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HOTS-Based Learning Versus HOTS-Based Test Instruments: A Study Analysis of Elementary School Teachers' and Students' Readiness

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Abstract. The research is motivated by the demands for the readiness of elementary school teachers and students to face the Merdeka Curriculum, one of which is the demand for HOTS-based learning. The implementation of HOTS-based learning requires an evaluation using HOTS-based test questions as well. The objectives are, 1) to analyze and examine the readiness of teachers in supporting the implementation of HOTS-based learning and its evaluation using HOTS-based test instruments, and 2) to analyze and examine how students' readiness to receive HOTS-based tests, especially in mathematics. This study used the survey method. The survey was conducted on 172 teachers and 154 high grade students in West Java, Indonesia. The instrument used questionnaires, for teachers distributed through Google Form, while for students using paper questionnaires that were filled in manually. Research results: 1) Elementary school teachers aren't fully prepared to implement HOTS-based learning, there are still misconceptions of teachers' understanding of HOTS learning; 2) In Mathematics, there are still many students who aren't ready to accept the presence of HOTS-based test questions, because they haven't mastered basic arithmetic skills. This is the biggest obstacle for students to be able to absorb, accept, and solve HOTS-based math questions as an evaluation standard in the Merdeka Curriculum.

Keywords: Study Analysis; Elementary Teacher Readiness; Elementary Student Readiness; HOTS-Based Learning; HOTS-Based Test Instrument

1. Introduction

In the era of globalization and industrial revolution 4.0, higher-order thinking skills (HOTS) have become a very important competency for students (Heffington & Coady, 2022; Shcheglova, et al., 2024; Vidergor, 2017; Sun, Xie, & Lavonen, 2022). Higher-order thinking skills include skills such as analysis, evaluation, synthesis, and problem solving that are needed to face complex challenges in real life (Houssart, 2012). Therefore, the demand for higher order thinking skills (HOTS) in students is increasing. This encourages the implementation of HOTS-based learning in schools, including elementary schools. HOTS-based learning aims to develop these skills through various innovative and interactive teaching methods (Nirtha, Hanip, & Tembang, 2024; Saido, et al., 2018; Muthmainnah, et al., 2022). Where the implementation of HOTS-based learning is also a mandatory demand for schools in Indonesia to support the implementation of the Merdeka Curriculum (Wahyudin, et al., 2024; Yansah, et al., 2023; Sahnan, & Wibowo, 2023). And of course, the implementation of HOTS-based learning cannot be separated from challenges, one of which is the readiness of teachers and students.

The effectiveness of HOTS-based learning cannot be separated from the test instruments used to measure the extent to which students have mastered these skills (Kurniawati & Hadi, 2021; Drenoyianni & Kourtis, 2022; Kemendikbud, Pusat Penilaian Pendidikan, & Abduh, 2019; Widana, 2017). HOTS-based test instruments are designed to evaluate students' critical and creative thinking skills, rather than simply measuring the ability to recall and understand information. HOTS-based learning and HOTS-based test instruments are important strategies to develop higher order thinking skills in elementary school students. Therefore, the readiness of teachers and students are two things that need to be the main concern in its implementation.

This article aims to analyze the readiness of elementary school teachers and students in implementing HOTS-based learning and test instruments. Teachers' readiness includes their understanding of HOTS concepts, their ability to design and implement HOTS-based learning, and their skills in creating appropriate test instruments (Isrokatun, et al., 2023). Meanwhile, students' readiness includes their ability to adapt to learning methods that demand higher order thinking skills and how they respond to HOTS-based test instruments, especially in Mathematics (Shoifa, HQ, & Zainudin, 2020; Amalia, Chan, & Sholeh, 2022; Grove, Guiry, & Croft, 2019).

This study is important because the implementation of HOTS at the elementary school level is the foundation for the development of critical and creative thinking skills at the next level of education. Through this analysis, it is hoped that effective strategies can be found to improve the readiness of teachers and students in implementing HOTS-based learning and assessment, so that holistic and sustainable education goals can be achieved.

This research is expected to provide useful information and recommendations for stakeholders in preparing elementary school teachers and students for HOTS-based learning and HOTS-based test instruments.

1.1. Problem Statement

The issue of how to know the readiness of teachers and the extent to which teachers have understood the ins and outs of HOTS learning is important, as an effort to anticipate and measure how much the prediction of the success of the implementation of the Merdeka Curriculum in Indonesia. And no less important is the capacity of elementary school students who will later receive types of evaluation in the form of HOTS-based test questions, especially for Mathematics. This is because Mathematics requires basic prerequisites, namely skill in mathematical arithmetic (addition, subtraction, multiplication, and division), which if this is not fully owned by students, it is impossible for a student to solve HOTS Mathematics questions.

1.2. Related Research

The following describes some previous studies that are relevant to this research. It is said by Handayani & Amirullah (2019), one of the problems experienced by teachers at SDN Kebon Pala 12 and 13 Pagi, in East Jakarta, Indonesia, is that the teacher's ability to develop K13 lesson plans based on literacy, 4C, PPK and HOTS is still lacking. This statement is also supported by Agusta & Sa'dijah (2021) who revealed that the knowledge and ability to prepare learning tools containing critical thinking skills and creative thinking in elementary school teachers in Banjarmasin City, is still insufficient, to deal with online learning during the Covid-19 pandemic. Where Agusta & Sa'dijah's research (2021) used quantitative methods with descriptive analysis. The object of research was 200 elementary school teachers in Banjarmasin city. The results showed that only 24.25% of the 200 samples had adequate knowledge of the concept of critical thinking and only 20.5% had adequate knowledge of the concept of creative thinking. The ability to prepare learning tools only 39.5% included elements of critical thinking and creative thinking skills in learning tools. In conclusion, less than 40% of teachers in Banjarmasin city have sufficient knowledge and mastery of critical and creative thinking skills- based learning. These results indicate that teachers in Banjarmasin city are not ready to implement learning based on critical thinking skills and creative thinking during the Covid-19 pandemic which will be mostly oriented towards online learning.

Meanwhile, Wicaksono & Irianti (2022) said that an effort is still needed to improve the skill development of elementary school teachers, one of which is by conducting HOTS-based training. Therefore, the service activities carried out by Wicaksono & Irianti (2022) were in the form of online workshops for 30 teachers representing KKG (Kelompok Kerja Guru). Activities are in the form of theory and practice. The purpose of this activity is for teachers to understand the importance of developing HOTS for students to improve the quality of learning in schools; understand basic learning preparation strategies centered on HOTS according to learning methods; and HOTS- based learning assessment. The results of this activity stated that most of the participants were able to develop HOTS-based learning.

According to Haverly & Davis (2023), the job of teaching science at the elementary level is challenging, given the variety of subjects that classroom teachers are expected to teach and the absence of specific science priorities at this level. Haverly & Davis (2023) revealed that the basic characteristics and abilities that teachers and prospective teachers must have include identity, disposition, emotions, beliefs, attitudes, self-efficacy, knowledge, engagement in and with science practices, lesson planning, and lesson implementation. These points are important for teachers and prospective teachers as a foundation for readiness as science teaching in elementary school. Therefore, it is necessary to think about how efforts can be made to train and develop their strengths.

Meanwhile, Suhaimi, Wahdini, & Amberansyah (2023) in their community service activities, conducted training on the development of Higher Order Thinking Skills (HOTS)-oriented learning for teachers of SDN Banjarmasin Utara. The method used was in the form of HOTS-oriented learning development training for teachers of SDN North Banjarmasin District. In this training, teachers are independently equipped with knowledge and trained to prepare, implement and evaluate HOTS-oriented learning. The data analysis technique is the participants' knowledge scores on the pretest and posttest, as well as from the results of observations during practice by the trainees. The results of the implementation of the activity obtained that the training provides benefits in increasing the knowledge of teachers in SDN North Banjarmasin District. The percentage increase of 42.58% of HOTS-oriented learning can be implemented to make students accustomed to ways of thinking that make students able to convey argumentative, logical, and confident ideas, both written and oral, which can later be a provision for students at the next level of education.

Therefore, from the description of previous studies, the survey research entitled HOTS-Based Learning Versus HOTS-Based Test Instruments: An Analysis of the Readiness of Elementary School Teachers and Students, this study will examine how teachers' readiness in supporting the implementation of HOTS-based learning and readiness in conducting evaluation using HOTS-based test instruments, as well as the factors that influence them. In addition, it is also to find out how students are ready to accept HOTS-based test questions, especially in Mathematics subjects, as part of the implementation of the Merdeka Curriculum, especially in the West Java, Indonesia.

1.3. Research Objectives

The purpose of conducting a survey of elementary school teachers and students is to find out how prepared teachers are in supporting the implementation of HOTS-based learning as well as their readiness in conducting evaluations using HOTS-based test instruments. In addition, it is also to find out how prepared students are to receive HOTS-based test questions, especially in Mathematics.

2. Theoretical Framework

2.1. Merdeka Curriculum

The Merdeka Curriculum is an education policy launched by the Ministry of Education, Culture, Research, and Technology (Kemendikbudristek) of the Republic of Indonesia in 2022 (Wahyudin, et al., 2024; Yansah, et al., 2023; Sahnan, & Wibowo, 2023). This curriculum is an improvement of the 2013 Curriculum with a focus on developing students' basic abilities and competencies more holistically (Pratycia, et al., 2023; Angga, et al., 2022). Merdeka Curriculum is an educational approach developed in Indonesia as part of the education reform effort. The aim is to provide more freedom and flexibility to schools and teachers in designing and implementing learning that suits the needs and potential of students (Mursyid, et al., 2023; Tsuraya, et al., 2022; Purnawanto, 2022; Sarnoto, 2024). This curriculum emphasizes the holistic development of student competencies, including knowledge, skills and attitudes.

The main principle of the Merdeka Curriculum (Wahyudin, et al., 2024; Sarnoto, 2024; Damiati, Junaedi, & Asbari, 2024; Ruth, Novia, & Surhayati, 2023; Anjani, Rufaidah, & Suharyati, 2023):

a. Focus on developing students' basic skills and competencies: The Merdeka Curriculum emphasizes the development of basic skills such as literacy, numeracy, science, and information and communication technology (ICT). In addition, this curriculum also encourages the development of student competencies in various areas, such as character, independence, and leadership.
b. Student-Centered Learning: This curriculum places students at the center of the learning process, where they are encouraged to be active, creative and critical in exploring knowledge.
c. Freedom and Flexibility: Schools and teachers are given the freedom to determine the teaching methods, teaching materials, and assessments that best suit the context and needs of the students.
d. Profil Pelajar Pancasila Strengthening Project: This program aims to build students' character in accordance with the values of Pancasila, such as mutual cooperation, independence, critical reasoning, creativity, faith, devotion to God Almighty, and noble character, as well as global diversity.
e. Project Based Learning: Students are engaged in projects that allow them to practice and apply knowledge and skills in a real context.
f. Authentic Assessment: Assessment is continuous and reflects students' real abilities in various situations, not just through written exams.
g. Development of 21st Century Competencies: The Merdeka Curriculum emphasizes the development of competencies required in the 21st century, such as critical thinking, creativity, collaboration, and communication.

The objectives of the Merdeka Curriculum, namely (Wahyudin, et al., 2024; Sarnoto, 2024; Damiati, Junaedi, & Asbari, 2024; Ruth, Novia, & Surhayati, 2023; Anjani, Rufaidah, & Suharyati, 2023):

a. Improving the quality of education in Indonesia: The Merdeka Curriculum is expected to improve the quality of education in Indonesia by equipping students with the skills and competencies needed for the future.
b. Creating the next generation of the nation with character, intelligence, and competitiveness: The Merdeka Curriculum is expected to create the next generation of the nation with character, intelligence, and competitiveness in the era of globalization.
c. Expanding access to quality education: The Merdeka Curriculum is expected to expand access to quality education for all students in Indonesia.

The Merdeka Curriculum is being implemented gradually across Indonesia. By 2022, it will be implemented in Sekolah Penggerak. In 2023, it was implemented in interested schools. In 2024, it will be implemented in all schools in Indonesia (Mursyid, et al., 2023; Tsuraya, et al., 2022; Purnawanto, 2022).

2.2. HOTS-Based Learning

HOTS (Higher Order Thinking Skills) based learning is a learning method that focuses on developing higher *order* thinking skills in students. These higher order thinking skills refer to the ability to analyze, evaluate, and synthesize information, as well as problem solving, make decisions, and work creatively (Muthmainnah, et al., 2022). In other words, HOTS-based learning is learning in such a way that the activities carried out in the classroom can train students to think critically, solve problems, creatively and build collaboration so that students have learning experiences that build their thinking skills (Nirtha, Hanip, & Tembang, 2024; Saido, et al., 2018; Muthmainnah, et al., 2022).

The main purpose of HOTS-based learning is to equip students with the skills needed to succeed in the globalization era (Muthmainnah, et al., 2022). In the current era, students are not only required to have extensive knowledge, but also to be able to think critically, creatively and innovatively. HOTS-based learning is an educational approach that aims to develop higher order thinking skills in students. Higher Order Thinking Skills include skills such as analysis,

evaluation, synthesis, and problem solving, which are above the level of basic skills such as remembering and understanding (Muthmainnah, et al., 2022).

Characteristics of HOTS-based learning (Nirtha, Hanip, & Tembang, 2024; Saido, et al., 2018; Muthmainnah, et al., 2022):

a. Emphasizesing on concept understanding: HOTS-based learning does not only focus on memorizing information, but also on understanding the underlying concepts and principles.
b. Utilizing various learning methods: HOTS-based learning utilizes a variety of active and participatory learning methods, such as discussions, problem solving, and projects.
c. Provide opportunities for students to learn independently: HOTS-based learning provides opportunities for students to learn independently and take responsibility for their own learning.
d. Assessing students comprehensively: Assessment in HOTS-based learning does not only focus on learning outcomes, but also on the learning process and students' progress.

Meanwhile, some important aspects of HOTS-based learning are (Nirtha, Hanip, & Tembang, 2024; Saido, et al., 2018; Muthmainnah, et al., 2022):

a. Analysis: Students are encouraged to identify patterns, correlations, and parts of a concept or problem. They learn to turn the information into smaller components and understand how these parts correlate to each other.
b. Evaluation: Students are trained to make judgments or decisions based on predetermined criteria. They learn to evaluate the strengths and weaknesses of an argument, idea or solution.
c. Synthesis: Students are encouraged to combine different elements to form a new whole or generate new ideas. This involves creativity and the ability to think outside the box.
d. Problem Solving: Students are trained to identify problems, design strategies to address the problems, and implement appropriate solutions. This often involves applying knowledge in new or contextual situations.
e. Creativity: Encourages students to create new and innovative ideas, as well as to look at problems from different points of view.

Hence, the benefits of HOTS-based learning (Nirtha, Hanip, & Tembang, 2024; Saido, et al., 2018; Muthmainnah, et al., 2022):

a. Improves students' higher order thinking skills: HOTS-based learning is proven to improve students' higher-order thinking skills, such as the ability to analyze, evaluate, and synthesize information.
b. Increase students' learning motivation: HOTS-based learning can increase students' learning motivation, as students feel more challenged and involved in the learning process.
c. Preparing students for the future: HOTS-based learning equips students with the skills needed to succeed in the globalization era, such as the ability to think critically, creatively, and innovatively.

Some examples of HOTS-based learning implementation include (Nirtha, Hanip, & Tembang, 2024; Saido, et al., 2018; Muthmainnah, et al., 2022):

a. Research Project: Students are given the task of conducting independent research on a specific topic. They must collect data, analyze the findings, and present their results in a creative and critical way.
b. Group Discussion: Students engage in group discussions where they have to analyze situations, evaluate different arguments, and reach conclusions based on the evidence at hand.
c. Case Study: Students study a real or hypothetical case and are asked to identify key issues, evaluate possible solutions, and recommend a course of action based on their analysis.
d. Complex Problem Solving: The teacher provides a complex problem that requires critical and creative thinking to solve. Students work individually or in groups to design and

implement solutions.

e. Open-ended Assignments: Students are given projects or assignments with minimal guidance, encouraging them to think independently and creatively to achieve the learning objectives.
f. The teacher asks students challenging questions that require critical thinking to answer.
g. Teachers give students tasks that require them to solve problems or make decisions.
h. Teachers provide opportunities for students to learn independently and manage their own learning.
i. Teachers use various assessment methods, such as portfolio assessment and performance assessment, to comprehensively assess students' progress.

HOTS-based learning is an important learning method to develop higher order thinking skills in students. By implementing HOTS-based learning, teachers can equip students with the skills needed to succeed in the globalization era (Muthmainnah, et al., 2022). HOTS-based learning aims to prepare students to be able to think critically and creatively in facing challenges in the real world, as well as to become lifelong learners who are able to adapt to changes and developments in the future (Muthmainnah, et al., 2022).

2.3. HOTS-Based Test Instrument

HOTS-based test instruments are measuring instruments used to assess students' higher order thinking skills (HOTS) (Kemendikbud, Pusat Penilaian Pendidikan, & Abduh, 2019). HOTS refers to the ability to analyze, evaluate, and synthesize information, as well as problem solving, make decisions, and work creatively (Kemendikbud, Pusat Penilaian Pendidikan, & Abduh, 2019). In other words, HOTS questions are a type of question designed to measure students' ability to think at a higher level or their ability to think critically, analytically, synthesize, evaluate, and also creatively (Kurniawati & Hadi, 2021; Drenoyianni & Kourtis, 2022; Kemendikbud, Pusat Penilaian Pendidikan, & Abduh, 2019; Widana, 2017).

The characteristics of HOTS-based test instruments are (Kurniawati & Hadi, 2021; Drenoyianni & Kourtis, 2022; Kemendikbud, Pusat Penilaian Pendidikan, & Abduh, 2019; Widana, 2017):

a. Measuring various aspects of HOTS: HOTS-based test instruments should measure various aspects of HOTS, such as the ability to analyze, evaluate, and synthesize information, as well as the ability to solve problems, make decisions, and work creatively.
b. Have varying levels of difficulty: HOTS-based test instruments should have varying levels of difficulty, so that they can assess the HOTS abilities of students of different levels.
c. Objective and fair: HOTS-based test instruments must be objective and fair, so that they do not favor certain students.
d. Easy to understand and answer: HOTS-based test instruments should be easy for students to understand and answer.

Types of HOTS-based test instruments include (Kurniawati & Hadi, 2021; Drenoyianni & Kourtis, 2022; Kemendikbud, Pusat Penilaian Pendidikan, & Abduh, 2019; Widana, 2017):

a. Multiple choice: Multiple choice questions can be used to assess students' HOTS skills in analyzing and evaluating information.
b. Description: Description questions can be used to assess students' HOTS skills in synthesizing information, solving problems, making decisions, and working creatively.
c. Games: Games can be used to assess students' HOTS skills in collaboration, communication, and critical thinking.
d. Projects: Projects can be used to assess students' HOTS skills in planning, executing, and evaluating a task.

Meanwhile, the principles of preparing HOTS test instruments include (Kurniawati & Hadi, 2021; Drenoyianni & Kourtis, 2022; Kemendikbud, Pusat Penilaian Pendidikan, & Abduh, 2019; Widana, 2017):

a. Clarity of instructions: Instructions should be clear and specific so that students can

understand the tasks they have to perform.
b. Relevancy: The questions should be relevant to the material that has been studied and in line with the learning objectives.
c. Linkage to the real world: Questions should reflect real-world situations or problems that require students to apply their knowledge and skills.
d. Question variety: Using varrying types of questions (essays, case studies, projects, etc.) to measure different aspects of higher order thinking skills.
e. Grading rubric: Use clear and detailed scoring rubrics to evaluate student answers objectively and consistently.

HOTS-based test instruments are important measurement tools to assess students' higher order thinking skills (Kurniawati & Hadi, 2021; Drenoyianni & Kourtis, 2022; Kemendikbud, Pusat Penilaian Pendidikan, & Abduh, 2019; Widana, 2017). By using appropriate test instruments, teachers can obtain information about students' HOTS skills and take the necessary steps to improve these skills.

3. Method

3.1. Research Design

This research is survey research. Survey research is research that involves collecting data from a group of people through the use of questionnaires or interviews. The purpose is to gather information about attitudes, opinions, behaviors, or certain characteristics of a larger population (Fraenkel & Wallen: 1990; Creswell: 1999; Creswell: 2015; Sugiyono: 2016).

Instrument Development ➔ Instrument Validation ➔ Survey-Google form: Teacher
Manual Questionnaire: Student

Figure 1. Flow of Survey Activities

This survey research was conducted with the aim of describing the characteristics, opinions, or behavior of the population (elementary school teachers and students) in relation to how they are ready to face the Merdeka Curriculum (Fraenkel & Wallen: 1990; Creswell: 1999; Creswell: 2015; Sugiyono: 2016).
a. Survey to elementary school teachers
   To analyze and assess teacher readiness in supporting the implementation of HOTS-based learning and its evaluation using HOTS-based test instruments.
b. Survey of High Grade Students
   To analyze and examine how students' readiness to receive HOTS-based tests, especially in mathematics subjects.

3.2. Respondent

There are 2 types of populations determined in this study, namely the population of elementary school teachers in West Java and the population of students in West Java, Indonesia, who will be surveyed regarding their readiness to face the implementation of the Merdeka Curriculum.

The teacher sample included 172 (136 female and 36 male) elementary school teachers from Majalengka, Cirebon, Bogor, Tasikmalaya, Bandung City, Sumedang, Garut, and other areas in West Java. While the student sample consisted of 154 students, derived from high grade students namely 4th grade, 5th grade, and 6th grade SDN Margamukti, Cimalaka, Sumedang, West Java, Indonesia.

Table 1. Sample of elementary school teachers in West Java

Sample of elementary school teachers in West Java = 172 people	
Male	Female
36	136

While the explanation for the sample of students is as follows.

Table 2. Sample of High Grade Students

Sample of High Grade Students (Age 8-13 years old)= 154 students					
4th Grade= 50 students		5th Grade= 61 students		6th Grade= 43 students	
Male	Female	Male	Female	Male	Female
26	24	22	39	23	20

3.3. Data Collection

To be able to answer the objectives of this study, data collection activities through surveys were carried out on 2 samples, namely elementary school teachers and elementary school students.

a. Data Collection of Elementary Teacher Responses

To be able to analyze and examine how teacher readiness supports the implementation of HOTS-based learning and its evaluation by using HOTS-based test instruments using questionnaires, for teachers distributed through the Google Form link. There are 2 types of questions, namely 10 closed questions with True, False, and Undecided answer options, and 2 open questions with a free fill format "long answer text".

b. Data Collection of Elementary Students' Responses

The survey conducted to students is to see how prepared they are to receive and solve various HOTS-based test questions, as one of the indicators to be able to measure the achievement of the implementation of HOTS-based learning in the classroom, especially in Mathematics. How students respond to learning activities in Mathematics, which will affect their response to HOTS- based math test questions. The instrument used a questionnaire that was filled in manually, through filling in with papers. There were 8 closed questions with "Yes" and "No" answer options.

3.4. Data Analysis

From all questionnaires given to respondents, there are 2 types of data received, namely 1) data from closed questionnaires and data from open-ended questionnaires.

a. Teacher Response Data Analysis

There are 2 types of data obtained from teacher responses, 1) closed-ended questionnaire data, processed graphically using a bar graph to show how the tendency of responses or answers given by 172 respondents; 2) open-ended questionnaire data, processed by identifying important themes or patterns in the data, then grouping the data into relevant categories in order to interpret the findings obtained from the survey, how teacher readiness supports the implementation of HOTS-based learning and its evaluation using HOTS-based test instruments (Ruseffendi, 1998; Sugiyono, 2015).

b. Analysis of Student Response Data

The 8 items of closed questions given to 154 students were processed using graphical analysis in the form of a bar graph. The graph is made based on the percentage of responses given to show the tendency of students' readiness in receiving HOTS-based test instruments, especially in Mathematics.

3.5. Validity and Reliability

This research uses instruments in the form of questionnaires, both with closed questions and free (open) entries. Before this instrument is used, content validity has been carried out, the aim is to ensure that the research instrument used measures what should be measured (Fraenkel & Wallen: 1990; Creswell: 1999; Creswell: 2015; Sugiyono: 2016). In other words, content validity ensures that the questions in the questionnaires for both teachers and students are relevant to the themes/concepts to be measured.

This content validity is done by:

a. Expert analysis is a review by 2 experts who are experienced in educational research and the development of various research instruments, as well as revision of questionnaire items that are deemed inappropriate based on the suggestions of the 2 experts (Fraenkel & Wallen: 1990; Creswell: 1999; Creswell: 2015; Sugiyono: 2016).
b. limited pilot test or readability test. The questionnaires that will be used in the data collection activities were first tested on fellow elementary school teachers (for the teacher questionnaire) who were not included in the survey sample, and also on several high school students (for the student questionnaire) to see if the questions were easy to understand and answer (Fraenkel & Wallen: 1990; Creswell: 1999; Creswell: 2015; Sugiyono: 2016).

4. Findings

As the objectives of this research are, 1) to analyze and examine teachers' readiness in supporting the implementation of HOTS-based learning and its evaluation using HOTS-based test instruments, and 2) to analyze and examine students' readiness in receiving HOTS- based tests, especially in mathematics subjects, the following research results were obtained.

4.1. Elementary Teacher Readiness Survey Results

The results obtained from the survey on teacher readiness in facing the Merdeka Curriculum in relation to HOTS-based learning versus HOTS-based test instruments are presented in the following graph.

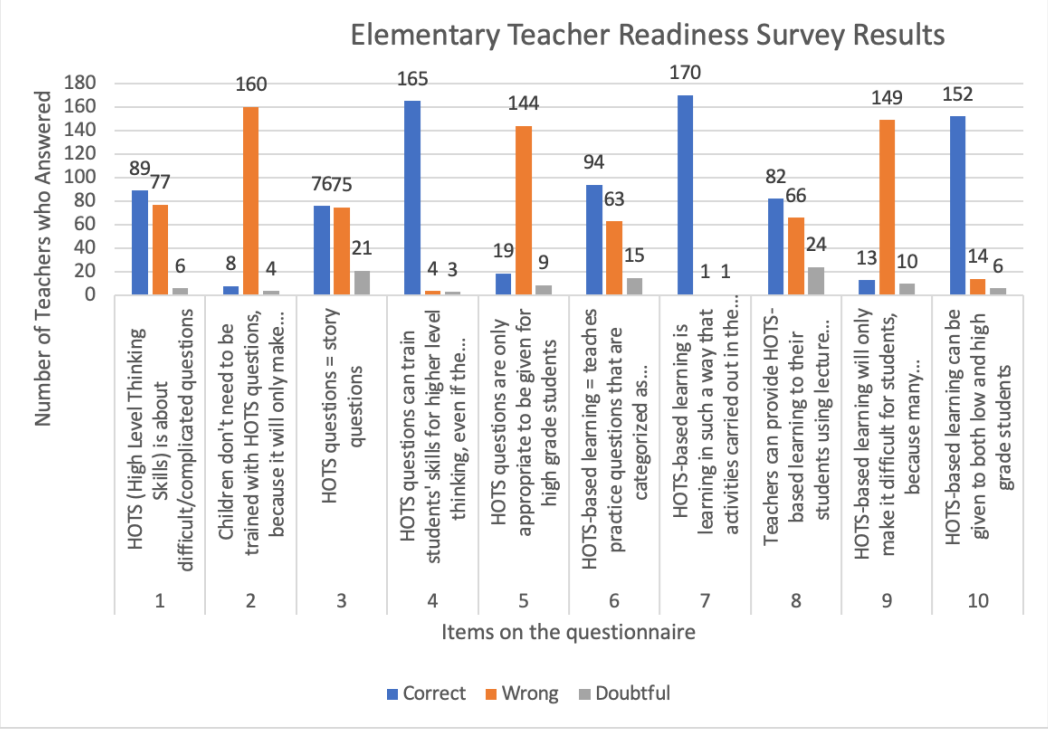

Figure 2. Elementary Teacher Readiness Survey Results

From Figure 2. it can be explained that out of 172 teachers, 1) there are still 89 teachers who understand that HOTS (Higher Order Thinking Skills) is about difficult / complicated questions, and 6 people are still hesitant about the definition; 2) there are still 8 people who justify that children do not need to be trained with HOTS questions, because it will only make them confused, and 4 people are still doubtful about the statement; 3) there are still 76 teachers who understand that HOTS questions = story problems, and 21 people are still doubtful; etc.. From this, it can be said that there are still misconceptions of elementary school teachers on the understanding of what HOTS questions are and the understanding of what HOTS learning is.

As for the results of the survey with open-ended questions, the results are presented in the following table:

Table 1. Results of the Survey of Elementary School Teachers

Question	Respondent's Answer	Description
What do you know about HOTS-based learning?	HOTS-based learning is learning in such a way that activities carried out in the classroom can train students to think critically, solve problems, be creative and build collaboration so that students have learning experiences that build high-level thinking skills	No misconceptions
	Teaching and learning activities with various **learning methods and models that suit student needs**	Misconceptions
	HOTS-based learning is a **process of thinking** of students at a higher cognitive level, namely problem solving abilities, thinking abilities creativity, critical thinking, argumentation ability, and decision making ability	Misconceptions
	Problem solving **ability**, creative thinking **ability**	Misconceptions
	Higher level thinking learning	Misconceptions
	HOTS **questions** can train students' skills for higher level thinking	Misconceptions
	HOTS-based learning is learning where the learning process is also HOTS, the learning **objectives** use HOTS-based operational verbs, including LKPD and assessment instruments	Misconceptions
	Learning with higher order **thinking**	Misconceptions
	The program was developed as an effort by the Kemendikbud to improve the quality of learning and improve the quality of graduates	Misconceptions
	High-level **thinking** learning to measure students' abilities in critical, analytical, synthesis, evaluation and creative thinking	Misconceptions
	Learning that uses a learning model that is **attractive to students** and is able **to present material related to current developments**	Misconceptions
	Learning that requires high level **thinking skills** which not only requires the ability to remember, but also requires other higher abilities, such as the ability to think creatively and critically	Misconceptions
	Learning that **starts from a problem**	Misconceptions
	A type of **question** that has been designed to enable critical thinking	Misconceptions

	A complicated, unique, exciting **problem**. Need to think seriously	Misconceptions
	The learning is detailed, from identification to problem solving	Misconceptions
What do you know about HOTS questions?	HOTS (Higher Order Thinking Skill) questions are a type of question designed to measure students' abilities in high-level thinking or students' abilities in critical, analytical, synthetic, evaluative and creative thinking	No misconceptions
	The problem is **in the form of a story**	Misconceptions
	HOTS is a type of question that **can improve** aspects of students' communication, creativity and problem-solving abilities	Misconceptions
	Learning that makes students think critically, creatively, be able to solve problems, and have the ability to collaborate	Misconceptions
	Questions are used to **train students' skills** for higher level thinking	(few) Misconceptions
	HOTS (Higher Order Thinking Skills) is about **difficult/complicated questions**	Misconceptions
	Questions with long narratives and require carefulness to digest the question sentences	Misconceptions
	Complicated matter	Misconceptions
	Usually in the form of **descriptions** or **story questions** with complex answers	Misconceptions
	HOTS **learning** is in accordance with the Merdeka Curriculum	Misconceptions
	The content of the questions is quite long so we have to be diligent in literacy	Misconceptions
	Difficult questions	Misconceptions

4.2. Survey Results of Elementary Students' Readiness

The survey results related to students' readiness in receiving HOTS-based tests, especially in Mathematics are as follows.

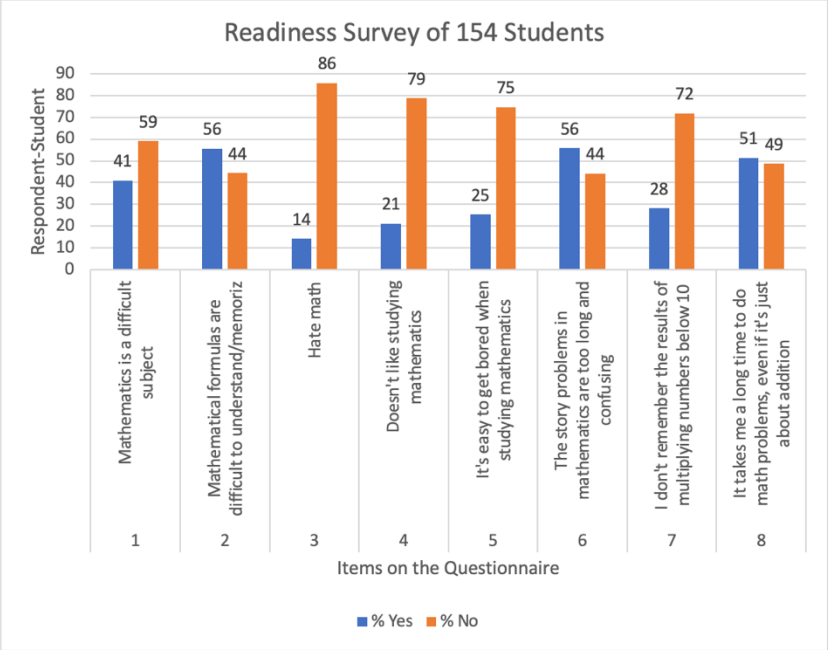

Figure 3. Student Readiness Survei

From Figure 3, it can be revealed that 1) there are still 41% of students who think that Mathematics is a difficult subject; 2) 56% of students still think that Mathematics formulas are difficult to understand/memorize; 3) there are still 14% of students who hate Mathematics; even 4) there are still 21% of students who do not like learning Mathematics; etc.

5. Discussion

The Merdeka Curriculum is a new breakthrough in Indonesian education, bringing a learning paradigm that focuses on developing students' character and potential holistically (Pratycia, et al., 2023; Angga, et al., 2022). One of the important elements in the Merdeka Curriculum is HOTS-based learning which emphasizes the development of students' critical, creative, and analytical thinking skills. However, the successful implementation of the Merdeka Curriculum cannot be separated from the role of the teacher as a learning facilitator (Fauzi & Mustika, 2022; Afriani, et al., 2024). Teacher readiness in understanding and implementing HOTS learning is the main key in realizing the objectives of the Merdeka Curriculum.

Teacher readiness in understanding and implementing HOTS learning is one of the determining factors for the successful implementation of the Merdeka Curriculum. By increasing teacher readiness, it is hoped that the Merdeka Curriculum can achieve its goals in producing a young generation of Indonesians who are characterized, intelligent, and competitive in the era of globalization. HOTS learning is an important element in the Merdeka Curriculum (Wahyudin, et al., 2024; Sarnoto, 2024; Damiati, Junaedi, & Asbari, 2024; Ruth, Novia, & Surhayati, 2023; Anjani, Rufaidah, & Suharyati, 2023). Teacher readiness in understanding and implementing HOTS learning is the main key in realizing the goals of the Merdeka Curriculum. Collaborative efforts from the government, schools, teachers, and other stakeholders are needed to improve teacher readiness and support the successful implementation of the Merdeka Curriculum in Indonesia.

In line with the results of this study, several other studies also suggest that there are still significant variations in teachers' understanding of HOTS (Isrokatun, et al., 2023). Most teachers understand the basic concepts of HOTS, but many still experience difficulties in translating them into classroom learning practices. Some aspects that need to be considered (Isrokatun, et al., 2023):

a. HOTS concept: Teachers should have a deep understanding of what HOTS are, including the skills of analysis, evaluation, synthesis and problem solving.
b. Learning Strategies: Teachers need to be trained to use various learning strategies that can develop HOTS skills in students, such as project-based learning, group discussions, case studies, and creative assignments.
c. HOTS Assessment: Teachers also need to understand how to design assessment instruments that can accurately measure HOTS skills. These include analytical essays, case studies and research projects.

There are several factors that influence teachers' readiness, including teaching experience, educational background, access to training and professional development, and support from schools and local governments. In addition, the government and publishers also need to provide quality teaching materials and learning resources to support HOTS learning (Rohmah, et al., 2024). The existence of these teaching materials and learning resources must also be in accordance with the curriculum and learning context in Indonesia.

The Merdeka Curriculum, with its focus on HOTS development, brings changes in learning evaluation, including in Mathematics subjects in elementary schools. HOTS-based evaluation in Mathematics requires students to not only memorize formulas and solve routine problems, but also be able to think critically, creatively, and analytically in solving mathematical problems (Kurniawati & Hadi, 2021; Drenoyianni & Kourtis, 2022; Kemendikbud, Pusat Penilaian Pendidikan, & Abduh, 2019; Widana, 2017). But in fact, there are still 41% of students who say

that Mathematics is a difficult subject and 56% of students still have difficulty understanding Mathematics formulas.

According to experts, there are several definitions of HOTS-based questions, namely 1) a high-level thinking process, where when students work on a problem, they do not immediately find the answer, but need to analyze it first; 2) non-routine questions; and 3) questions that measure high-level thinking skills, such as problem solving, critical thinking, creative thinking, etc. (Anwar & Puspita, 2018; Saraswati & Agustika, 2020). This means that in this case HOTS is not fixated on difficult / complicated questions, but the emphasis is on questions that train / invite students to the "real thinking process" (Anwar & Puspita, 2018; Saraswati & Agustika, 2020).

As explained earlier, the emphasis of HOTS questions is on how a problem can stimulate students to a "real thinking process", and this does not always mean story problems, if in Mathematics. It is possible for a problem to be in the form of a story but in essence does not make children think at a higher level (Wicaksana & Sukirman, 2023; Arifin, Kirana, & Widodo, 2017).

a. Basic Math Understanding and Skills

Research shows that before students can be successful in HOTS questions, they must have a strong understanding of basic mathematical skills. These basic skills include (Shoifa, HQ, & Zainudin, 2020; Amalia, Chan, & Sholeh, 2022; Grove, Guiry, & Croft, 2019):

1) Arithmetic Skills: Basic understanding of math operations such as addition, subtraction, multiplication, and division.
2) Geometry Skills: Understanding of shape, size, and properties of space.
3) Basic Problem Solving: The ability to apply basic operations in different situations.

Students who have a strong mathematical foundation tend to be better prepared for problems that demand higher-order thinking skills.

b. Critical and Creative Thinking Skills

HOTS questions in mathematics not only test the ability to remember and understand concepts, but also the ability to (Shoifa, HQ, & Zainudin, 2020; Amalia, Chan, & Sholeh, 2022; Grove, Guiry, & Croft, 2019):

1) Analyzing: Students should be able to decompose math problems, identify patterns, and understand the relationships between concepts.
2) Evaluate: Students need to evaluate different potential solutions and choose the best solution based on logic and evidence.
3) Creating: Students are encouraged to create new solutions or alternative methods of solving math problems.

c. Mental and Emotional Readiness

Students' readiness to face HOTS questions also depends on mental and emotional factors, including (Hidayatullah, Setiyawan, & Syarifuddin, 2024):

1) Self-Confidence: Students should feel confident in their ability to solve complex problems.
2) Mental Resilience: The ability to stay focused and not give up easily when facing difficult problems.
3) Motivation: Intrinsic motivation to learn and understand math, not just to get a good grade.

d. Challenges in Implementing HOTS Evaluation

There are several challenges faced by students in dealing with HOTS questions in mathematics, among others:

1) Unfamiliarity with Complex Questions: Many students may be unfamiliar with complex question formats that require higher-order thinking, as most previous assessments may have focused more on recall and comprehension skills.

2) Time Constraints: HOTS questions often take longer to complete, so students need to learn to manage their time well.
3) Learning Support: Students need adequate support from teachers and parents to develop higher order thinking skills.

The capacity of elementary school students to cope with HOTS-based evaluation in Mathematics depends on their basic understanding of mathematics (arithmetic skills), critical and creative thinking skills, and mental and emotional readiness (Hidayatullah, Setiyawan, & Syarifuddin, 2024). Although there are challenges in implementing HOTS evaluation, appropriate strategies such as project-based learning, focus on the thinking process, HOTS question practice, and constructive feedback can help improve students' readiness. Thus, students can be better prepared to face higher academic challenges and develop into critical and creative thinkers.

6. Conclusion

From the results of this study, it can be concluded that elementary school teachers are not fully prepared to implement HOTS-based learning. This is due to the misconceptions of teachers' understanding of HOTS-based learning. Many teachers' understanding is biased by two terms that are similar, namely HOTS-based learning and HOTS-based test instruments. While on the students' side, especially in Mathematics, there are still quite a number of students who are not ready to respond to the presence of HOTS-based test questions, many students are still "afraid" of Mathematics because they have not mastered basic arithmetic skills, such as addition, subtraction, multiplication, and division. In fact, HOTS questions explore students' thinking power more by having a sufficient condition, namely being proficient in basic math arithmetic.

Limitation

There are several limitations of this research, including 1) this research was conducted as a survey that has not been followed up with in-depth interviews with respondents, both teachers and students, in order to obtain more complete data; 2) the survey conducted on students was only limited to seeing students' readiness to accept HOTS-based test instruments in Mathematics subjects; and 3) the survey was only aimed at high-grade students, whereas the implementation of evaluations using HOTS-based test instruments is certainly applied to elementary school students from grade 1 to grade 6.

Recommendation

From the limitations of the research previously described, the recommendations that can be given include:

a. Future researchers
   1) To complement the results of this survey research, future researchers can conduct similar research that is more comprehensive, using a variety of more complete research instruments, for example questionnaires and interviews.
   2) Future researchers can also conduct experiments related to how to eliminate the *image* that mathematics is a difficult subject for students, by presenting various forms and types of learning media, both in high grades and at low grade levels.

b. Dinas Pendidikan, teachers and relevant academics
   It is necessary to organize seminars and/or *workshops on* how to introduce the concept of HOTS-based learning and understand the fundamental differences with the term HOTS questions, as a provision for implementing the Merdeka Curriculum.

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Conflict of Interest

The authors declare that there is no conflict of interest with any party, related to the research and writing of this article.

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