

ANALYSIS OF HIGH ORDER THINKING SKILLS IN PHYSICS IN 21ST CENTURY LEARNING IN SENIOR HIGH SCHOOL MA MUHAMMADIYAH BOARDING SCHOOL METRO

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Abstract :

The purpose of this research is to analyze the extent to which High Order Thinking Skill is applied in physics learning at MA Muhammadiyah Boarding School Metro and analyze students' HOTS ability in the current 21st century learning. In this article, the type of research used is qualitative research. The data collection stage consists of 3 stages, namely observation and interview, literature study, and data analysis stage. The data analysis technique uses data triangulation techniques by comparing 3 data sources. The results showed that physics learning at MA Muhammadiyah Boarding School Metro has been integrated with High Order Thinking Skill. This is evidenced by the use of the PjBL method. The PjBL method allows students to use reasoning to create a project. However, the application of HOTS in physics learning has not been fully successful because there are still students who have difficulty in applying formulas and working on problems. In 21st century learning, teachers are expected to continue to improve their abilities and innovate in the application of methods, strategies, and learning media that can support students' HOTS.

Keywords: Higher Order Thinking Skills, Physics Learning, 21st Century

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INTRODUCTION

Education is an important part of every individual's future, because preparing students for the future is always a top priority. Education is a learning process that focuses on teachers and students in the classroom (Hidayat., et al. 2023). In general, the purpose of education is to develop the potential of students so that they are able to face every condition in their lives (Abraham et al, 2021: 419). So that by getting education through class learning, students will get learning experiences and their abilities will be honed. Learning experiences provide new knowledge or skills that are useful for students in the

future. According to Mahanal (2019), education is required to prepare students with competencies that cannot be replaced, such as empathy, inspiring skills, and higher-order skills.

Curriculum change is one of the government policies to maintain the quality of Indonesian education. The Ministry of Education and Culture (MoEC) policy changes the curriculum, where previously education adhered to the 2013 curriculum and then the current independent curriculum was established. according to Gumilar et al (2023: 150) The curriculum is updated to adapt it to the demands of the 21st century, where the integration of technology in education is so pronounced, especially since the COVID-19 pandemic hit the world. Inayati (2022: 296) "This curriculum also integrates literacy, knowledge proficiency, skills and attitudes in the use of technology. Learners are given the freedom to think and learn from any source, in order to be able to seek knowledge and solve real problems". According to Prabawati (2023) this independent curriculum program has the freedom to choose tools based on student learning needs and preferences. Student activities in the independent curriculum include intracurricular and extracurricular activities, as well as the P5 program (Pancasila Student Profile Strengthening Project). So that the independent curriculum requires a lot of students in applying the concepts of thinking, creativity, and collaboration in carrying out the learning process. The skills that students need to master in 21st century learning include critical thinking skills, problem solving, communication skills, collaboration skills, creativity and the ability to innovate (Erlitasari, 2022). Skills in the 21st century are included in the ability to think at a high level (High Order Thinking Skill), so that students are currently required to apply high-level thinking skills in learning in the 21st century. This is also in accordance with what is stated by Suratno et al (2019) Education in the 21st century emphasizes fostering students' ability to solve problems, encouraging them to explore and gather information from various sources, think critically, and collaborate effectively to find solutions.

Physics is a science that explores or studies natural phenomena that occur around through certain concepts. According to Kurniawan (2023: 26) "Physics learning in schools and universities contains concepts and analysis. As a branch of science, physics studies natural phenomena and symptoms as a whole both concretely and abstractly". Jayadi (2020: 26) states that "Physics learning in schools has a central role in imparting 21st century skills to students". Physics learning is one that applies problem-based learning in the classroom. Problem solving in physics learning is expected to increase critical thinking, communication skills, collaboration, and student creativity. So that it can make the ability of High Order Thinking Skill (HOTS) increase.

Education in this modern era has involved the implementation of a learning paradigm that emphasizes the development of High Order Thinking Skills or HOTS as a key element to form creative and critical individuals. In this context, the application of HOTS in Physics learning becomes an important aspect that not only measures the extent of concept understanding but also the ability of students to relate, apply, and analyze variables that affect physical phenomena.

In underlying the importance of analyzing students' HOTS at MA Muhammadiyah Boarding School Metro, it should be noted that the curriculum and learning methods play a central role in shaping students' mindset. Therefore, this study aims to analyze and provide a comprehensive picture of the extent to which HOTS skills have been developed in students through Physics learning. This research is directed to explore and analyze in depth the HOTS skills of students at MA Muhammadiyah Boarding School Metro in Physics.

RESEARCH METHOD

This type of research is qualitative research that focuses on factors and indicators from the environment in the form of natural phenomena or symptoms . Fadli (2021) states that qualitative research is a research approach by conducting certain settings in the real world or naturally occurring, with the aim of investigating and understanding a phenomenon.

The data collection methods used are observation and interview methods. The data analysis technique used is the data triangulation technique, by comparing three data sources. The stages in this research include 3 stages, namely the observation and interview stage, literature review, and data analysis stage. The research was conducted on November 13, 2023 at MA Muhammadiyah Boarding School Metro in class X, with a total of 3 students as respondents. Respondents were selected using

purposive random sampling technique. The research instruments used include observation sheets and interview sheets.

The first stage is to make observations to find out the problems or phenomena that arise in physics learning. Then after obtaining data from observation activities, then researchers conducted interviews with Physics teachers and 3 grade 10 students. The students chosen were the result of references or suggestions from physics teachers at MA Muhammadiyah Boarding School Metro. The three respondents were selected based on physics grades, there were students with low physics grades and students with high physics grades. In addition, data were also obtained from literature review of previous research.

After the data were collected, the researchers then analyzed the data using data triangulation techniques. Noeng Muhadjir (1998) states that data analysis is a systematic effort in finding and organizing information from observations, interviews, and literature reviews, to improve the researcher's understanding of the case under study, and make it available to others ". The data analysis process is carried out using descriptive data analysis techniques and using a qualitative approach. Descriptive data analysis produces good data and is presented through words or descriptions. Then after data analysis, triangulation or conclusion drawing is also carried out. According to Hapiz (2020) triangulation is a data collection technique by combining several data combining techniques with existing data sources. According to Mekarisce (2020) triangulation aims to increase the strength of theory, method, and interpretative in qualitative research. So that with triangulation, researchers can draw conclusions from several data sources and obtain findings related to the variables under study.

RESULTS AND DISCUSSION

High Order Thinking Skill is a thinking skill using high reasoning. According to Nasir et al (2023: 2) High order thinking skills (HOTS) are high thinking skills, including critical, analytical, and creative thinking skills. This can allow individuals to access information and analyze it to draw accurate conclusions. Meanwhile, Umami et al (2021) state that a high-level thinking skill or HOTS is a process or method that allows students to use their ability to analyze, plan, design, implement and evaluate an existing problem. According to Nasir et al (2023) HOTS skills are very important and need to be taught because this can have an impact on students through skills for critical thinking and creative thinking. In addition, HOTS can also help students in forming a broad and comprehensive understanding of the material presented. Meanwhile, according to Apipah and Novaliyosi (2023: 1813) HOTS goes beyond a person's ability to simply remember, know, or repeat information, but focuses more on the ability to solve problems, think creatively, argumentatively, and think critically in decision making.

The explanation above can be seen that the indicators of students' High Order Thinking Skill abilities are critical thinking, problem solving, communication, collaboration and creativity. This is also in accordance with the learning skills that are needed for the 21st century. According to Jaenudin (2020) The importance for students to adapt to the 21st century is needed to develop creativity and solve problems. According to Prabawati et al (2023: 166 - 167) "21st century education requires students to have complex knowledge equipped with skills that support these skills have been put forward by the Patnership for 21st Century Learning Skills, namely higher order thinking skills.

HOTS skills and 21st century skills are interrelated because both require the ability to think critically, think creatively, innovate, and think collaboratively (Hilt et al, 2019; Rios et al, 2020; van Laar et al, 2020). Therefore, from the explanation above, it can be seen that high-level thinking skills are currently needed because the demands of the 21st century include the abilities in HOTS.

Problem solving skills allow students to explore their knowledge and hone their critical thinking skills. While critical thinking according to Setiawan et al (2022) Critical thinking is the human ability to analyze and solve problems related to the gap between reality and truth. According to Dhamayanti (2022) efforts in shaping critical thinking skills can be developed through interactive classes where students are fully involved in the learning process.

According to Mantau and Talango (2023: 89) "Critical thinking skills play an important role in learners' ability to solve problems. By thinking logically and analytically, they can identify root causes, analyze available options, and choose the most effective solution. This applies in a variety of contexts, both in academic subjects and in everyday life". Through critical thinking, students should be sensitive to various things that happen in the environment, then analyze and understand using the stages of *Analysis Of High Order (Riswanto, et al) pp:148-154*

scientific work, so that they think, feel, and act in a controlled manner in accordance with their potential capacity in healthy, quality behavior, and maintain their integrity (Tawil and Liliarsari in Cahyani et al, 2021: 919). That way problem solving skills are so important to apply in physics learning, because it can help improve students' thinking skills.

Meanwhile, communication is the delivery of ideas or ideas between individuals or groups through oral or words. Communication skills are very important in learning. Good communication skills will be able to increase students' enthusiasm for learning and discipline in solving problems with higher-level thinking skills (Rochmawati et al., 2019). In addition, another ability in HOTS is the ability to think creatively. According to Astria and Kusuma (2023), creative thinking ability is an ability that must be possessed by every student in order to conclude a case or problem based on different points of view so as to create the right results. According to Zebua (2024: 96) Critical and creative thinking skills play an important role in preparing students to become good problem solvers and be able to make informed decisions and conclusions that are academically accountable. Meanwhile, according to Ulhusna et al (2020) collaboration is a goal-oriented, mutually beneficial process that aims to educate parties by solving problems, developing strengths, overcoming differences and sharing responsibilities.

The process of higher order thinking skills obtained by students through learning experiences, students can create and build knowledge within themselves, and understand the learning process (Acesta, 2020). It can be said that HOTS is successful if students are involved in the process of learning what they already know, are able to distinguish opinions or points of view clearly, argue well, and have the ability to solve problems, the ability to construct explanations, draw conclusions and understand more complex things to be clearer, with this ability clearly showing how students can reason (Beddu, 2019). One of the learning methods that apply high-level thinking is Project Based Learning (PjBL). Oktavia and Ridlo's research (2020) found that triangulation data shows that project-based learning students can encourage students to improve communication skills and higher order thinking skills in problem solving.

Based on the results of teacher interviews, the results obtained in the form of methods that are often applied in physics learning at MA Muhammadiyah Boarding School Metro are PjBL. While the learning media used is printed books. The PjBL method was chosen to hone students' skills but also to facilitate students' understanding through projects. In addition, the teacher also explained that PjBL was chosen because students are more interested in learning that is gestural than just taking notes and listening in class. Then to deepen students' understanding, teachers often do habituation by doing problems at the end of the lesson. But on the other hand, based on the results of interviews with students, it turns out that there are still class X students who have difficulties and have low scores in learning physics. The difficulty is in the form of difficulty in applying physics formulas in problems, so that it makes students feel that physics is difficult. On the other hand, based on the results of interviews with students, it turns out that there are still grade X students who have difficulties and have low scores in learning physics. The difficulty is in the form of difficulty in applying physics formulas in problems, so that it makes students feel that physics is difficult.

While the results of observations in class X MA Muhammadiyah Boarding School Metro, the results obtained in learning students have varied abilities, some are able to follow the learning well, some have not been able to follow the learning well, and some are able to half follow. Students who can follow the learning well are students who follow the specialization class, but also some students outside the Physics specialization who are also able to follow the learning well. The way the teacher provides an understanding of HOTS questions to students is by following the flow step by step and then increasing each lesson point, so that every student who does not understand, the teacher will provide more understanding to the student. During the learning process there are still some students who are sleepy, in that case the teacher will instruct students to wash their faces first so that students can focus on learning again.

It can be concluded that physics learning at MA Muhammadiyah Boarding School Metro has implemented HOTS-based learning. This is shown through the existence of learning that can hone the ability to solve problems and think critically, through problems then students are required to be able to make a project that can solve existing problems. In addition to problem solving, PjBL can also hone students' creativity and innovation through making projects that teachers provide. Then communication

and collaboration skills can also increase due to collaboration between students during the process of making projects and submitting results which can also hone communication skills.

On the other hand, the implementation of HOTS-based physics learning at MA Muhammadiyah Boarding School Metro is still not fully successful. This is reinforced because there are still students who have difficulties and get low scores. Nisak et al (2018) "The cause of the low HOTS of students is influenced by several factors such as the way teachers facilitate learning activities that are not suitable and the low level of learning independence of students". This is why in honing students' high-level thinking skills (HOTS), teachers should do habituation. habituation either in the form of questions or in the learning process that can improve students' HOTS abilities. According to Nasir et al (2023: 2): "The importance of students being familiar with HOTS questions in the future world of work, high order thinking skills will be one of the main factors in determining one's success. By honing high-order thinking skills, students can practice abstract and creative thinking skills that will benefit them in the future".

Learning media also needs to be considered in supporting students' HOTS abilities. Based on data analysis, the use of printed books seems to be overused, less interesting and less efficient in supporting students' HOTS abilities. According to Latifah, et al (2020) HOTS-based teaching and the use of media during learning that is less interesting can cause students' HOTS ability to be low and make students bored and students will be less interested in learning physics. Therefore, teachers should also be more innovative in using learning methods and media, so that students' HOTS ability can increase.

CONCLUSION

Physics learning at MA Muhammadiyah Boarding School Metro has stimulated the ability of High Order Thinking Skills (HOTS) through a Project Based Learning (PjBL) model in 21st century learning. These abilities include critical thinking, problem solving, communication, collaboration, and creativity which contribute positively to student development. PjBL encourages students to actively construct knowledge, especially in problem solving and improving critical thinking. Good communication is considered important in learning, while creative thinking becomes a vital aspect in concluding problems. The PjBL process is able to explore students' creativity through project creation, as well as improve higher order thinking skills. However, the implementation of HOTS in Physics learning at MA Muhammadiyah Boarding School Metro has not been fully successful because there are some class X students who still have difficulty in solving problems, so it requires habituation of problems and teacher innovation in the use of learning methods and media.

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