

Development of Tests Based on Proprofs Digital Media to Measure Higher Order Thinking Skills (HOTS) of Students in Science Learning

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Abstract: The development of digital technology in the world of education has been very rapid. Teachers must be able to adapt to the use of innovative and creative learning technology. In addition to the learning process that requires technology integration, learning evaluation also needs to be integrated with technology so that students are accustomed to working on questions through technology integration. One of the learning technologies used to conduct assessments is propoofs digital media. Propoof digital media equipped with HOTS questions will make students practice their thinking skills and get used to using technology. This study aims to develop an online test based on valid/feasible and practical propoofs digital media. This type of research is research and development (R&D) with the ADDIE method. The data collection technique in this study used validation sheets and response questionnaires related to the practicality of propoofs digital media. Research data analysis used ideal standard deviation for validity and readability percentage analysis for practicality. Based on the analysis results, it was concluded that the online test based on propoofs digital media is valid/feasible to use and practical in evaluating science learning.

Keywords: Digital media; HOTS; Propoofs; Science; Test

Introduction

Education is a conscious, planned effort so that students actively develop their potential to have spiritual and religious strength, personality, self-control, intelligence, noble morals, and skills needed by themselves, society, nation, and state. Intending to develop students' potential to become human beings who believe and fear God Almighty, have noble morals, are healthy, knowledgeable, capable, creative, independent, and become democratic and responsible citizens. The world of education in the past was very different from the world of education today, especially what teachers feel in dealing with students today. The challenges that teachers will face will be very different, teachers are required to be more creative in dealing with students who are children of Generation Z. Children of

Generation Z are children who were born and grew up in the era of the development of the internet (Nurfitrani et al., 2023).

Education is also a learning process that is obtained by every human being to be able to make humans understand, comprehend, and be more mature and able to make humans more critical in thinking (Rahman et al., 2022). Educators have an important role in advancing education in Indonesia. One way for educators to improve the quality of quality education is by innovating in the learning process and evaluation of learning (Rohmah & Anam, 2023). Learning is essentially a process of interaction between students and their environment so that behavioral changes occur for the better. The main task of educators is to condition the environment to support behavioral changes for students (Yektyastuti & Ikhsan, 2016). Especially science learning

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which is still relatively monotonous in terms of learning and evaluation methods. Science learning aims to develop students' understanding of concepts, critical thinking, and literacy (Lafifa & Rosana, 2023). So one alternative is the use of innovative and creative learning technology (Dewi & Setyasto, 2024). The integration of information and communication technology in education in the 21st century is believed to be able to help educational institutions both academically and administratively (Zulfira et al., 2024).

In addition to the learning process, the use of technology can also be integrated into learning evaluation. Learning evaluation is a process that is carried out in a structured and continuous manner to determine quality, based on certain criteria that aim to make decisions, to what extent the goals set by the teacher that have been formulated are achieved (Rodiana & Pahlevi, 2020). Evaluation is a systematic, continuous, and comprehensive activity process in controlling and determining the quality of learning components based on certain criteria. The evaluation must be able to measure students' understanding and knowledge so that they can improve their thinking skills (Aviory & Susetyawati, 2021). Evaluation is a structured process to determine the quality of student work, this evaluation, aims to improve students' knowledge and understanding in the learning process, evaluation can also use HOTS-level questions.

HOTS is related to the ability to solve a problem by analyzing problems and finding the right solution (Ayubi et al., 2023; A. R. Hidayatullah et al., 2022). 21st-century science learning also shows that there is a relationship between students' academic achievement and their high-level thinking skills. Students who have HOTS abilities will have better learning outcomes than students whose abilities are still limited to LOTS (Jihannita et al., 2023; Rahayu et al., 2023). Specifically in science learning, several abstract concepts require high-level thinking skills to understand them. Therefore, it is important to train high-level thinking skills from an early age and develop them gradually (Hidayatullah & Gusemanto, 2024).

Evaluation can also be carried out routinely, scheduled, and planned so that information on the development of students' learning abilities is obtained optimally. One alternative is to develop HOTS evaluation questions based on digital media propoofs. Digital media propoofs is one of the evaluation tools that can be utilized. Propoofs is a platform that provides online tests in the form of online quizzes and games that can be accessed via Smartphones, Computers, or Laptops for free. Propoofs has many features, including information on student work results. Propoofs can make it easier for teachers to implement the evaluation process

into a fun and non-boring process. Propoofs is a website or learning media platform that provides many opportunities for online tests or quizzes that can be used practically. This platform can be used with digital devices such as PCs, laptops, and smartphones. The Propoofs platform has many interesting features such as Quiz Maker, Training Maker, Knowledge Base, Collaborate, Project, Brain Games, FlashCard, Polls, and others (Aristia & Sari, 2024). Propoofs has superior features in the form of graduation certificates and learning test result reports that can be downloaded directly by students. The Quiz Maker menu offers various types of questions that also include feedback and result information on student answers (Nurkhasanah, 2022).

Based on the results of initial observations conducted at SD Negeri 5 Selong, it can be seen that the evaluation questions usually given to students are still at the Lower Order Thinking Skills (LOTS) level, and the teacher does not even know about Higher Order Thinking Skills (HOTS) questions. In addition, teachers are not used to making HOTS evaluation questions using digital media. One way to deal with this is to develop HOTS-based evaluation questions using propoofs digital media, with the development of HOTS-based evaluation questions using propoofs digital media, can measure students' HOTS abilities and slowly it will be able to improve students' HOTS abilities if the evaluation questions are used to evaluate the learning carried out, especially in science lessons.

Method

The type of research used in this study is Research and Development or known as Research and Development (R&D). Development research is a systematic study of the design, development, and evaluation of learning programs, processes, and products that must meet the criteria of validity, practicality, and effectiveness. A product or program is said to be valid if it reflects the spirit of knowledge (state-of-the-art knowledge). This is called content validity; meanwhile, the components of the product are said to be practical if the product assumes that it can be used (usable). Then a product is said to be effective if it provides results following the objectives set by the developer (Danuri & Maisaroh, 2019). The type of development research used is the ADDIE method which consists of 5 steps, namely Analyze, Design, Development, Implementation, & Evaluation.

The location of this research is SDN 5 Selong. The sample of this research is 20 students with the material used in data collection, namely science lessons on plant material. Data collection techniques in this study used

interviews, observations, validation sheets, and student response questionnaires. The analysis of feasibility or validity uses the ideal standard deviation presented in the table 1.

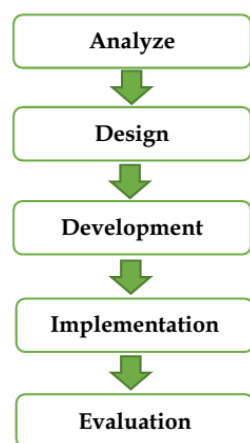


Figure 1. Research flow

Table 1. Validity Criteria with Ideal Standard Deviation (Yektyastuti & Ikhsan, 2016)

Formula	Category
$X > \bar{X}_i + 1.80 S_{b_i}$	Very good
$\bar{X}_i + 0.60 S_{b_i} < X \leq \bar{X}_i + 1.80 S_{b_i}$	Good
$\bar{X}_i - 0.60 S_{b_i} < X \leq \bar{X}_i + 0.60 S_{b_i}$	Enough
$\bar{X}_i - 1.80 S_{b_i} < X \leq \bar{X}_i - 0.60 S_{b_i}$	Poor
$X > \bar{X}_i - 1.80 S_{b_i}$	Very poor

Meanwhile, for the practicality and readability of the digital media test, the following analysis is used.

$$RPF (\%) = (TS/Y) \times 100 \quad (1)$$

*Description: RPF = Readability percentage formula; TS = Total score; Y = Highest score on Likert scale

Table 2. Readability Categories of Test Based on Digital Media Propofs

Readability Percentage	Category
76% - 100%	Very good
51% - 75%	Good
26% - 50%	Deficient
0% - 25%	Not good

Result and Discussion

The product developed in this study is a higher order thinking skills (HOTS) evaluation question based on digital media propofs science learning for grade 4 elementary school students at SD Negeri 5 Selong. Referring to the ADDIE development model and procedure, this study has been conducted by producing a product in the form of a higher order thinking skills (HOTS) evaluation question based on digital media

propofs science learning in grade 4 at SD Negeri 5 Selong.

The analysis stage, starts from the analysis of student needs, the learning process of students in class, the process of teachers delivering material in class, and when teachers give evaluation questions when learning has been carried out. This stage is carried out by observing learning activities in class and interviewing teachers. From these activities, information was obtained that the ongoing learning process was still not optimal where only teachers were seen to be active while students were passive. Learning was still centered on the teacher when the learning process was taking place, and still using student textbooks. Another thing that was obtained was the lack of HOTS-based questions and the media used was still limited. Based on this, it is necessary to develop HOTS-based media and tests so that students are more enthusiastic and motivated in following learning until the end and make it easier for teachers to evaluate student work results when in class or at home.

After analyzing student needs, product planning is carried out to be developed. At this design stage, various plans are prepared to plan the general product produced, namely higher-order thinking skills (HOTS) evaluation questions in science learning. The HOTS evaluation questions developed emphasize the learning process to improve students' critical thinking skills by evaluating learning outcomes using propofs digital media, to create new learning evaluations that are fun and follow students' ability levels and the learning characteristics of elementary school students, namely they are very happy with digital media that attract students' attention to learn.

The next stage is the development of HOTS questions based on propofs digital media. This stage is a follow-up stage from the design stage. In making HOTS evaluation question products, this use a propofs digital laptop as a means for teachers to evaluate student learning outcomes using propofs digital media. In the process of making HOTS evaluation questions, they are made seriously by paying attention to several things, starting from teaching modules, grids, and HOTS evaluation questions according to C4, C5, and C6, from making HOTS questions according to the topic of the material used. Not only paying attention to HOTS questions, word selection is also needed so that students are not confused.

The fourth stage is the trial stage of the product that has been produced. This is useful for knowing to what extent the product that has been made is good or needs to be improved again. This stage is carried out at SD Negeri 5 Selong, especially in grade 4. In implementing the product or the process of implementing the product

that was developed went well. After carrying out the HOTS evaluation questions using proprofs digital media, students filled out a student response questionnaire to find out to what extent the HOTS evaluation questions based on digital media were able to

help students think more critically when answering questions, feel more enthusiastic, enthusiastic and can motivate students to be more enthusiastic in following the learning evaluation process until the end.

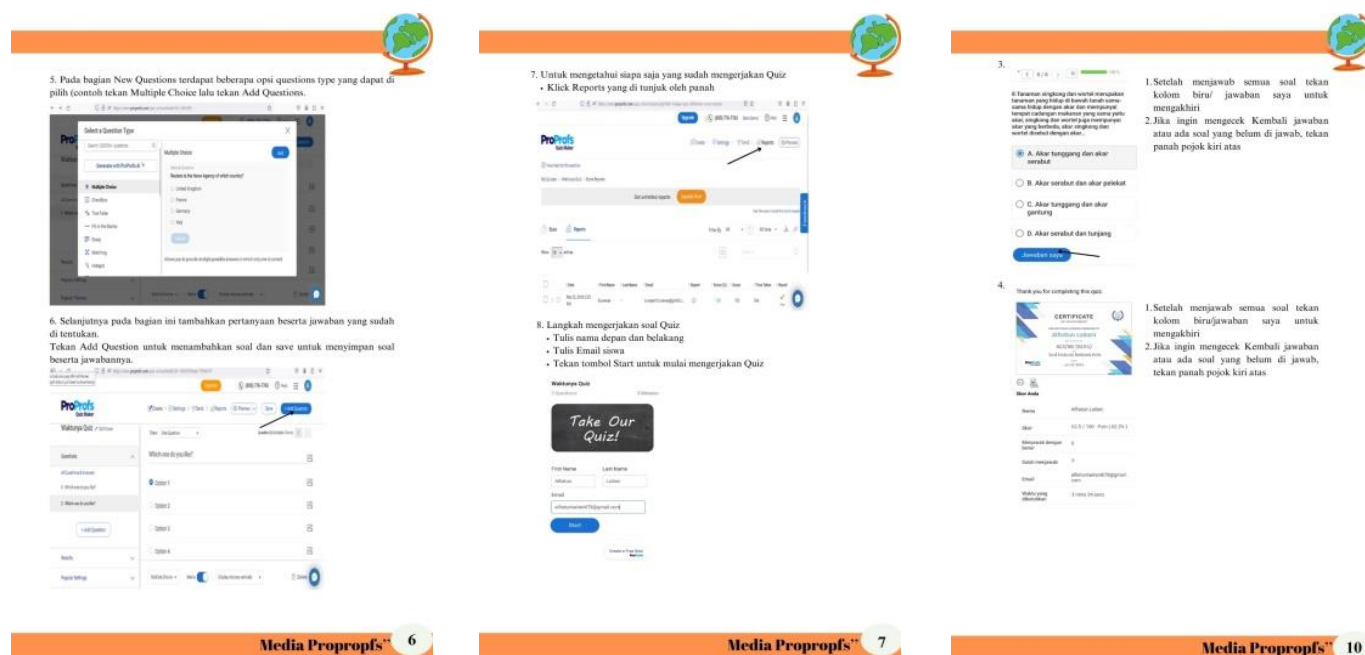


Figure 2. HOTS questions based on proprofs digital media

The final stage of this research is to evaluate the results of the experts or validators and product revisions as a research evaluation. In this case, the researcher evaluates the results of the validation of media/display experts and material experts. The suggestions given by the media and material expert validators are very useful for researchers to be able to develop HOTS evaluation questions based on digital media to be better than before. The researcher also did not forget to evaluate the results of the student response questionnaire on the HOTS evaluation questions, this aims to find out to what extent these HOTS evaluation questions can make students not only know their critical thinking skills but

also be able to find new ways of learning by following the development of a more sophisticated era by involving technology in learning so that it helps students be more enthusiastic and motivated in following the learning process until the end.

The results of expert validation show that the product in the form of HOTS questions based on digital media that was developed is effective for use, and has met the criteria for students so that the product is worthy of being tested on grade 4 students of SD Negeri 5 Selong. This can be seen from the assessment aspects of media/appearance experts and material experts.

Table 3. Validation Results

Validator	Number of Indicators Assessment	Score Sbi	Maximum Score	Validity Category
Media and Expert	12	49	60	Good
Material Expert	22	93	110	Very Good

From the results of the analysis using the Likert scale formula (five-point scale) it can be categorized as "Good" and there are five categories that can be used as a reference, namely: Very good, good, quite good, less good, very poor. The assessment of media and display expert validation with a total of 12 assessment indicators consisting of completeness of identity, appearance, and practicality. The maximum score is 60 and the score

obtained in this display expert assessment is 49. While the validation of material experts with a total of 22 questions. The maximum score in this material expert assessment is 110, and the score obtained is 93. The results of the analysis using the Likert scale (five-point scale) can be categorized as "Very Good". The validator's input is that some questions need to be added with narratives to compile/adjust to the HOTS category.

Overall, media/display experts also concluded that the HOTS evaluation questions based on digital media propofs are very good for use in elementary schools.

Furthermore, an analysis of the readability of HOTS evaluation questions based on digital media propofs in science learning was carried out using a questionnaire. The level of student interest can be seen from the results of filling out the response questionnaire to the HOTS evaluation question product based on digital media propofs that were worked on by students. Based on the results of filling out the questionnaire, a very good response was obtained with an average of filling out the questionnaire getting the very good and good categories.

Table 4. Recapitulation of Student Questionnaire Results

Initials Name	Average	Description
QA	82%	Very good
ARM	100%	Very good
SAA	87%	Very good
AI	97%	Very good
SA	90%	Very good
LN	87%	Very good
TA	89%	Very good
NJ	82%	Very good
GA	91%	Very good
DR	94%	Very good
FRS	92%	Very good
MH	86%	Very good
ASR	73%	Good
DA	93%	Very good
MARD	92%	Very good
ASH	81%	Very good
MRA	84%	Very good
KY	100%	Very good
AJ	96%	Very good
R	82%	Very good
Practicality Analysis Results	89%	Very good

Based on the table above, the readability test score of the HOTS evaluation questions based on digital media propofs in science learning carried out by 20 students obtained an average percentage value of 89%. The score obtained is included in the "Very Good" category, thus indicating that the HOTS evaluation questions based on digital media propofs are in the very practical category for students to use in carrying out practice questions in class with the operator teacher or independently at home with parental supervision.

Based on the results of the validation data analysis from experts and education practitioners, it was concluded that the developed learning evaluation questions were valid and practical. It can be concluded that the development of HOTS evaluation questions based on digital media propofs has an influence on students' enthusiasm and motivation to learn. The

benefits of using HOTS evaluation questions based on digital media propofs are a new and interesting learning atmosphere, increasing students' interest and motivation to learn, involving students in various activities in the learning process, and working on evaluation questions. The learning process that follows the learning character of elementary school students is that they enjoy learning new things, especially related to electronic media such as laptops. Propofs Media-based learning equipped with HOTS questions has an attraction in learning and is more practical for evaluating student learning outcomes (Nurfitriani & Aminah, 2023). The use of technology as an evaluation tool can help teachers complete their tasks more efficiently and effectively (Irmawati et al., 2023).

The propofs application can be used as an alternative answer to media that can be used in the implementation of exams. The features offered by the Propofs application are quite complete and good for use in implementing online exams (Budyastomo, 2019). One of the media that can improve learning outcomes is utilizing Propofs as a learning medium, because apart from being used as a learning medium, Propofs can also provide a different impression for students when working on it. After all, what is presented is not only questions in the form of text but can be in the form of interesting and non-boring games (Ayub et al., 2024).

Conclusion

Research in this development produces a product in the form of HOTS evaluation questions based on digital media propofs for grade 4 students of elementary school. The development procedure used by researchers in the development is the ADDIE model. Assessment from the validator of the display expert and material expert that the HOTS evaluation questions based on digital media propofs developed in this study have been considered valid and can be used with the improvements that have been suggested. From the validator's assessment, the validity value from the display expert obtained a score SBi of 49 and the validity from the material expert obtained a score SBi of 93 so that all components are declared valid. Thus, HOTS evaluation questions based on digital media propofs are suitable for use. After a limited trial of the product developed on grade 4 students of SD Negeri 5 Selong, the student response to the HOTS evaluation question product based on digital media propofs in the trial received a very good response from students with a percentage value of 89%. So that students' responses to HOTS evaluation questions based on digital media propofs are valid.

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Author Contributions

Preparation and development of digital media propof, A. L. Validation, D. B. M.; and A.; Data Collection and analysis, A. L.; Writing original draft article, D. B. M.; Review and Editing, D. B. M; A. L. All authors have read and agreed to the published version of the manuscript.

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Conflicts of Interest

The authors declare no conflict of interest.

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