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The Technique and Validation of Composing the Attitude Assessment Instrument for Junior High School Mathematics Learning Based on Curriculum 2013

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Abstract**—**Assessment is one of the important components that have to be attention in order to support the success of Junior High School Mathematics learning implementation based on Curriculum 2013. The accountable assessment results will be obtained if the assessment instrument uses a good quality that is proved by having a good content validity and align with Curriculum 2013. Therefore, assessment of Junior High School Mathematics learning based on Curriculum 2013 should use appropriate instrument arranged through the appropriate steps in order to generate a good quality and accountable assessment instrument..Through some theories, this paper studies the technique of composing the attitude assessment instrument for Junior High School Mathematics learning that can generate the instrument of attitude assessment based on Curriculum 2013. The technique of composing instrument in this paper contains of steps to compose the assessment instrument that can generate attitude assessment instrument theoretically. It shows that attitude assessment instrument has a good content validity and it is align with Curriculum 2013. In addition, this paper also discusses the studies about how to validate the instrument in order to get a good content validity and align with Curriculum 2013.

Keywords: *assessment, attitude, instrument, mathematics, validation*

I. INTRODUCTION

Through the curriculum in 2013, the government tries to develop Graduate Competency Standards increasing from the previous curriculum and balancing between soft skills and hard skills. It changes one important elements in Curriculum 2013. The changing is the standard educational assessment. Based on Permendikbud No. 53 of 2015, it states that the scope of the assessment of learning outcomes by educators in primary and secondary education includes aspects of attitudes, aspects of knowledge and skills aspects. The assessment objectives of learning outcomes by educators in primary and secondary education by Permendikbud No. 53 of 2015 are: (a) determine the level of mastery of competencies; (b) establish mastery of competency; (c) establish a program for remediation or enrichment based on the level of mastery of competencies; and (d) improve the learning process. It means that the assessment based on Curriculum 2013 need qualified assessment instrument that can measure the achievement of students competency well and able to fulfill the accuracy and accountability of the assessment results.

Based on the reflection results of the implementation Curriculum 2013 which is done by the coach directorate of Junior High School in 2014 show that based on the quantitative report approximately 34% teachers who had been trained were less understanding of assessment based Curriculum 2013. Relate to the assessment process shows that about 22% teachers have difficulty in assessing the attitude aspect and 14% teachers have difficulty in assessing the skill aspect. Based on the qualitative report shows that the trainer's understanding toward assessment aspect based on Curriculum 2013 was still lack. The teachers expect special training or assistance related to the particular assessment [1]. In addition, more than 50% teacher respondents state that they have not been able to design, implement, and process the results of an assessment well. The main difficulty faced, such as formulate indicators, formulate points of the instrument, and implement, the assessment attitude by various techniques [2].

From the results of reviews these reflections, through the revision of the Curriculum 2013 which will be implemented in the beginning of the academic year 2016/2017, the government simplifies the assessment activity that should be done by teachers. Assessment activity is made simpler, affordable to do, not overlap, not a burden for teachers/students, but still maintaining the principles and rules of assessment. The simplification is the assessment for attitude aspects (social and spiritual) done by PPKn teachers and religious education teachers, while other teachers who teach other subjects only assess the academic aspects of the field that is taught. Teacher of other subjects, such as math, assesses attitude aspect but it just to add a reference or input in assessing the students' attitude. In addition, the assessment activities carried out do not only assessment of learning, but also assessment for learning and assessment as learning.

One of the criteria that should be considered related to the quality of the attitude assessment instrument is validity. During this time, the validity verification of an attitude assessment instruments are generally seen by content validity and construct validity. Especially for content validity evidence is generally done by rational analysis through expert judgment and evidence of construct validity with factor analysis. Development in the theory of measurement shows that the content validity of an assessment instrument can also be obtained through the study of alignment between the assessment and standards in the curriculum. This is as Ananda which states that alignment can be source for evidence of content validity, construct, and consequential [3].

Based on the statements above, it shows that student learning outcomes based curriculum 2013 measured on aspects of attitudes, knowledge, and skills. But until now, the teachers including math teachers still have difficulty in arranging an assessment instrument in particular on attitude aspect. Therefore, the composing guideline of attitude assessment instrument is urgently needed by teachers in composing the instrument that will be used in conducting the assessment. Besides, the paper will also discuss how to prove the validity of its contents. The composing technique of attitude assessment instruments is the steps of composing the attitude assessment instruments that can generate qualified attitude assessment instruments and align with Curriculum 2013.

II. ATTITUDE ASSESSMENT IN MATHEMATICS LEARNING OF JUNIOR HIGH SCHOOL BASED CURRICULUM 2013

Understanding of attitudes have been suggested by experts as Baron & Byrne that gives a definition of the attitude that someone provisions in evaluating either positively or negatively towards others, oneself, thing, or matter [4]. Attitude has constant characteristic all the time so momentary feeling is not counted as an attitude. This is similar to Ajzen who argues the definition of attitude as the disposition of the individual to respond positively or negatively to an object, person, institution, or event [5**]**. Based on some opinions above, it can be concluded that the attitude is a state in human beings who motivate to act or behave in a permanent or momentary feeling either positive or negative to the situation or conditions in the surrounding environment.

It is not different from the various definitions about the attitude, based on the Curriculum 2013, the attitude is defined as an expression of values or philosophy of life that is owned by someone and manifested in behavior. Attitude assessment in mathematics is an activity to identify trends spiritual and social behavior of students in daily life inside and outside the classroom as a result of education [2]. Based on Curriculum 2013 competencies characteristic of attitude dimension refers to the affective domain taxonomy Krathwohl [6]. Based on guideline of learning outcomes assessment by educators in 2015, it is mentioned that the attitude assessment is made by the subject teacher (during the learning process in school hours) naturally, counseling teachers, and homeroom (during the students outside class hours) which is written in the journal. Besides, self-assessment and peer-assessment can be done in the framework of development and character formation of students which the results can be used as one of the confirmation data of the overall attitudes. The attitude assessment scheme is presented in Figure 1 below.

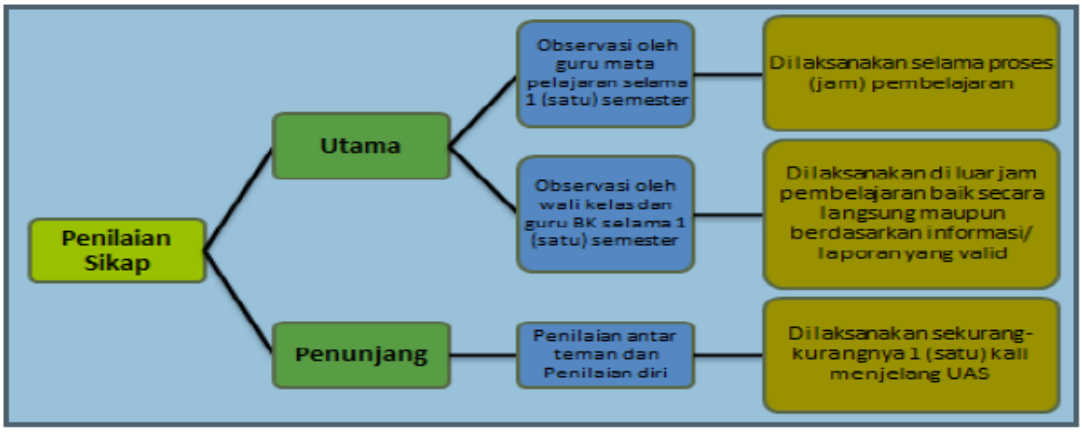

Figure 1.The Attitude Assessment Scheme [2]

III. TECHNIQUE OF COMPOSING ATTITUDE ASSESSMENT INSTRUMENT

An assessment instrument is a prominent key of the successful implementation of educational assessment activities. The quality of the assessment results depends on the quality of assessment instruments used. Therefore, assessment instruments should be composed and developed through the steps that can be accounted so the result of the assessment that is obtained is accurate and reliable. If the assessment instrument is badly designed, the assessment which is done will waste of time and cost. Conversely, if the assessment instrument is designed well, the results can support the quality of information obtained from the assessment results even be one of the factors that can improve the learning outcomes of students.

Nitko state five basic principles in assessment, such as: (1) determine clearly what will be assessed; (2) Ensure that the assessment technique selected suitable for assessing what will be assessed; (3) Ensure that the assessment techniques are selected according to the students' needs; (4) If possible, make sure the use of various indicators of learning outcomes for each assessment targets; and (5) Ensure that when interpreting the results of the assessment, had been obtained enough information about the students [7]. Development of instruments according to Wilson, such as: (1) map constructs, (2) items, (3) scores items, and (4) measurement. In general, based on the Queensland Studies Authority procedure development of assessment instruments that can be done by teachers includes steps as follows. (1) Start with a general purpose syllabus: determining the general objectives aspect which can be assessed; (2) refers to the standard matrix for relevant descriptions to the selected general purpose; (3) develop instruments that enable learners to show attributes assessed; and (4) develop criteria on instruments sheet based on the selected attributes of a standard matrix. Related to the attitude assessment, Djemari Mardapi suggests steps of the development of affective assessment instruments as follows: (1) determine the specifications of instruments, (2) writing instruments, (3) determine the scale of the instrument, (4) determine the system of scoring, (5) examine the instruments, (6) test, (7) analyze the instruments, (8) assemble instruments, (9) carry out measurements, and (10) interpret measurement results [8].

Attitude assessment based Curriculum 2013 refers to the affective domain taxonomy of Krathwohl the which includes five stages, such as receiving, responding, valuing, organization, and characterization by value as follows: (1) Receiving, it describes the stages awareness or sensitivity to the presence of certain ideas, material, or phenomena and are willing to tolerate the willingness to recognize the existence of a phenomenon in its environment. This stage is the opener one's senses to the world; (2) Responding, it is the second taxonomic phase as form of reaction to the phenomena that exist in the environment. At this stage learners do not only pay attention to the phenomenon but also give react. A high level at this stage is interest; (3) Valuing, it is relating to award or assessment given on an object, phenomenon, or behavior. Degree range is from receiving a value to the level of commitment. Assess stage or appreciate do not only accept but also assess the value of a concept or good or bad phenomenon; (4) Organization, it is fourth phase that combines different values, solves conflicts, and establish a consistent value system. Organizing occurs when a person is in a situation where there is more than one value; and (5) characterization by a value or value complex, it is the highest stage which means to act in a manner consistent with the values

of individuals who have been internalized. At this stage, learners have a value system that controls behavior until a certain time to form a lifestyle or one-self [9].

Based on the reasons the above, it can be arranged a composing technique of assessment instrument for mathematics which refers to affective taxonomy by Krathwohl with the following steps:

(1) Determine the purpose of the attitude assessment which will be assessed.

This step is done by looking at the basic framework and structure of Curriculum 2013 for junior high school mathematics especially Basic Competency on the material that will be assessed.

Example:

The following Basic Competence in statistical material based Curriculum 2013 class VII.

Basic Competencies:

2.3. Behave honestly and responsibly as a implementation form of honesty in reporting observational data.

Based on the basic competencies, it can be determined the purposes of assessment that will be done by assessing the attainment of students' attitude on the matter of statistics and opportunities. The attitude assessed are being honest and responsible attitude.

(2) Develop the lattice of attitude assessment instruments.

Composing the lattice of assessment instrument is done by determining the conceptual definition of values of attitude which will be assessed. Conceptual definition is formulated based on the results of theoretical studies of various reference or expert opinion. Referring to the conceptual definition, it is formulated operational which is explained into operational indicators and each indicator also refers to the charge Krathwohl taxonomy. The content of affective aspect according to taxonomy Krathwohl include: receiving, responding, valuing, organization, and characterization by a value or value complex.

(3) Choose the assessment techniques and determine the type of measurement scale.

Based Curriculum 2013, the attitude assessment techniques that can be used is observation, self-assessment and peer assessment. After selecting assessment techniques, it is determined the type of measurement scale for example using the subject scale or a response scale in the form of Thurstone scale, Likert scale, Beda Semantics scale, or any other scale.

Example:

Assessment techniques used to measure students' integrity is honest self-assessment in the form of honest attitude scale, in the form of subject scale with three possible answers.

(4) Write instruments items and determine the scoring system and method of interpretation.

Writing items of attitude assessment instruments refers to the scale of measurement that has been determined and indicators contained in the lattice instruments. Scoring system and interpretation method also depends on the measurement scale used.

Example:

The system of scoring for honest attitude scale forms scaling subject with three possible answers are: Answers option which indicate the most honest attitude (Score: 2); Answer option which indicates that answer is less honest attitude (Score: 1); Answer option that does not indicate an honest attitude (Score: 0). The method of interpretation can be made by referring to the following categorization of honest attitude.

Table 1. Categorization of Honest Attitude

Scores of Students	Category Attitudes Honest
$X \geq \bar{x} + 1{,}5\, s_x$	Very high
$\bar{x} \leq X < \bar{x} + 1{,}5\, s_x$	High
$\bar{x} - 1{,}5\, s_x \leq X < \bar{x}$	Less
$X \leq \bar{x} - 1{,}5\, s_x$	Low

IV. THE CONTENTS VALIDITY OF ATTITUDE ISNTRUMENT

Validity verification of the attitude assessment instruments generally emphasize to content validity and construct validity. The content validity is aimed to know the contents of a measuring instrument if it is representative or not. According Sireci & Bond state that evidence of the content validity of an instrument can be done by traditional and modern approaches [10]. Traditionally, an estimate of the content validity of an instrument is obtained by examining the items instruments reflects and does not reflect the content domain. The most common method to vivificate the validity based content is through expert judgment that look items in terms of: (a) examine the objectives that are tested, (b) assess the item representing content meant, and (c) assess the items which are relevant to the domains tested. Lawshe suggests Content Validity Ratio (CVR) to measure the degree of expert agreement of the items [11]. The level of the contents validity expressed in a single indicator that amount ranging from -1 to 1. Lawshe proposes that each appraiser consisting of the judging panel answer the question for each item with three possible answers: (1) essential, (2) useful but not essential, (3) not required. The formula for calculating the CVR is as follows.

$$CVR = \frac{ne-(\frac{N}{2})}{\frac{N}{2}} \tag{1}$$

where:
ne: The number of experts who give essential response to an item; N: Number of experts.

CVR calculation is made on each item. According to Lawshe, generally, if more than half of panelists show that the item is important/essential, reviews those items have at least the validity of the content. Specifically, CVR score of each item can also be compared with a minimum score of CVR with acceptance of 0,05 as researched by Lawshe.

Another approach related content validity coefficients suggested by Aiken [12]. Aiken V Formula for calculating the content validity coefficient based on the assessment results from the expert panel of n people toward an item in terms of these items represents the measured construct. Aiken V coefficient value ranges between 0 - 1. The coefficient is higher than 0,5 can be considered to have adequate content validity. The formula for V Aiken is as follows.

$$V = \frac{S}{[nx\ (c-1)]} \tag{2}$$

$$S = \Sigma \text{ ni (r-lo)}$$

where:
V: the validity index of Aiken; ni: Number of experts choosing the criteria i; r: Criteria to i.
lo: lowest rate; n: The number of all the experts; c: Number rating/criteria.

As a modern, Sireci & Bond argue that new approaches developing related to the verification content validity is through the test alignment [13]. Alignment between assessment and standards can be defined as the level of agreement that measures the consistency between the standards or curriculum content for a particular subject with the assessment to measure student learning outcomes [13]. This shows that the purpose of the test is to establish the suitability between assessing suitability and content of subjects as contained in the basic competence in the subject. Ndiovu & Mji state Alignment index calculation can be done by using alignment index formula of Porter. Alignment index ranges from 0 (no alignment) to 1 (perfect alignment). The formula alignment of Porter index is as follows [14].

$$P = 1 - \frac{\sum_{k=1}^{K} \sum_{j}^{J} \left| a_{jk} - b_{jk} \right|}{2} \tag{3}$$

where:
a: The number of lines, K: the number of columns in each matrix X and Y,
x_{jk} and y_{jk}: the ratio of cells in row j and k columns for each matrix ratio of x and y.

In general, the index of alignment Porter (P) can be determined in four steps as follows: (1) make a matrix of frequencies for the two documents which are compared, for example, give label as a matrix X and Matrix Y, (2) for each cell in the matrix X and Y, the ratio is calculated by comparing the number of cells in a cell with amount of numbers in each matrix. Label this as aratio matrix x and y, (3) For every row j and column k in the ratio matrix, calculated the absolute value of the difference between the ratio in cells x_{jk} and y_{jk}, and (4) Calculated alignment index.

V. CONCLUSIONS

Composing the attitude assessment instruments in mathematics based on the Curriculum 2013 can be done by steps as follows: (1) Determine the attitude assessment objectives which will be assessed; (2) Develop lattice of attitude assessment instruments for each indicator refers to the operational definition of attitude assessed and affective taxonomy of Krathwohl; (3) Choose the assessment techniques and determine the type of measurement scale; and (4) Write instruments items and determine the scoring system and the method of interpretation. The validity verification of the content on the attitude assessment instrument can be done traditionally by using CVR index and index of Aiken and in modern way by using index alignment.

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