



The Development Science of Physics Question Bank High Order Thinking Skill (HOTS) to Olympiad of Science in Elementary School

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Abstract: The learning science at Junior High School can be supported by the experience of learning. The research of purpose was to develop Science of Physics Question Bank High Order Thinking Skills (HOTS) to Olympiad of Science in Elementary School with valid, practical, and effective criteria. The type of research was Reeves model which consists of four phases: analysis problem, design and development phases, Iterative cycles of testing and refinement, and the implementation phases. The Population of research the students' Olympiad team in Rambah of the district. Data of this research were obtained through questionnaires, validation sheets, practicalities, and achievement tests. The data analysis used was descriptive. Important information which obtained for analysis problem was to develop the Science Physics Question Bank High Order Thinking Skill (HOTS) to Olympiad of Science in Elementary School. The validity of the developed question bank was determined by the expert review which involved four validators. Whereas, the practicality of that question bank was determined by one-to-one, small group, and field test evaluation. Effectivity analysis showed that the category of question banks was very effective to improve high and critical thinking skills (HOTS) of knowledge. It is concluded that the science of physics question bank High Order Thinking Skills (HOTS) to Olympiad of science in Elementary School was already fulfilled the criteria of valid, practical, and effective.

Keywords: Question Bank, Reeves Model, High Order Thinking Skill, Elementary School, Olympiad of Science.

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INTRODUCTION

IPA is a subject that has been studied since Elementary School (SD). Science is divided into two, namely Physics Science and Biology Science. At the elementary level, science learning is studied simultaneously or in an integrated manner. So, to test the level of understanding of students in learning science, there is a competency at the school, district, provincial, and national levels known as the National Science Olympiad. (OSN). OSN is an event to compete in the field of science for students at the elementary, junior high, and high school levels in Indonesia. Students who take part in the National Science Olympiad are students who have passed the selection at the district and provincial levels and are the best students from their respective provinces. However, the lack of availability of a question bank or books that completely discusses the Olympics material and questions has made it difficult for elementary students and science teachers to understand them. Teachers,

counselors experienced difficulties in providing the book collection of bank problems for the students to be trained in answering questions the Olympics with correct and appropriate (Susanto, Sembiring, & Nugroho, 2017). The question bank that will be developed describes the natural science material complete with questions and discussion. The questions that are developed will be assisted by high order thinking skills. High order thinking skill (HOTS) is a thought process that is not just memorizing and relaying known information. The purpose of research (1) to determine phase development of the book bank about IPA Physics SD-based high-order thinking skills (HOTS) and (2) to determine the validity of the bank problem that has been developed that can be used by teachers and students SD.

METHOD

This research is a quantitative research description of R&D (Sugiyono, 2019). Reeves

development model. The model is composed of four stages namely the analysis of practical problems (phase analysis of the problem), design and development of the prototype (phase of design and development of prototypes), iterative cycles of testing and refinement (phase test repeatedly and repair), and the implementation phase (phase of implementation).

The subject of research is a team of Olympic-SD excl. Crush. Type of data the study is that the primary data, such as results validity book bank about that do validator. Instruments of collecting data that is used so that: (1) Phase analysis of the problem: the collection of questions Olympics, and (2) instrument validation of the book bank matter. The data obtained from the study were analyzed using the Likert scale technique. Analysis of the validity of use Kappa (Antony, 2005) by the equation.

$$K = \frac{P - P_e}{P_e}$$

with a valid category at the interval ≥ 0.61 - 1.00 and not valid at the interval < 0.61 .

RESULTS AND DISCUSSION

Research results have done through 4 stages of development with models of Reeves, namely:

Analyze sis of Practical Problems (problem analysis phase)

Phase analysis of practical problems is the stage early that needs to be done to get the data beginning or an idea early on what that will be developed. The results of interviews with science Olympiad teachers and distributing google forms to students found that there were difficulties for Olympic supervisor teachers in providing explanations about science material so that students could easily understand it, the fewer question banks that discussed the material. directly according to the problem.

Design and Development of the Prototype (prototype design and development phase)

Analysis of students' cognitive abilities is still low in solving problems with the ability to analyze, evaluate, and be creative. This is because the basis of high order thinking skills (HOTS) is to measure the ability to analyze (C4), namely the ability to separate concepts into several components and relate to each other to gain an understanding of the overall concept, evaluate (C5), namely the ability to determine the degree of something based on norms, certain criteria or benchmarks, and create (C6) (Dinni, 2018), namely the ability to combine elements into a new form that is whole and broad or make something original. Dividing the classification of the bloom from low-level thinking to higher-order thinking as in Figure 1 (Krathwohl. DR, 2002).

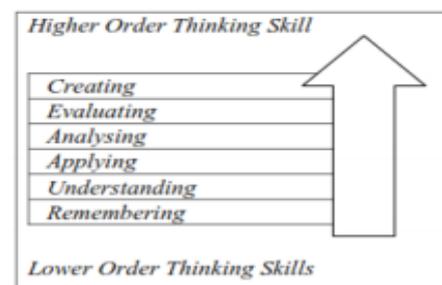


Figure 1. High Order Thinking Skill Classification

Figure 1 describes that the ability to level thinking critically and level high or High Order Thinking Skills (HOTS) started most high is thinking creatively, evaluate, analyze, apply, understand, and remember. In the preparation of HOTS questions, a stimulus is generally used. The stimulus is the basis for making inquiries. In the HOTS context, the stimulus presented should be contextual and interesting (Fanani, 2018). In completing the questions Olympics to the level of School Elementary, if all of the skills already trained, then with an easy to resolve problems of the Olympics with the right. Limitations book bank about that particular matter IPA Physics, causing the ability HOTS it does not appear on most students in elementary school. So, it is necessary to develop a question bank by the expected skill abilities.

At this stage, solutions are prepared and developed so that they can be implemented in educational problems. This stage consists



of two parts, namely the design of the question bank book prototype and the preparation of the instruments needed in this study. In designing the physics science question bank book, 13 materials are explained and given the discussion of answers to several Olympic questions, namely (1) Introduction to Measuring Instruments (2) GLB and GLBB Motion (3) Free Fall Motion (4) Upward Vertical Motion (5) Force (6) Simple Plane (7) Vibration (8) Waves (9) Sound (10) Light and Optics (11) Matter and Heat (12) Electric Magnets (13) Solar System (Erick Indonesia Institute, 2016). After the question bank book has been designed, it will be carried out the preparation of the instruments needed in the research, namely the validation instrument for SD Physics question bank book validation.

Evaluation Phase (Phase Evaluation)

Evaluation Phase is done after the bank about the Olympics IPA Physics SD charged HOTS is said to be valid by the validator. The evaluation phase was carried out with the self-evaluation stage and the small group. Self-evaluation phase, researchers give a vote in private to the bank about that has been developed with the results easily understandable, because it is equipped with the material and the discussion of any matter, a clear and consistent in the use of paper, and efficient, so practical for use by students and teachers in elementary school. The evaluation stage of the small group consisted of 20 students and 5 teachers of the Science Olympiad at the Rambah sub-district level. From the results of the small group evaluation, an average result of 83.4% was categorized as effective for student responses, and 84.5% categorized as effective for teacher responses.

Development banks about the Olympics IPA Physics Schools Elementary charged HOTS conducted to provide convenience for teachers and students in understanding the problems of the Olympics with easy. Bank matter that has been completed is developed, further validated by the expert to be recognized too valid. The results of the validation of textbooks developed from the

Interactive Cycles of Testing and Refinement (repeated testing and repair phases)

At this stage, the validator tests the instrument validity and the Physics Olympiad question bank book so that a valid Physics Science question bank book is obtained. This stage is carried out when the book has been developed. Bank matter that has been developed will be evaluated in sequence starting from the Validator. The validator consists of 3 people who are experts in the field of Science and Physics and compilers of Olympic questions. The results of the validation instrument development bank about the Olympic IPA Physics charged HOTS amounted to 0.87% considered valid by using a formula Cohens Kappa.

content, construct, and language with an average value of 0.89% are categorized as valid. Fadhlilana (2020) says that the development of the book Olympic IPA Chemistry uses a journal which was developed got the results were very positive by the students, it is necessary the development of a bank about to Physics Olympiad.

The results of the expert validators with valid results, then proceed with the evaluation stage. Evaluations are carried out by giving the bank a matter that is already developed to some of the students and teachers. At the stage of evaluation may be concluded that the bank about the Olympics IPA Physics SD-charged High Order Thinking Skills is said to be effective for use among teachers and students. So, it can improve the ability to think the level of high and critical in completing the questions Olympiad of Physics good level of sub-districts, counties, provinces of national, and international. The aim main of high order thinking skills is how to improve the ability to think participant learners at levels much higher, especially that relating to the ability to think is critical in receiving various types of information, think creatively to solve a problem using the knowledge that is owned and make decisions in situations - complex situations (Saputra, 2016).



Of all phases of the development bank about IPA Physics SD charged HOTS can be concluded that the bank problem that developed was valid, practical, and effective to use. By that done by Rofiah, Aminah, & Sunarno (2018), namely Module Development Learning science-based High Order Thinking Skills (Hots) To Enhance Capabilities Critical Thinking Student Class VIII SMP/MTs, which can improve the ability to think critically students with HOTS in learning.

CONCLUSION

Based on research that has been done, the conclusion that the book bank problem - based High order thinking skills (HOTS) which developed valid, practical and effectively used to improve understanding of the concept and think critically student elementary school in completing the questions test the Olympics with a good and true.

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