sheet. The data reveal that each of taxonomy contains different percentage. The highest percentage goes to Remembering with the score 44%. Then it is followed by Applying with the score is 42%. The next is Analyzing with the score is 10% then followed by Understanding with the score is 4%. While both Evaluating and Creating are the lowest with the score is 0%. It indicates that tests which were constructed by the English teacher were dominated by Remembering and Applying.



Note: Rem: Remembering, Und: Understanding, App: Applying, Ana: Analyzing, Ev: Evaluating, Cr: Creating

Fig 2: Interval Range on Revised Bloom's Taxonomy in Rule I

The interval range between remembering and understanding taxonomy is 42. The interval range between understanding and applying taxonomy is 40. The interval range between applying and analyzing is 37. The interval range between analyzing and evaluating taxonomy is 5. The interval range between evaluating and creating is 0. The interval range between creating and remembering is 44.

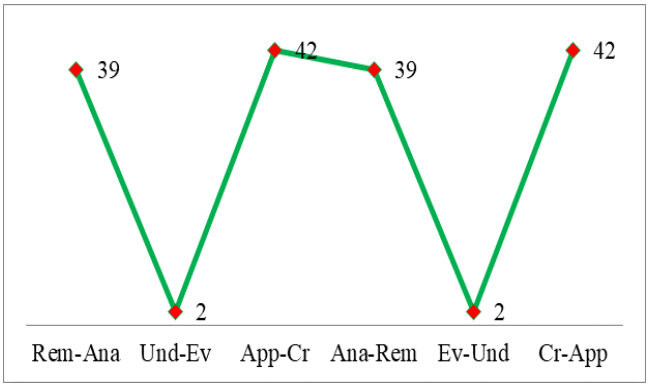


Note: Rem: Remembering, Und: Understanding, App: Applying, Ana: Analyzing, Ev: Evaluating, Cr: Creating

Fig 3: Interval Range on Revised Bloom's Taxonomy in Rule II

The interval range between remembering and applying taxonomy is 2. The interval range between understanding and analyzing taxonomy is 3. The interval range between applying and evaluating taxonomy is 42. The interval range

between analyzing and creating taxonomy is 5. The interval range between evaluating and remembering taxonomy is 42. The interval range between creating and understanding taxonomy is 2.



Note: Rem: Remembering, Und: Understanding, App: Applying, Ana: Analyzing, Ev: Evaluating, Cr: Creating

Fig 4: Interval Range on Revised Bloom's Taxonomy in Rule III

The interval range between remembering and analyzing taxonomy is 39. The interval range between understanding and evaluating taxonomy is 2. The interval range between applying and creating taxonomy is 42.

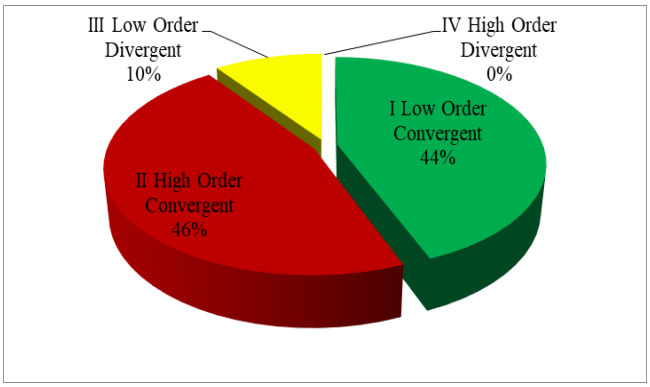


Fig 5: The Percentages of Cognitive Levels

The researchers classify the cognitive levels which were found in the English test sheet. The cognitive levels are classified into four levels; level I low order convergent which refers to remembering taxonomy. Level II high order convergent which refers to understanding and applying levels. Level III low order divergent which refers to analyzing level and level IV high order divergent which refers evaluating and creating. The cart presents the percentage of cognitive levels based on Bloom's Taxonomy. The data in English test sheet showed that level II is high order convergent is the highest percentage with the score 46%. Then it is followed by level I is low order convergent with the score 44%. Level III is low order divergent made 10% in the English test sheet. While, level IV is high order divergent is 0%. This indicates that there is no item which is categorized as level IV high order divergent.

This section elaborates more about the findings of the research which discusses results based on the objectives of this research. The data on the revised Bloom's Taxonomy found in the English test sheet showed the highest percentage goes to Remembering with the score 44%. Then it is followed by Applying with the score is 42%. The next is Analyzing with the score is 10% than followed by Understanding with the score is 4%. While both Evaluating and Creating are the lowest with the score is 0%. It indicated that tests which were constructed by the English teacher were dominated by Remembering and Applying. Thus; the research on Using Bloom's Revised Taxonomy to Analyze Reading Comprehension Questions conducted by Tangsakul, *et al.*, (2017) [12] showed that the most frequency of levels of questions found were Remembering and Understanding with 41.54% each. Moreover, only these two levels – Remembering and Understanding could be found in every test from academic years 2013-2016. Nevertheless, Creating which is the highest level of Bloom's Revised Taxonomy did not appear any test years.

The interval range among each of taxonomy in the English test sheet showed that there was a significant interval among revised Bloom's taxonomy. It indicates that the there was no balance interval between one taxonomy to another taxonomy. There was very big figure in one taxonomy to another; therefore the test which was given to students did not cover all revised Bloom's taxonomy.

4. Conclusions and Recommendations

This part draws the conclusions of the study based on the research problems mentioned earlier. This study analyzed the questions which were used by the English teacher in final semester test based on revised Bloom's taxonomy. The revised Bloom's Taxonomy found in the English test sheet showed that remembering taxonomy made 44%. Then, the applying taxonomy made 42%. The analyzing taxonomy made 10%. The understanding taxonomy made 4%. While both evaluating and creating were the lowest with the score was 0%. It indicates that tests which were constructed by the English teacher were dominated by remembering and applying taxonomy. The interval range among each of taxonomy in the English test sheet showed that there was a significant interval among revised Bloom's taxonomy. It indicates that the there was no balance interval between one taxonomy to another taxonomy. There was very big figure in one taxonomy to another; therefore the test which was given to students did not cover all revised Bloom's taxonomy. The cognitive levels are categorized into four levels. The data in English test sheet showed that level II is high order convergent is the highest percentage with the score 46%. Then it is followed by level I is low order convergent with the score 44%. Level III is low order divergent made 10% in the English test sheet. While, level IV is high order divergent is 0%. This indicates that there is no item which is categorized as level IV high order divergent. Regarding to the conclusions of this research, English teachers must use the revised Bloom's taxonomy in constructing English test items. The test items must be constructed based on the revised Blooms' taxonomy of learning.

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