International Journal of Advanced Educational Research
ISSN: 2455-6157; Impact Factor: RJIF 5.12
Received: 27-06-2019; Accepted: 29-07-2019
www.educationjournal.org
Volume 4; Issue 5; September 2019; Page No. 105-108

Development of multiple intelligence-based assessment instruments in science learning in SMP Negeri 3 Ratahan

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Abstract
This study aims to produce products and determine student responses to assessment instruments based on multiple intelligences of science learning in junior high schools. This research was carried out in Ratahan State Junior High School 3 by conducting small-scale trials on 10 students and large-scale trials on 20 students who had conducted research, the research instruments were first validated by experts before being trialled. This research is a type of research and development (research and development). The product produced from this research is an assessment instrument based on multiple intelligences in natural science learning that is feasible to use, as evidenced by a score of 4,625 (very good) from experts on aspects of attitude assessment, a score of 4,406 (very good) from experts on the aspects of knowledge and a score of 4,469 (very good) from experts on the aspect of skills. The practicality analysis results obtained a total score of 55 with a percentage of 90% included in the very good category, because the compound intelligence-based assessment instrument developed contains all aspects of the ability to be observed. Evaluation results in small groups obtained an average score of 4.64 (very good) and large group trials obtained an average score of 4.81 (very good). Based on these results, the assessment instrument is based on multiple intelligences in science learning and students' responses to the instrument are categorized very well.

Keywords: development of assessment instruments, multiple intelligences, natural sciences learning

Introduction

Assessment strategies are prepared to facilitate teachers in developing approaches, techniques and instruments for evaluating learning outcomes with an authentic approach, in assessing learning outcomes there are three activities that need to be defined, namely measurement, assessment, and evaluation. In addition, assessment strategies can facilitate a teacher in assessing students directly.

Assessment is an inseparable part in a teaching and learning process. Assessment is a collection of valid, reliable information and aims to improve appearance. Assessment requires good information and good information must be valid and reliable. Assessment is used as an effort to see the success of the teaching and learning process shown in the form of values and also used as an assessment of efforts in order to improve an appearance. Assessments must be done fairly, and must be linked to objectives. Important steps in the assessment process include objectives, re-stated objectives in the behavioral section, succeeding in targets and criteria, collecting data achieving goals through specific strategies and regular measurements, maintaining as well as developing skills and controlling towards teaching.

Assessment is very important in a learning, without assessment teachers cannot know the ability of students to receive information that has been given. Assessment is designed and implemented by the teacher in accordance with the planning and implementation of learning. Assessment is not only aimed at one aspect only. In accordance with bloom's taxonomy in Arikunto (2007) [1] which clarifies learning outcomes into 3 aspects namely cognitive, affective and psychomotor.

During this assessment process conducted by the teacher is still focused on cognitive aspects that really appreciate mathematical intelligence and logic, while other intelligence is underestimated. Whereas the minimum intelligence possessed by a person includes eight different intellectual abilities called multiple intelligence theory.

Based on the theory of multiple intelligences, to assess student performance both individually and in groups, assessment needs to be changed with more variations because the strategies used in learning also vary. Gardner (in Suparno, 2004: 61) [10] states that assessment needs to include the ability of mathematical-logical, linguistic, kinesthetic, musical, visual / spatial, interpersonal, and intrapersonal intelligence according to their learning.

Based on observations made at SMP Negeri 3 Ratahan it was found that the assessment for natural science learning is only a general assessment format used for all learning in SMP Negeri 3 Ratahan and still focuses on cognitive aspects and only looks at logical mathematical intelligence so there is no variation yet assessment indicators that are able to see or develop intelligence owned by students.

Problems that occur in smp Negeri 3 Ratahan do not have a tool or instrument to measure learning outcomes based on students intelligence and this problem needs to get more serious attention from the school, to answer the above problems it is necessary to develop a multi-intelligence based assessment instrument. The development of this instrument is expected to provide accurate data or information about students' intelligence, both attitudes, knowledge and skills.

The development of the instrument referred to by the researcher is the development of a multiple intelligence-based assessment instrument that will produce a product that

has been tested for validity and practicality by a team of validators or experts. The products that have been declared eligible by the validator team are the products that will be used by the teacher in the process of assigning grades to students.

Based on the background above, a research will be conducted with the title "Development of multiple intelligence-based assessment instruments in science learning in SMP Negeri 3 Ratahan".

This research aims to produce a product in the form of an instrument based on multiple intelligence based on natural science learning in junior high school and to determine student responses.

Research Methods

This type of research used in this research is research and development (Research and Development). Research and development (R & D) is a research method used to produce certain products and test the effectiveness of these products. The research location was chosen according to the purpose and intentionally, because the multiple intelligence-based assessment instrument that will be generated is intended for junior high school students, the research location chosen is SMP Negeri 3 Ratahan. The subjects in this study were assessment instruments, validators, science teachers and class students. The object of research is validity, practicality, and student response to multiple intelligence-based assessment instruments.

Data collection techniques in the research development of multiple intelligence-based assessment instruments use two types, namely interviews, and questionnaires (questionnaire).

1. Interviews are used as data collection techniques if the researcher will conduct a preliminary study to find problems that must be examined and also if the researcher will know things from the respondents in more depth and the number of respondents is small. Interviews conducted to determine preliminary data in research and information obtained are used as input for developing multiple intelligence-based assessment instruments.
2. Questionnaire is a data collection technique that is done by giving a set of questions or written statements to the respondent to be answered. The questionnaire was used during the evaluation and trial of the assessment instrument. Evaluation of assessment instruments is carried out by validator assessment instruments and teachers to get practical data. While testing the assessment instrument gives a compound intelligence questionnaire to students.

The instrument is a tool that serves to facilitate the implementation of something. In addition to compiling an assessment instrument, a research instrument is also used to assess the developed assessment instrument. Based on the research objectives, the following instruments are designed and structured:

1) Preliminary study instruments

The instrument is in the form of interviews with teachers that are arranged to find out what assessment instruments are in accordance with the needs of the assessment of learning outcomes that serve to provide input in the development of multiple intelligence-based assessment instruments.

2) Expert Validation Instrument

This instrument is in the form of a validation questionnaire related to quality of content, instructional quality and technical quality of assessment instruments based on multiple intelligences.

3) Teacher Response Instruments

The questionnaire used as one of the instruments in this study was a teacher response questionnaire. This questionnaire was given to teachers to find out the practicality of science learning using multiple intelligence-based assessment instruments. This questionnaire aims to obtain data on teacher opinions about the science learning process using multiple intelligence-based assessment instruments. This questionnaire is in the form of a Likert scale with 4 rating categories, namely strongly agree (score 4), agree (score 3), disagree (score 2), strongly disagree (score 1).

The teacher's questionnaire responses in the multiple intelligence-based assessment instrument can be seen in the following table:

Table 1

No	Criteria	Indicator	Item Number
1	Technical aspects of presentation	Appropriate display appearance	1,2,3,4
2	Aspects of language suitability	Simplicity of language	5,6
		Clarity in sentence structure	7,8,9,10
3	Ease aspect	Ease of use of instruments	11, 12, 13, 14, 15
Number of Items			15

Analysis of the teacher's response questionnaire data was carried out with the following steps.

1. Give a score for each item of answers consisting of strongly agree (4), agree (3), less agree (2), disagree (1)
2. Add up the total scores for all indicators
3. Give practicality using formula

$$P = \frac{f}{N} \times 100\ \%$$

Information

P = practicality value
F = score acquisition
N = maximum score

The practicality criteria can be seen in the following table:

Table 2

Interval	Interpretation
$20 < P \leq 40$	Not good
$40 < P \leq 60$	Pretty good
$60 < P \leq 80$	Good
$80 < P \leq 100$	Very good

4) Product Trial Instrument

This instrument was carried out using a questionnaire sheet which was used to determine the type of intelligence of students towards assessment instruments. Questionnaire is given before the learning process takes place.

Analysis of the data in this study was to use qualitative and quantitative descriptive analysis techniques. Qualitative is data obtained in the form of input from the validator at the validation stage, also input from the science teacher. While quantitative is data describing the results of product

development in the form of assessment instrument? Data obtained during the trial were analyzed using statistics. The results of data analysis will be used as a basis for revising the product to be developed. Data in the form of eligibility on product tests collected through questionnaires were analyzed statistically.

The formula for determining the interval from very less to very good is

$$\text{Skor rata} - \text{rata } (\overline{X}) = \frac{jumlah\ skor\ (\Sigma X)}{jumlah\ butir\ (n)}$$

Based on the distance interval above can be arranged table of eligibility criteria for the product of the results of the development and research as follows:

Table 3

Average score	Classification	Conclusion
$\bar{x} > 4{,}2$	Very good	Can be used as an example
$3{,}4 < \bar{x} \leq 4{,}2$	Good	Can be used without repair
$2{,}6 < \bar{x} \leq 3{,}4$	Good enough	Can be used with a little improvement
$1{,}8 < \bar{x} \leq 2{,}6$	Less	Can be used with many improvements
$\bar{x} \leq 1{,}8$	Very less	Cannot be used yet

Based on the table above, the product development will end when the assessment score of the multiple intelligence-based assessment instrument on natural science learning meets the requirements or in other words has reached a good classification.

Results and Discussion

The development model used in this study is the development model of Borg and Gall which has been modified by Sugiyono and is limited to only seven steps of research and development, namely potential and problems, data collection, product design, design validation, design improvement, product trials, and product revision. The reason researchers limit only to the seven steps of research and development is because up to stage 7 can already answer the research results.

Data on the validation results of multiple intelligence based assessment instruments on natural science learning were obtained from expert validators, namely Prof. Dr. Meytij J. Rampe, M.Si and Dr. Fernny M. Tumbel, MS, and practicality can be measured by seeing whether the teacher considers that multiple intelligence-based assessment instruments are easy and can be used by teachers. The product can be said to be practical if the results are categorized as "Very Good". The term "Very Good" still requires indicators to be measured in a product that is developed. The data obtained in the form of quantitative data and qualitative data. Quantitative data in the form of assessment questionnaires and qualitative data in the form of responses to suggestions, criticisms and conclusions in general of the assessment instruments developed.

Qualitative data in the form of suggestions and criticisms are used as material to make improvements to the developed assessment instruments. Quantitative data were analyzed by calculating the average value of the questionnaire in the form of a rating scale 1, 2, 3, 4, 5. The value of the validator was averaged for each aspect of the indicator then averaged again to obtain the final validity value. This value is always referred to at the interval of determining the level of validity of the product developed so that validator criteria are obtained for multiple intelligence-based assessment instruments in science learning.

Based on research that has been done, the assessment instrument based on multiple intelligences in science learning in junior high school on solar system material that has been developed is feasible to be used / applied in the process of assessing the ability of students based on the type of intelligence with validation data filled out by experts as validators, then the instrument This assessment was stated to meet the requirements for proper use, as evidenced by a score of 4,625 (very good) from experts on the aspects of attitude assessment, a score of 4,406 (very good) from experts on aspects of knowledge assessment, and a score of 4,469 (very good) from experts on aspects of assessment the skills.

The practicality analysis results obtained a total score of 55 with a percentage of 90% included in the very good category, because the compound intelligence-based assessment instrument developed contains all aspects of the ability to be observed. Obtaining an average score of teacher questionnaire response analysis results ranged from 80 <P 100, the learning tools included in the criteria is very good. This means that multiple intelligence-based assessment instruments used by teachers are practical. Thus the practicality criteria of multiple intelligence-based valuation instruments are achieved.

Then the results of the questionnaire evaluation carried out in small groups with respondents of 10 students with different abilities obtained an average rating of 4.64 (very good) and then field trials with 20 students with different abilities, shows that this assessment instrument is of interest to students with an average score of 4.81 (very good). This is in accordance with the theory that states that students' responses are said to be very good when they are at intervals> 4.2. (Widoyoko, 2008).

The advantages of the product resulting from the development of this product development have the following advantages:

a) This assessment instrument is based on multiple intelligences on science learning that makes the assessment process can find out the types of intelligence that exist in students.
b) The assessment instruments that are arranged there are types of multiple intelligences on the ability of attitudes, knowledge and skills, so that they can know the types of intelligence that exist in students.
c) Multiple intelligence based valuation instruments are effective for use in the assessment process.

Lack of product development results from the development of this product has several shortcomings as follows:

a) The assessment instruments developed did not cover all types of multiple intelligences.
b) This assessment instrument does not have an assessment for oral tests.

Conclusion

The conclusions obtained from this research and development are:

1. Multiple intelligence-based assessment instruments on science learning that have been produced have been developed with the Borg and Gall model modified by

Sugiono which includes stages of potential problems, data collection, product design, design validation, design revision, product trials, and product revisions.
2. Student responses to multiple intelligence-based assessment instruments on science learning obtained an average score of 4.64 small scale trials with "very interesting" criteria and 4.81 large scale trials with "very interesting" criteria.

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