

Development of Assessment Instruments Based on Higher Order Thinking Skills (HOTS) in Thematic Learning of Grade IV Elementary School Students

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Abstract

This study aims (1) develop a HOTS-based assessment instrument to measure the analytical and creative thinking skills of fourth grade elementary school students (2) analyze the effectiveness of the HOTS-based assessment instrument to measure the analytical and creative thinking skills of fourth grade elementary school students. The development of the HOTS-based assessment instrument adopts the 4D model developed by Thiagarajan, Semmel & Semmel those are : Define, Design, Development, and Disseminate stages. The product trial design consists of product validation and test instrument testing. The subjects of the research trial included 3 teachers and 30 students of fourth grade of elementary school in Dabin 3, Jepara District. Analysis of product quality data uses validity, reliability, level of difficulty and differentiating power. Meanwhile, data analysis of feasibility and students' thinking skills uses analysis of ideal assessment criteria. The results showed that the instrument of HOTS-based assessment met content validity by the agreement of expert judgment with the percentage result of material aspects 94%, construction aspects 92% and language aspects 90% . Those are good categories. Furthermore, the results of the analytical thinking ability test of 52% of students are in the medium category, and 37% of students' creative thinking skills are in the medium category. The conclusion of this study is the development of the instrument of High Order Thinking Skill (HOTS) – based assesment is needed by teachers to carry out the learning assessment process to train and measure students' thinking skills.

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Introduction

Higher Order Thinking Skills are thinking skills that not only require memory skills, but require other higher skills. Indicators to measure Higher Order Thinking Skills include skills in analyzing (C4), evaluating (C5), and creating (C6) Anderson & Karthwol in (Wardany et al., 2015). The ability to think analytically is the initial ability that students must have in higher-order thinking. Analytical ability is defined as the ability to break down material into its constituent parts, determine the relationship between the divided parts, and connect the parts into a whole structure or purpose. Components of analytical ability consist of distinguishing, organizing, inferring and attributing (Anderson & Krathwohl, 2001, 101-102). At the synthesis level, the ability to combine various information into one conclusion or a new concept is required (Huitt, 2011). The synthesis process in learning can be demonstrated through the formulation, planning, design, and manufacture of certain products. Kunandar (2013:164) defines the evaluation level into several stages where students are able to consider right and wrong, good and bad, useful, and useless.

Aboeslam Yousef (2016) in the International Journal of Secondary Education shows that using high-level assessments will help students improve and evaluate their thinking skills such as

using multiple choice tests and descriptions. Meanwhile, The Malaysian Online Journal of Educational Science concludes that this study provides evidence that almost all students can improve higher-order thinking skills, especially at the synthesis and evaluation stages, which are needed to increase students' creativity in their knowledge (Saïdo, 2015). Meanwhile, research conducted by (Alghafri & Ismail, 2014) on the effectiveness of the integration of students' creative and critical thinking states that the integration of students' creative and critical thinking skills shows a significant difference in post-test scores. There is a significant increase in the aspects of fluency and flexibility, there is no significant result for the aspect of originality.

The results of several literature reviews and the results of observations and interviews conducted with several teachers provide information that teachers have not implemented the HOTS-based assessment model in the learning and assessment process, especially in thematic learning. The assessment instrument that is generally applied is still Low Order Thinking Skill (LOTS), which only covers aspects of C1-C3. This is in line with research conducted by Herawati (2014) which states that the assessments used in these elementary schools have not developed students' higher order thinking skills or HOTS, especially for high grade students. HOTS must be possessed by humans in this century, this ability is very important to be taught from an early age as a provision for students in their lives (Hartik et al., 2021). This is because HOTS is considered appropriate to emphasize effective learning involve all aspects of the five senses in finding information to make students active, creative, and creative think critically in solving problems around them (Widyaningrum et al., 2021). Based on the problems found through observation and interviews, it is necessary to develop an assessment model that can measure students' higher-order thinking skills in exploring the characteristics of the theme 2 material analytically and creatively. The innovation that can be done is by developing a HOTS-based assessment model to measure analytical and creative higher-order thinking skills.

Higher Order Thinking Skills in Indonesian is translated as *Kemampuan Berpikir Tingkat Tinggi*. According to Sastrawati, et.al. (2011) higher order thinking is a process that involves mental operations such as classification, induction, deduction, and reasoning. In the process of higher order thinking is often faced with a lot of uncertainty and also demands a variety of applications that sometimes conflict with the criteria found in the evaluation process. Higher order thinking is more than just memorizing facts or telling someone exactly as something was told to us (Heong et al., 2011). According to Presseisen in (Devi, 2011) states that "HOTS (High Order Thinking Skills) or higher order thinking skills are categorized into four groups, namely problem solving, decision making, critical thinking and creative thinking".

Devi in Rochmah & Asih (2015: 29) states that there are several ways that can be used as guidelines by authors to construct higher-order thinking questions, namely the material to be asked is measured by behavior in accordance with Bloom's cognitive domain revision at the analysis level (C4), evaluation (C5) and creation (C6), each question is given a basic question (stimulus) and a matter of measuring critical thinking skills. To ensure that each question that is compiled can require high-level thinking, it is paramount to always provide basic questions (stimulus) in the form of sources/reading materials such as: reading texts, paragraphs, drama texts, fragments of novels/stories/tales, poems, cases, pictures, graphs, photos, formulas, tables, word lists/symbols, examples, maps, movies/sound recordings.

Method

This study aims to (1) analyze the development of assessment instruments based on Higher Order Thinking Skills in thematic learning theme 2. Always save energy in sub-theme 1 energy sources for 4th grade elementary school students, (2) Analyze the effectiveness of assessment instruments based on Higher Order Thinking Skills on thematic learning themes 2. Always save energy, sub-theme 1 for 4th grade elementary school students. This study is a Research and Development (R&D), which seeks to develop and produce a product in the form of developing an assessment model based on Higher Order Thinking Skill (HOTS) to measure the ability to think analytically and creatively in thematic learning of class IV SD theme 2. This study adopts a model 4-D developed by Thiagarajan, Semmel & Semmel (1974). The 4-D model development stage consists of define, design, development, and disseminate stages. The test subjects in this study were elementary school students in Dabin 3, Jepara District, Jepara Regency. Data was collected by using test techniques, and non-test techniques. The data analysis technique used is qualitative data analysis and quantitative data analysis.

Result and Discuss

Product Development of HOTS-Based Assessment Instruments (Design-Development)

Product development of cognitive assessment instruments based on Higher Order Thinking Skills is done by first determining the theme and sub-theme. The theme chosen is theme 2 always save energy, sub-theme 1 is an energy source for grade IV elementary school. The KI used is KI 3 "understanding factual knowledge by observing (hearing, seeing, reading) and asking questions based on curiosity about themselves, other creatures and their activities, and objects they encounter at home and at school". KI 3 is then segmented into 5 KDs, namely PPKn, SBdP, IPA, IPS and Indonesian. Furthermore, KD is re-translated into Competency Achievement Indicators by using the appropriate Operational Verbs (KKO). The product draft is made based on the elaboration of KI and KD containing a grid for the preparation of items. The grid contains themes, lesson content, Basic Competence (KD), Competency Achievement Indicators (GPA), subject matter, question indicators, cognitive level, question form and item number.

In Indonesian KD, theme 2 always saves energy, sub-theme 1 energy sources, there are 2 Indonesian KD, namely KD 3.1 "Observing the main ideas and supporting ideas acquired from spoken, written and visual texts" and KD 3.2 "Observing the connection between ideas that obtained from spoken, written, or visual texts", translated into 9 indicators for 22 items of description. KD Natural Sciences 3.2 "Identifying various energy sources, changes in energy forms, and alternative energy sources (wind, water, solar, geothermal, organic fuels, and nuclear) in everyday life", elaborated into 6 indicators and 9 questions. KD Civics 3.2 "Identifying the implementation of obligations and rights as citizens in everyday life", is translated into 6 indicators and 6 questions. KD Social Sciences 3.1. "Identifying the characteristics of space and the use of natural resources for the welfare of the community from the city/district level to the provincial level", is translated into 7 indicators and 7 questions. KD Art, Culture, and Craft 3.2 "Understanding tempo and pitch signatures". It is broken down into 7 indicators and 7 questions. To make it easier to assess and make items, it is necessary to arrange a cognitive assessment grid, this is in line with research conducted by (Erlin & Wahyudi, 2020) "Development of an Integrated Thematic Learning Assessment Instrument for Grade 4 Elementary School".

After developing the draft item, the next step is to test the assessment instrument based on Higher Order Thinking Skills to determine the quality of the assessment instrument. The trials carried out included item validation, test reliability and the level of difficulty of the questions. The results of the analysis of the quality of the test instrument are presented in table 1.

No	Test Characteristics	Analysis Results	Information
1.	Theoretical Validation		
	Material expert	94%	High
	Construction Expert	92%	High
	Linguist	90%	High
2	Empirical Validation	24 Valid Questions	The questions that failed were 1,8,13,17, 21,29.
3	Reliability Test	0,78	Good
4	Difficulty Level	Question 4 Question 2,8	Hardest Question Easiest Question

Table 1. provides information about the quality of the instruments developed. Based on the table, it can be concluded that the developed test instrument has high validity, good reliability coefficient, and moderate level of difficulty. Thus the HOTS-based assessment instrument in this study is declared valid and reliable. This is supported by research (Erniwati, 2018) which states that a good learning outcome assessment instrument can be declared valid for use after going through several stages in instrument development.

The Effectiveness of HOTS-Based Assessment Instruments

After the characteristics of the test instrument are known, the next step is to analyze the feasibility of the instrument based on the reviewer's review. The reviewers in this study consisted of 10 fourth grade elementary school teachers in the district of Jepara who were competent in this research field. Based on the results of the analysis, it is known that of the 30 indicators, 24 of them are categorized as very feasible. The highest reviewer review is an indicator of the suitability of measurement variables and the lowest is an indicator of measurement accuracy. These results indicate that the instrument is suitable to be used to test the thinking skills of fourth grade elementary school students.

After the feasibility of the test instrument is known, the next step is to measure students' thinking abilities. Students' thinking skills include the analytical and creative thinking skills of fourth grade elementary school students in the city of Jepara. The student's thinking ability profile data is summarized in Figure 1.

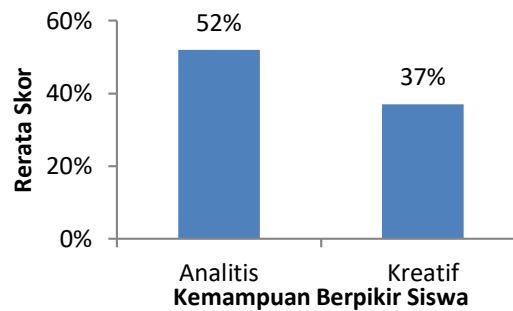


Figure 1. Average Thinking Ability Score of Fourth Grade Elementary School Students in the City of Jepara

The results of the analysis show that the thinking ability of fourth grade elementary school students in Jepara City is categorized as moderate. Figure 1 provides information about the average score of students' thinking skills. Based on the picture, it can be seen that the highest student's thinking ability is analytical thinking ability and the lowest is creative thinking ability. Students' creative thinking ability is lower than analytical thinking ability, because creative thinking has a higher cognitive level (C6) than analytical thinking (C4) (Krathwohl, 2002).

Conclusion

Development of "HOTS-Based Cognitive Assessment Instruments" in the subjects of Civics, Indonesian, Natural Sciences, Social Sciences, and Art, Culture, and Craft with the theme "Always Saving Energy" for Grade IV Elementary School. The HOTS-based assessment instrument based on the results of the trial has the following qualities; The HOTS-based assessment instrument fulfills content validity with expert judgment agreement with the results of the percentage of material aspects 94%, construction aspects 92% and language aspects categorized as good. The HOTS-based assessment instrument that was developed consists of 24 essay questions on theme 2 always saving energy, sub-theme 2 energy sources. All items in the HOTS-based assessment instrument are categorized as good. The reliability of the HOTS-based assessment instrument meets the requirements in the high category, which is 0.78. The effectiveness of the "HOTS-Based Cognitive Assessment Instrument" in the subjects of Civics, Indonesian Language, Natural Sciences, Social Sciences, and Social Sciences, and Art, Culture, and Craft with the theme "Always Saving Energy" for Grade IV Elementary School. The results of the analytical thinking ability test of 52% of students in the medium category and 37% of students' creative thinking skills in the medium category. This percentage proves that the HOTS-based assessment instrument in thematic learning of fourth grade elementary school students is effectively applied to help students improve their analytical and creative thinking skills and help educators make assessments. The researcher suggests that the next study should develop the "HOTS-Based Cognitive Assessment Instrument" as an assessment instrument with more varied practice questions, and use it as an assessment with other materials and the development of other themes yet to be developed.

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