

Need Analysis in The Development of HOTS-Oriented Study Project Assessment Instrument in Android-Based Science Learning

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Article Info

Article history:

Received 25 December 2018

Approved 07 January 2019

Published 10 March 2019

Keywords:

Project Assesment, HOTS, Android-Based

Abstract

Need analysis in the development of HOTS-oriented project assesment instruments on Android-based Science learning was carried out with the aim of identifying teacher need about HOTS-oriented project assesment instruments in the form of modules and Android applications. The problem found by researchers is project assessment on Science learning heat transfer material is not HOTS-oriented and proven when observation, the assessment book only assesses two indicators, namely the completeness of the tools and materials and the suitability of the trial and step. Two indicators are not enough to assess project skills and have not been able to measure the ability of the students' HOTS, so teachers need the development of HOTS-oriented project assesment instruments on Android-based Science learning. Android application made with simple coding. The method used for research is research and development (R&D). Qualitative data analysis is used to describe triangulation of data sources, while quantitative data analysis is used to test validity, reliability and practicality. The results of the need analysis of 20 statement items filled by fifth grade teachers in the Sunan Kalijaga Cluster of Gemuh Subdistrict to 8 teachers obtained validity, each statement item was greater than r-table, 0.707 and was declared to be valid. Reliability obtained 0.973 and declared to be reliable. It is hoped that modules and Android applications will be available which can be accessed through Google Drive. The practicality of the module is carried out after the instrument is valid and reliable. Teachers can use HOTS-oriented project assesment instrument manuals on Andoid-based Science learning in classroom learning.

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p-ISSN 2252-6420

e-ISSN 2503-1732

INTRODUCTION

Need analysis is a preliminary study for researchers to determine the appropriate steps for the continuation of research. The need analysis method uses interviews, observations, questionnaires, and documentation studies. Need analysis is carried out to obtain data in the form of problems and then a product that is believed to be appropriate and can overcome the problem appeared. The problem found through the need analysis method is project assessment on learning Science heat transfer material is not HOTS oriented. The solution to the problem found was to create a project assessment guidebook on learning Science of heat transfer material not yet oriented on Android-based HOTS.

Instrument development is an activity of developing existing instruments or making new instruments by following the instrument development procedures systematically. The instrument is a tool used by researchers to collect data by taking measurements. The instrument was used to obtain objective data to produce an objective research conclusion (Eko Putro Widoyoko, 2017, p.51).

The assessment instrument is a tool for collecting data (Sugiyono, 2016, p.102). The evaluation tool used in the study was a non-test instrument, meaning the project assessment technique was carried out without using tests. The assessment technique is done through careful observation and without testing students. Non-test technique is the assessment of student projects without testing students, but is done using systematic observation (observation), conducting interviews (interviews), distributing questionnaires (questionnaire), and examining documents (document analysis).

According to the Ministry of National Education in 2018, the rules of writing non-test instruments, namely: 1) material, statements in accordance with the formulation of indicators and aspects measured by each statement in accordance with the demands in the grid. 2) construction, concise statement (not more than 20 words) and clear, statement-free statement of an irrelevant statement, double negative, referring to the past,

factual, agreed by the respondent, containing complete ideas, and uncertain statements (all, always, sometimes, not one, never). 3) language, language must be communicative, use standard Indonesian, and do not use locally accepted language (taboo).

Assessment is the process of gathering and processing information to measure the achievement of student learning outcomes. The 2013 Curriculum emphasizes a shift in assessment, from assessment through tests that measure knowledge based on results alone, to authentic assessments that measure knowledge competencies, attitudes, and skills (Kunandar, 2014, p.36). Attitude assessment to obtain descriptive information about student behavior. Knowledge assessment to measure students' mastery of knowledge. Skills assessment to measure the ability to apply knowledge in carrying out tasks. A good assessment can reveal all aspects of learning, namely affective, cognitive, and psychomotor aspects in accordance with Permendikbud no. 23 of 2016.

Project assessment is an assessment of an assignment containing an investigation and must be completed within a certain time (Vera Wahyuni, Kartono, 2018, p.148). Project tasks include planning, implementing, and reporting. Projects provide information about students' understanding and knowledge on specific learning, students' ability to apply knowledge, and students' ability to communicate information (Majid, 2015, p.206).

Higher Order Thinking Skill (HOTS) is a thought process that tests at a higher level, in the sense of not testing the aspects of memory and memorization, but rather testing the aspects of analysis, synthesis, and evaluation (Desi Fitriani, Yusuf Suryana, 2018, p.88). The process of thinking is needed in learning, the process of thinking will continuously give birth to quality thinking and make students able to think at a high level (Asdiana, 2015, p.204). HOTS-oriented assessment maximizes the teacher's assessment.

HOTS is a higher level of thinking ability to be able to process certain information, think critically, evaluate and solve a problem (Kenedi, 2018, p.69). Shukla & Dungsungnoen (2016, p.211) gives an explanation of the ability to think highly, that "It requires someone to apply new

information or prior knowledge and manipulate the information to reach possible answers in new situations." Meaning that the ability to think highly requires someone to apply new information or prior knowledge and manipulate information to reach possible answers in new situations. HOTS learning process activities, namely knowledge transfer, critical thinking, and creativity and problem solving (Kemendikbud, 2018: 24). It was concluded that HOTS is a high-level thinking ability to process information, think critically and think creatively, evaluate, and be able to solve problems.

In the preparation and development of HOTS operational definitions are divided into three, namely the ability to think critically, the ability to think creatively and the ability to solve problems. According to Ennis (Wowo Sunaryo Kuswana, 2011: 45) critical thinking is to think naturally and effectively focus on deciding what to believe or do. Creative thinking is a new idea that is considered as an unknown and non-repetitive (Yusuf Abu Al-Hijaj, 2017: 79). Problem solving is an event that is experienced by everyone in everyday life, to master the ability to solve problems requires a mindset, technique, and analytical skills.

Science is one of the important subjects instilled in students because through natural Science learning, students are able to be scientific in solving problems faced (Ni Md. Rusnadi, dsk. Pt. Parmiti, 2013). Science learning is expected to be a vehicle for students to learn about themselves and the natural environment, as well as the prospect of further development in applying it in everyday life (Ketut Susiani, Nyoman Dantes, 2013). The purpose of Science learning is to provide provision to students with pressure structuring of reason in its application.

The results of the study of the Science abilities of Indonesian students show that the Science education goals have not yet been achieved. The results of the third international mathematics and Science study repeat study (tim 1999 - 1999), Indonesian junior high school students ranked for Science and 34 for mathematics from 38 countries studied in Asia, australia, and africa. timss study results in 2003, the field of Indonesian Science was ranked 37 out

of 46 countries, and in 2007 ranked 35 out of 49 countries. Timss's discovery in 2009 stated that Indonesian students were only able to answer basic concepts or memorizing but were unable to solve problems that needed analysis (Tasiwan, Hartono, 2014).

One of the natural Science materials in primary schools is the heat transfer material on basic competencies (KD) reporting the results of observations about heat transfer. Conducting experiments is included in project assessment. Students experiment about how to move heat. Students identify the flow of heat in boiling water in class. Students make observations to determine differences in heat transfer, namely conduction, convection, and radiation. The project assessment identified heat flow in boiling water contained in the assessment book not in accordance with HOTS-oriented assessment criteria.

The development of the 2013 Curriculum, Science learning in elementary school focuses on the formation of students' competencies and characters, in the form of a blend of knowledge, skills and attitudes that students can demonstrate as a form of understanding of the concepts learned contextually. Science learning is more meaningful when learning is associated with the real world of students. Students learn and understand themselves and the surrounding environment, thereby providing a more tangible and applicable learning experience. The material of heat transfer is natural Science material taught in the fifth-grade elementary school semester II (even).

Heat is a form of energy, namely heat energy. If an object releases heat on another object, then the heat received by other objects is the same as the heat released, commonly called the black principle (Suwarno & Hotimah Wahyudin, 2009: 127). The existence of heat can cause changes that are permanent or temporary. According to Atikah anneta (2015: 49-50) the change in burning paper is permanent, a sheet of paper when heated will burn to ashes and if it is cooled down it cannot become paper again. Changes to the wire are temporary, the wire being heated will glow red and turn white and increase in length and if the wire is cooled down the temperature and length of the wire return to normal.

Heat can cause objects to expand, melt, and evaporate. Slamet Riyadi (2017: 69) believes that objects expand when heated. For example, a railroad connection is made tenuous so that there are gaps to expand, so that the rail is not curved. Things will melt when heated. For example, a candle will melt at 54 °C. All liquid will evaporate when heated. For example, hot water is blown to cool quickly.

Heat can move from one object to another. Heat transfer occurs in three ways (Aep Saefulloh, 2017: 168), namely: 1) convection is heat transfer due to substance transfer, for example sea breeze and land wind; 2) radiation is heat transfer without passing through an intermediate. An example is the arrival of sunlight to planet Earth. 3) conduction is the transfer of heat through solid objects. A thing that conducts heat well is called a conductor. Conductors are made of metal, aluminum, brass, bronze, stainless, and iron. An example of a conductor is that one end of the iron is heated, then the other end of the iron becomes hot due to heat transfer. Things that are difficult to conduct heat are called insulators. Insulators are made of wood, ebonite, plastic, and paper. An example of an insulator is a potholder made of plastic (Ridwan, 2015: 143-144).

In the assessment book only assesses two indicators, namely the completeness of tools and materials and the suitability of the trial and step. Two indicators are not enough to assess project skills. Research conducted observational activities will be replaced by experimental activities. Experimental activities are included in the project assessment, so the performance assessment is replaced by the researcher into a project assessment to complement the need of the researcher to match the problem in the class. The project assessment process includes critical thinking, creative thinking, and problem solving.

Project techniques provide students' experience in planning, implementing, and reporting the results of experiments conducted. The research was supported by PT, Ardiantari, Wiarta, & Manuaba, (2015, p.10) with the results of research showing that through the application of a scientific approach to project assessment can improve problem solving abilities and learning outcomes of mathematical knowledge.

Android is an operating system for Linux-based mobile devices including operating systems, middleware and applications (Nazruddin Safaat, 2012, p.1). The teacher conducts project assessments on learning Science in elementary schools according to technological developments by making Android an application to create a development project assessment instrument. The use of Android is supported by research from Desi Fitriani, Yusuf Suryana, (2018, p.69), which is a Science-based learning media using augmented reality (ar) based on Android. It is very feasible to be used as one of the learning media in schools. Another study by Prasetyo, (2017, p.139) that Android-based learning media products can be used as a Science learning media in elementary / mi. Smartphones are becoming a fast-developing trend now that is Android, so that the development of performance instruments for Android-based peer assessment models can be applied (hasan ashari, sustainable revelation, 2016, p.10).

Android-based assessment instruments make it easy for users, especially teachers in primary schools. Android application is needed because it makes it easier for users to work wherever and whenever, especially in terms of information. Android devices save time and space, making it easier and more flexible (Nikodemus, 2013, p.2). Android is always connected to the internet, so an Android-powered smartphone requires an active internet connection. Based on observations in three schools that elementary schools in the Sunan Kalijaga cluster are noisy and already equipped with Wi-Fi facilities and the teachers already have Android-based smartphones.

The results of the fifth-grade observations in elementary schools in the cluster of Sunan Kalijaga, the subdistrict district of Kendal, obtained information that in the assessment process teachers assess only based on the performance assessments in the assessment book, the contents of the trial instructions are limited. Aspects of high-level thinking ability of students have not been considered in detail because the existing assessments have not been able to measure students' high-level thinking skills in learning Science in school. The assessment guidelines are still incomplete because there are only two assessment indicators and there are no assessment

rubrics. Assessment is traditional, meaning that the teacher evaluates at the end without seeing the process of student activities in making assignments, so the teacher's assessment is still subjective. The assessment process of making a report has not been done. Therefore, to assess projects based on the 2013 Curriculum it is necessary to have an HOTS-oriented project assessment.

The results of interviews with fifth grade teachers in Sunan Kalijaga Cluster, Regency of Kendal obtained information that the lack of understanding of fifth grade teachers develops the reasoning power of students in applying the concepts that have been learned, especially in students' higher-order thinking skills. The teacher has an Android-based smartphone and the school has Wi-Fi facilities.

Field observations of project assessments can be revealed as problems and alternative solutions are sought. The problem is that the teachers' understanding of fifth-grade in developing high-level thinking of students is still lacking so that teachers only follow the existing assessment books without regard to the skills needed by students. The subject chosen in the development of project assessment instruments is heat transfer. In the assessment book there are only two assessment indicators, while the two assessment indicators are not enough to assess students' high-level thinking skills. In Science learning the material of heat transfer students conduct experiments that lead to HOTS. Heat transfer material is a concept that is close to real life students. In natural Science learning the material of heat transfer as a basis for making project assignments in fifth-grade primary school. Fifth-grade teachers have an Android-based smartphone and the school is equipped with wi-fi functionality, so project assessment will be applied through Android with the aim of facilitating the teacher's work in assessing experimental activities carried out by students. Based on the problem, it is necessary to "The Development of HOTS-Oriented Study Project Assessment Instrument in Android-Based Science Learning".

Research on the development of HOTS-oriented project assessment instruments on Android-based Science learning produces a product that can make students think critically, creatively, and solve problems. Students are the

main target of this research because students not only gain memorization and understanding cognitive abilities but also analysis, synthesis, and application are also needed in solving problems. The results of this study can be used as one of the assessment models for teachers to measure the process and student learning outcomes. The purpose of this study was to analyze the practicality of HOTS-oriented project assessment instruments on learning Science based on Android, then made a guidebook and Android application.

METHOD

The research design used is research development (research and development). The development model used is 4d development by Thiagarajan. There are 4 stages in 4d development. The development of HOTS-oriented project assessment instruments consists of 4 stages, namely: (1) the defining stage, (2) the design phase, (3) the development phase, and (4) the deployment stage.

The study was applied to Science learning on heat transfer material. The study was conducted in three elementary schools namely sd n sedayu, sd n pamriyan, and sd n 02 galih. The subjects were 120 students in fifth-grade, with 30 students for small-scale trials and 90 students for large-scale trials. Research is important as a study in the product development process. The instruments developed were tested for validity (content validity and construct validity), reliability and practicality, so as to produce products that could be used. The resulting product is a guidebook and Android application HOTS-oriented project assessment instrument on Android-based Science learning.

The instrument used to collect product practicality data was a questionnaire sheet in the form of a check list that was used to obtain assessments from teachers. HOTS-oriented project assessment indicators on Android-based Science learning used in this study include: preparing experimental activities, determining the pace of experimental activities, dividing group assignments, conducting group collaboration, using experimental tools, using experiment time efficiently, measuring the quality of experimental

activities, mastery of the material in the experimental activities, and appearance in the presentation. The instrument used to collect product trial data was in the form of questionnaire sheets. Questionnaire sheets are used to assess student experimentation activities and measure students' high-level thinking skills (HOTS). Presentation and use of Android-based assessment. The product practicality test data analysis technique aims to measure the practicality of HOTS-oriented project assessment on Android-based Science learning based on responses from 8 teachers.

RESULTS AND DISCUSSION

Science learning is important to be mastered and implemented by students. Science learning is adapted to the 2013 Curriculum which is the existence of high-level thinking skills (HOTS), so that Science learning and assessment of Science learning can measure higher-order thinking skills (HOTS). Facts in class, the teacher has difficulty in making an assessment especially project assessment. The teacher lacks understanding in making project assessment instruments as evidenced by the assessments made by the teacher during learning, the teacher evaluates based on the rubric in the assessment book only. The assessment in the assessment book does not measure the students' Higher Order Thinking Skills (HOTS), the events are seen when the researcher makes observations in class while learning takes place. Teachers use cellphones and at school there are wifi facilities, so technological developments require innovations such as HOTS-oriented project assessment applications on mobile phone to assess.

Teachers have a perception that the existing assessment books are in accordance with applicable Curriculum standards, so teachers are reluctant to create new instruments. The teacher considers the existing assessment is appropriate to be used to assess. The fact that there is a project assessment in the assessment book is not in accordance with the stages of project assessment and has not been able to measure students' high-level thinking skills (HOTS). Factors that make teachers need practical instruments, namely

teachers are preoccupied with teaching and class administration makes teachers have two sides busy outside of teaching hours, so that if assisted with practical assessment instruments can be used at any time and teacher work is reduced. Students will get an ideal score based on students' high-level thinking skills (HOTS), because basically every student's right is to get ideal and pure results from the abilities possessed by students.

The researcher took the data from the fifth grade teachers in a cluster of Sunan Kalijaga, totaling 8 teachers through a need analysis questionnaire. A need analysis questionnaire was given to teachers to find out whether further action was needed regarding the development of an Android-based HOTS-oriented project evaluation instrument to assist the process of assessing teachers. Need analysis will answer the difficulties encountered by the teacher when doing learning, especially at the assessment stage. The development of assessment instruments made by researchers is expected to assist teachers in carrying out practical assessments. The need analysis will be the initial study of researchers in conducting studies and providing continued solutions for teachers who are sustainable.

Questionnaire of need analysis will be filled by fifth grade teachers in a group of Sunan Kalijaga cluster, totaling 8 teachers honestly and will be tested for validity and reliability testing in order to get results that are corroborating and suitable for reference, data processing is done by researchers using the SPSS application and data processing manually.

Table 1. Validity Result

No	Total	Category
1	0.784*	Valid
2	0.868**	Valid
3	0.914**	Valid
4	0.772*	Valid
5	0.772*	Valid
6	0.772*	Valid
7	0.772*	Valid
8	0.718*	Valid
9	0.772*	Valid
10	0.914**	Valid
11	0.914**	Valid
12	0.718*	Valid
13	0.817*	Valid
14	0.784*	Valid
15	0.914**	Valid
16	0.735*	Valid
17	0.914**	Valid
18	0.735*	Valid
19	0.735*	Valid
20	0.914**	Valid

Based on the data in table 1, the validity results show that each item statement is greater than r-table above 0.707 and is declared valid, the researcher uses the reference 0.7 while the valid condition of an instrument is the r count greater than r-table, 0.7.

Tabel 2. Reliability Result

Cronbach's Alpha	N of Items
0,973	20

Based on the data in table 2 the reliability results show that 0.973 is obtained and is reliable. Researchers used the r-table reference 0.7. The reliable condition of an instrument is that the count is greater than the table. Greater than 0.7.

The results of the validity and the results of the reliability, fifth-grade teacher and a cluster of Sunan Kalijaga, the sub-district of Gemuh, Kendal Regency, need a new assessment instrument that is practical in conducting the assessment process in the classroom according to the 2013 Curriculum.

CONCLUSION

The results of the need analysis and discussion, the conclusion is that the need analysis questionnaire is declared valid and reliable, so that the Android manual and application containing an Android-based HOTS-oriented project assessment instrument need to be made.

ACKNOWLEDGMENT

Acknowledgments from the researchers were conveyed to those who helped during the need analysis process, including; Farid Ahmadi, M.Kom, Ph.D, as reviewer of the article, Family of Sunan Kalijaga cluster, Gemuh sub-district of Kendal district, as a place to collect need analysis data which has provided opportunities for researchers for research activities.

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